MANIPAL UNIVERSITY JAIPUR

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

PROGRAMME OUTCOMES & PROGRAM SPECIFIC OUTCOMES

ACADEMIC YEAR – 2019-20

PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4]. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAM SPECIFIC OUTCOMES (PSO)

PSO 1: Will be able to design, develop and implement efficient software for a given real life problem.

PSO 2: Will be able to apply knowledge of AI, Machine Learning and Data Mining in analysing big data for extracting useful information from it and for performing predictive analysis.

PSO 3: Will be able to design, manage and secure wired/ wireless computer networks for transfer and sharing of information.

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INSPIRED BY LIFE

Articulation Matrix 2019-20																
Semester	Course Code	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
III	CS1301	3	2	1	0	0	0	0	0	0	0	0	2	1	1	1
	CS1302	1	1	2	0	0	0	0	0	0	0	0	2	2	0	2
	CS 1303	3	2	2	0	0	0	0	0	0	0	0	2	3	0	0
	CS1304	3	2	2	2	0	0	0	0	1	1	1	2	2	0	0
	CS1331	3	2	2	0	0	0	0	0	0	0	0	0	3	0	0
	CS1332	1	2	2	1	1	0	0	0	0	0	0	0	2	0	0
IV	CS1401	2	2	3	1	1	0	0	0	0	1	1	2	1	1	2
	CS1402	2	2	2	2	2	2	0	0	0	2	0	0	2	2	0
	CS1403	2	2	1	2	1	1	0	0	0	0	1	1	1	0	0
	CS1431	2	2	2	2	1	1	0	1	1	1	1	2	1	1	1
	CS1432	1	3	2	3	1	1	0	1	1	1	1	0	1	1	0
	CS1433	1	1	2	2	1	1	0	0	0	0	1	1	1	0	0
V	CS1501	0	3	2	2	2	2	1	2	3	2	2	0	3	2	3
	CS1502	2	3	3	3	3	0	0	0	3	3	3	3	3	0	0
	IT1504	3	2	1	0	0	0	1	0	1	2	0	1	3	2	2
	CS1505	3	3	3	3	2	2	0	1	1	0	1	1	3	0	0
	CS1530	3	1	2	0	0	0	0	0	0	0	0	2	3	0	0
	CS1532	1	3	3	1	3	0	0	0	0	0	0	0	3	0	0
	CS1535	3	3	3	2	2	0	0	0	0	0	0	0	3	0	0
	CS1551	3	1	3	1	2	0	0	0	1	1	1	2	2	1	2
	CS1553	2	2	2	3	2	1	1	0	1	3	1	3	3	3	1
	CC1551	2	2	3	3	3	1	2	2	2	2	3	3	3	0	1
	IT1504	3	2	1	0	0	0	1	0	1	2	0	1	3	2	2
VI	CS1604	3	3	0	2	3	0	0	0	0	0	1	0	1	0	0
	CS1631	2	0	3	0	3	0	2	0	2	0	0	0	2	0	3
	CS1633	3	3	0	2	3	0	0	0	0	0	1	0	1	0	0
	CS1650	1	1	1	2	0	2	2	2	2	2	2	2	1	2	2
	CS1653	3	0	2	1	0	0	0	0	0	0	1	1	2	0	0
	IT1653	3	3	3	3	2	2	1	1	1	1	0	1	0	3	0
	CC1653	3	3	3	3	1	2	0	0	3	2	3	3	0	0	0
	CS1634	1	1	1	2	2	1	0	1	1	1	2	2	1	2	1
VII	CS1701	2	3	2	3	2	0	0	0	0	0	2	1	2	3	0
	CS1704	3	2	1	0	0	0	1	0	1	2	0	1	3	2	2
	CS1730	2	3	2	3	2	0	0	0	0	0	2	1	2	3	0
	CS1750	3	2	2	2	2	2	0	2	3	1	2	1	1	1	0
	CS1756	3	3	3	3	3	2	2	3	3	3	1	1	3	0	3
	CS1757	2	2	2	2	2	0	0	2	2	1	2	3	2	2	2
	CS1758	3	3	3	0	3	3	0	3	2	3	2	3	3	2	2
	CS1759	2	2	2	2	2	2	1	2	2	2	2	2	2	2	2
	CS1760	2	2	2	3	2	3	1	2	0	0	1	1	2	3	3
	CC1753	3	0	3	3	3	0	0	0	0	0	0	3	3	1	0
	IT1760	3	1	3	3	2	2	2	2	3	0	2	1	3	2	3
	IT1753	2	2	2	3	0	3	0	0	2	0	2	0	3	1	3
VII	CS1881	2	2	1	2	3	1	0	1	0	0	0	0	2	2	1

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Program Attainment Matrix 2019-20

Semester	Course Code	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
III	CS1301	2	1	1	0	0	0	0	0	0	0	0	1	1	1	1
	CS1302	1	1	2	0	0	0	0	0	0	0	0	0	2	0	2
	CS 1303	3	2	1	0	0	0	0	0	0	0	0	2	3	0	0
	CS1304	2	1	1	1	0	0	0	0	1	1	1	1	1	0	0
	CS1331	3	2	2	0	0	0	0	0	0	0	0	0	3	0	0
	CS1332	1	2	2	1	1	0	0	0	0	0	0	0	2	0	0
IV	CS1401	2	2	3	1	1	0	0	0	0	1	1	2	1	1	2
	CS1402	2	2	2	2	2	2	0	0	0	2	0	0	2	2	0
	CS1403	2	2	1	2	1	1	0	0	0	0	1	1	1	0	0
	CS1431	2	2	2	2	1	1	0	1	1	1	1	2	1	1	1
	CS1432	1	3	2	3	1	1	0	1	1	1	1	0	1	1	0
	CS1433	1	1	2	2	1	1	0	0	0	0	1	1	1	0	0
V	CS1501	0	2	1	1	1	1	1	1	2	1	1	0	2	1	2
	CS1502	2	3	3	3	3	0	0	0	3	3	3	3	3	0	0
	IT1504	2	1	1	0	0	0	1	0	1	1	0	1	2	1	1
	CS1505	2	2	2	2	1	1	0	1	1	0	1	1	2	0	0
	CS1530	3	1	2	0	0	0	0	0	0	0	0	2	3	0	0
	CS1532	1	3	3	1	3	0	0	0	0	0	0	0	3	0	0
	CS1535	2	2	2	1	1	0	0	0	0	0	0	0	2	0	0
	CS1551	2	1	2	1	1	0	0	0	1	1	1	1	1	1	1
	CS1553	2	2	2	2	2	1	1	0	1	2	1	3	3	3	1
	CC1551	1	1	2	2	2	1	1	1	1	1	2	2	2	0	1
	IT1504	3	2	1	0	0	0	1	0	1	2	0	1	3	2	2
VI	CS1602	2	0	3	0	3	0	2	0	2	0	0	0	2	0	3
	CS1604	3	3	0	2	3	0	0	0	0	0	1	0	1	0	0
	CS1631	1	0	3	0	3	0	2	0	2	0	0	0	2	0	3
	CS1633	3	3	0	2	3	0	0	0	0	0	1	0	1	0	0
	CS1650	1	1	1	0	0	2	2	0	0	2	0	0	1	2	2
	CS1653	3	0	2	1	0	0	0	0	0	0	1	1	2	0	0
	IT1653	3	3	3	3	2	2	1	1	1	1	0	1	0	3	0
	CC1653	3	3	3	3	1	2	0	0	3	2	3	3	0	0	0
	CS1634	1	1	1	2	1	1	0	1	0	0	1	1	1	2	1
VII	CS1701	1	2	1	1	1	0	0	0	0	0	1	1	1	2	0
	CS1704	2	1	1	0	0	0	1	0	1	1	0	1	2	1	1
	CS1730	1	2	1	2	1	0	0	0	0	0	1	1	1	2	0
	CS1750	2	2	2	1	1	1	0	1	2	1	2	1	1	1	0
	CS1756	2	2	2	2	2	1	1	2	2	2	1	1	2	0	2
	CS1757	2	2	2	2	2	0	0	1	2	1	2	2	2	2	2
	CS1758	2	2	1	0	2	2	0	1	1	1	1	2	2	1	1
	CS1759	1	1	1	2	2	1	1	1	1	1	1	1	2	2	1
	CS1760	2	2	2	3	2	3	1	2	0	0	1	1	2	3	3
	CC1753	3	0	3	3	3	0	0	0	0	0	0	3	3	1	0
	IT1760	3	1	2	3	2	2	1	2	3	0	1	1	3	2	3
	IT1753	2	2	2	3	0	3	0	0	2	0	2	0	3	1	3
VII	CS1881	2	2	1	2	3	1	0	1	0	0	0	0	2	2	1

OVERALL PROGRAM ATTAINMENT	86
OVERALL PROGRAM ATTAINMENT LEVEL	3

School of Computing and Information Technology

Course Hand-out

Problem Solving Using Computers
| CS 1001 | 3 Credits | 3 0 0 3

Session: 2019-20 (odd Sem.) | Faculty: Dr. Punit Gupta, Mr Nitesh Pradhan, Dr Shivani Gupta, Ms. Neha Sharma, Dr Hemlata Goyal,Mr Harish Sharma, Ms. Shikha Mundra, Ms. Vinita Soni | Class: B.Tech 1st Year

A. **Introduction:** Programming in C focuses on basic computer fundamentals, number system and programming fundamentals. By means of C language students learn to write set of instruction to create a program so that desire output can be generated by computer.

B. **Course Outcomes:** At the end of the course, students will be able to

[1001.1]. Demonstrate bitwise operations and conversion of numbers in different representations through Number System.
[1001.2]. Demonstrate a deep knowledge of computer for better understanding of devices, basic fundamental of computer comprises in this course.
[1001.3]. Design flow chart, Write algorithm and pseudo code parallel with Control Statements to understand flow of program execution.
[1001.4]. Create memory oriented operation using pointers and understating programming skills by Array, Structure, Union, Enum and String are added.
[1001.5]. Create program using concept of re-usability by means of functions in C.
[1001.6]. Illustrate the concept of data base by using file handling.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. **Problem analysis**: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

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[PO.4]. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

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[PO.11]. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Close Book)	20
	Sessional Exam II (Close Book)	20
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	20
End Term Exam (Summative)	End Term Exam (Close Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

Digital computer fundamentals: Algorithms and flowcharts, the von Neumann architecture, programs, assembly language, high level programming languages; Number System: binary, decimal, octal, hexadecimal; Imperative programming (Using C): data types, variables, operators, expressions, statements, control structures, functions, arrays and pointers, recursion, records (structures), files, input/output, some standard library functions and some elementary data structures.

F. Text Books

T1. E. Balagurusamy, "Programming in ANSI C", 7th Edition, McGraw Hill Publication, 2016.

T2. Y. P. Kanetkar, “Let us C”, 12th Edition, BPB Publication, 2014.

G. Reference Books

R1. B. W. Kernighan, D. M. Ritchie, “The C Programing Language”, 2nd Edition, Prentice Hall of India, 2014.

R1. B. Gottfired, “Schaum's Outline Series: Programming with C”, 3rd Edition, McGraw Hill Publication, 2012.

H. Lecture Plan:

lecture	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode Of Assessing CO
1	Number systems: decimal, binary, octal, hexadecimal, base-r conversions	To acquaint knowledge about basics of number system	Lecture	1001.1	Mid Term I, Quiz & End Term
2	Number systems: decimal, binary, octal, hexadecimal, base-r conversions	To acquaint knowledge about basics of number system	Flipped Classroom	1001.1	Mid Term I, Quiz & End Term
3	Basic architecture of computers and its building block	Describing basic architecture of computer	Lecture	1001.2	Mid Term I, Quiz & End Term
4	Computer languages: machine language, assembly language, high level language; translators: assembler, compiler, interpreter	Differentiate between machine language and high level language	Lecture	1001.2	Mid Term I, Quiz & End Term
5	Short history, character set, tokens	Describing basics of datatype, token and keywords with differentiation between them.	Guided Self-Study	1001.3	Mid Term I, Quiz & End Term
6	Constants (integer, real, character, string); variables, keywords	Describe and implementation of various contant type	Lecture	1001.3	Mid Term I, Quiz & End Term

7	Data types (table including range, memory and format specifier)	Implementation of various data type	Lecture	1001.3	Mid Term I, Quiz & End Term
8	Operators: arithmetic, relational, logical, assignment	Implementation of various arthematic operations	Lecture	1001.3	Mid Term I, Quiz & End Term
9	Bitwise, conditional, type-cast, sizeof, comma	Implementation of various operators	Lecture	1001.3	Mid Term I, Quiz & End Term
10	Operator precedence and associativity, type conversion	Implementation of precedence in programing	Activity (Think Pair Share)	1001.3	Mid Term I, Quiz & End Term
11	Operator precedence and associativity, type conversion	Implementation of precedence in programing	Lecture	1001.3	Mid Term I, Quiz & End Term
12	Input and output statements (formatted and unformatted) : printf, scanf	Implementation of input and output statements	Lecture	1001.3	Mid Term I, Quiz & End Term
13	Gets, puts, getchar, putchar	Implementation of input and output statements using system functions	Activity (Jigsaw)	1001.3	Mid Term I, Quiz & End Term
14	Decision statements: if, if-else, nested if-else, if-else ladder	Implementation of decision statements	Lecture	1001.3	Mid Term I, Quiz & End Term
15	Decision statements: if, if-else, nested if-else, if-else ladder	Implementation of decision statements	Lecture	1001.3	Mid Term I, Quiz & End Term
16	Switch, break statement	Learning the implementation of switch and break	Flipped Class	1001.3	Mid Term I, Quiz & End Term
17	Switch, break statement	Learning the implementation of switch and break	Lecture	1001.3	Mid Term I, Quiz & End Term
18	Repetitive structures: for, while, do-while	Learning the implementation of looping	Lecture	1001.3	Mid Term II, Quiz & End Term
19	Repetitive structures: for, while, do-while	Learning the implementation of looping	Lecture	1001.3	Mid Term II, Quiz & End Term
20	Nested loops	Learning the implementation of looping	Activity (Think Pair Share)	1001.3	Mid Term II, Quiz & End Term
21	Nested loops	Learning the implementation of looping	Lecture	1001.3	Mid Term II, Quiz & End Term
22	Continue and break statements	Describe the usage of continue and break	Lecture	1001.3	Mid Term II, Quiz & End Term
23	Continue and break statements	Describe the usage of	Lecture	1001.3	Mid Term II, Quiz & End Term

		continue and break			
24	1-D array: definition, declaration, initialization, input array, output array	Describe and define array of various data type	Lecture	1001.4	Mid Term II, Quiz & End Term
25	1-D array: definition, declaration, initialization, input array, output array	Describe and define array of various data type	Lecture	1001.4	Mid Term II, Quiz & End Term
26	1-D character array: character array, string, string standard function	Describe and define array of various data type	Lecture	1001.4	Mid Term II, Quiz & End Term
27	1-D character array: character array, string, string standard function	Describe and define array of various data type	Lecture	1001.4	Mid Term II, Quiz & End Term
28	1-D character array: character array, string, string standard function	Describe and define array of various data type	Lecture	1001.4	Mid Term II, Quiz & End Term
29	2-D array: definition, declaration, initialization, input array, output array, one simple program	Describe and define array of various data type	Lecture	1001.4	Mid Term II, Quiz & End Term
30	2-D array: definition, declaration, initialization, input array, output array, one simple program	Describe and define array of various data type	Lecture	1001.4	Mid Term II, Quiz & End Term
31	2-D array: definition, declaration, initialization, input array, output array, one simple program	Describe and define array of various data type	Lecture, Activity	1001.4	Mid Term II, Quiz & End Term
32	Pointers: introduction	Describe functionality of pointers in programming'	Lecture	1001.4	Mid Term II, Quiz & End Term
33	1-D Array and pointer	Implementation of ID array with pointer	Lecture	1001.4	Mid Term II, Quiz & End Term
34	Functions: introduction to functions	Describe importance of fuction and modular programming	Lecture, Activity	1001.5	Mid Term II, Quiz & End Term
35	Function prototype, call, definition	Describe importance of fuction and modular programming	Lecture	1001.5	Mid Term II, Quiz & End Term
36	Storage classes	Describe usage of storage classes	Lecture	1001.5	Mid Term II, Quiz & End Term
37	Structures: definition, declaration, initialization, array of structures	Describe usage of structures	Lecture	1001.4	Quiz & End Term
38	Structures: definition, declaration, initialization, array of structures	Describe usage of structures	Lecture	1001.4	Quiz & End Term
39	Union, difference between union and structures	Describe usage of union	Lecture	1001.4	Quiz & End Term

40	File handling: introduction, operations on files, opening modes	Describe usage of file handling with various operations and modes	Lecture	1001.6	Quiz & End Term
41	File handing function	Describe usage of file handling with various operations and modes	Lecture	1001.6	Quiz & End Term
42	File handing function	Describe usage of file handling with various operations and modes	Lecture	1001.6	Quiz & End Term

I. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CS 1001.1:	Understand bitwise operations and conversion of numbers in different representations through Number System.	2											1
CS 1001.2:	Described a deep knowledge of computer for better understanding of devices, basic fundamental of computer comprises in this course.	2											
CS 1001.3:	Design flow chart, Write algorithm and pseudo code parallel with Control Statements to understand flow of program execution.	2		1									2
CS 1001.4:	Developing ability in students to learn memory oriented operation using pointers and understating programming skills by Array, Structure, Union, Enum and String are added.	3	1	3									2
CS 1001.5:	Students learnt the concept of reusability by means of functions in C.	3		3									3
CS 1001.6:	Illustrate the concept of data base by using file handling.	3											1

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Course Hand-out

Problem Solving Using Computers Lab
| CS 1030 | 1 Credit | 0 0 1 1

Session: 2019-20 (odd Sem.) | Faculty: Dr. Punit Gupta, Mr Nitesh Pradhan, Dr Shivani Gupta, Ms. Neha Sharma, Dr Hemlata Goyal,Mr Harish Sharma, Ms. Shikha Mundra, Ms. Vinita Soni | Class: B.Tech 1st Year

A. **Introduction:** Problem Solving Using Computers focuses on basic computer fundamentals, number system and programming fundamentals. By means of C language students learn to write set of instruction to create a program so that desire output can be generated by computer.

B. **Course Outcomes:** At the end of the course, students will be able to

[1030.1]. Demonstrate bitwise operations and conversion of numbers in different representations through Number System.
[1030.2]. Demonstrate a deep knowledge of computer for better understanding of devices, basic fundamental of computer comprises in this course.
[1030.3]. Design flow chart, Write algorithm and pseudo code parallel with Control Statements to understand flow of program execution.
[1030.4]. Create memory oriented operation using pointers and understating programming skills by Array, Structure, Union, Enum and String are added.
[1030.5]. Create program using concept of re-usability by means of functions in C.
[1030.6]. Illustrate the concept of data base by using file handling.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4]. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

D. Assessment Plan:

Criteria	Description	Maximum Marks
Lab	Practical Lab Exam	50
	Day to Day Assessment	50
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

Digital computer fundamentals: Algorithms and flowcharts, the von Neumann architecture, programs, assembly language, high level programming languages; Number System: binary, decimal, octal, hexadecimal; Imperative programming (Using C): data types, variables, operators, expressions, statements, control structures, functions, arrays and pointers, recursion, records (structures), files, input/output, some standard library functions and some elementary data structures.

F. Text Books

T1. E. Balagurusamy, "Programming in ANSI C", 7th Edition, McGraw Hill Publication, 2016.

T2. Y. P. Kanetkar, "Let us C", 12th Edition, BPB Publication, 2014.

G. Reference Books

R1. B. W. Kernighan, D. M. Ritchie, "The C Programing Language", 2nd Edition, Prentice Hall of India, 2014.

R1. B. Gottfired, "Schaum's Outline Series: Programming with C", 3rd Edition, McGraw Hill Publication, 2012.

H. Lab Experiment Plan:

lecture	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode Of Assessing CO
1	Algorithms and Flow Charts	Describe the flowcharts and design of algorithm	Lecture	1030.1	Mid Term Lab Assessments and End Term Lab Assessment
2	Working with Linux Commands	Use Unix commands to manage files and develop programs, including multi-module programs	Lecture	1030.1	Mid Term Lab Assessments and End Term Lab Assessment
3	Formula based C Programs	Understand the fundamentals of C programming.	Lecture	1030.2	Mid Term Lab Assessments and End Term Lab Assessment
4	Control Structures: If statement	Choose the loops and decision making statements to solve the problem.	Lecture	1030.2	Mid Term Lab Assessments and End Term Lab Assessment
5	Control Structures: Switch	Choose the loops and decision making statements to solve the problem.	Lecture	1030.3	Mid Term Lab Assessments and End Term Lab Assessment
6	Control Structures: Loops	Choose the loops and decision making statements to solve the problem	Lecture	1030.3	Mid Term Lab Assessments and End Term Lab Assessment
7	Control Structures: Nested Loops	Choose the loops and decision making statements to solve the problem	Lecture	1030.3	Mid Term Lab Assessments and End Term Lab Assessment
8	1-D Array	Implement different Operations on arrays	Lecture	1030.3	Mid Term Lab Assessments and End Term Lab Assessment
9	2-D Arrays	Implement different Operations on arrays	Lecture	1030.4	Mid Term Lab Assessments and End Term Lab Assessment
10	Strings	Implementation of precedence in programing	Lecture	1030.4	Mid Term Lab Assessments and End Term Lab Assessment

11	Functions	Use functions to solve the given problem	Lecture	1030.5	Mid Term Lab Assessments and End Term Lab Assessment
12	Pointers	Understand pointers, structures and unions	Lecture	1030.5	Mid Term Lab Assessments and End Term Lab Assessment
13	Structures	Understand pointers, structures and unions	Activity (Jigsaw)	1030.6	Mid Term Lab Assessments and End Term Lab Assessment
14	End Term Exam				Mid Term Lab Assessments and End Term Lab Assessment

I. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CS 1030.1:	Demonstrate bitwise operations and conversion of numbers in different representations through Number System.	2											1
CS 1030.2:	Demonstrate a deep knowledge of computer for better understanding of devices, basic fundamental of computer comprises in this course.	2											
CS 1030.3:	Design flow chart, Write algorithm and pseudo code parallel with Control Statements to understand flow of program execution.	2		1									2
CS 1030.4:	Create memory oriented operation using pointers and understating programming skills by Array, Structure, Union, Enum and String are added.	3	1	3									2
CS 1030.5:	Create program using concept of re-usability by means of functions in C.	3		3									3
CS 1030.6:	Illustrate the concept of data base by using file handling.	3											1

2- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Civil and Chemical Engineering
Department of Civil Engineering
Course Hand-out
Basic Civil Engineering | CV1001| 3 Credits | 3 0 0 3
Session: 2019-20(odd sem)| Faculty: Dr. Jitendra Singh Yadav | Class: B.Tech (First Year- Physics Group)

A. Introduction:
This course is offered by Dept. of Civil Engineering as a departmental core course. The main objectives of this course are to understand, basics of civil engineering with are essential for everyone. The course covers principle of surveying, method and equipment's used for surveying, building material used for construction, different components of building, forces and its equilibrium, evaluation of centre of gravity and moment of inertia of simple and composite sections, simple stress and strain, method of analysis of truss, estimation and costing. Overall, this course will help to understand the basic of civil engineering used in our day to day life.

B. Course Outcomes: At the end of the course, students will be able to

[CV1001.1]. Describe the importance and role of Civil Engineering and Civil Engineer in development of Society.
[CV1001.2]. Explain surveying and the type of instruments used for surveying.
[CV1001.3]. Describe the scientific terminologies related to building materials and components of building.
[CV1001.4]. Assess the force acting on a materials, centre of gravity and moment of inertia of composite area.
[CV1001.5]. Calculate the different type of stress like, simple stress, shear stress, and direct stress and strain in the material, and analysis of truss. Familiar to basic terminologies related to Estimation and Costing which create employability, and entrepreneurship.

Program Outcomes and Program Specific Outcomes

[PO.1]. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4]. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	20
	Sessional Exam II (Closed Book)	20
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	20
End Term Exam (Summative)	End Term Exam (Closed Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

D. Syllabus

Introduction:- Scope of Civil Engineering, Role of Civil Engineer in Society, Impact of infrastructural development on economy of country; **Surveying:-**Principles and types of surveying, Site plans, Linear measurements, Angular measurements, Levelling, ordinary levels and total stations, Use of theodolite and plane table, contouring, L- section and cross sections; **Buildings:-** Properties, uses of Stones, bricks, cement, timber, steel, plastics and paints. Properties of concrete. Selection of site for Buildings, Layout of building Plan, Types of buildings, Plinth Area, Carpet Area, Super built up area, floor space index, building bye laws, ventilation, components of buildings and their functions, Functional design of buildings, basic concepts of R.C.C., Type of foundations; **Mechanics of Solids**:- Forces and Equilibrium, Graphical and analytical treatment of concurrent and non-concurrent co-planer forces, Free body diagram, Frictional force in equilibrium problems; **Centroid and centre of gravity**, Moment of inertia of simple and composite areas; **Normal stress and strain**, Hooke's law, modulus of elasticity, modulus of rigidity, allowable stress, shear stress and shear strain; **Analysis of plane truss**, Method of joints, Method of sections; **Estimation and Costing**:- Types of estimates and Contracts, Tenders, NIT, EMD and Security deposits, Award of work, measurements, billing and payments.

E. Text Books

T1. Ramamrutham S., Basic Civil Engineering (3e), Dhanpat Rai Publishing Company (P) Ltd, 2013.

T2. Punamia B. C., Jain A. K., Jain A. K., Surveying Volume 1 (16e), S Chand, 2016.

T3. Dutta B. N., Estimation and Costing in Civil Engineering (28e), UBS Publishers Distributors LTD., 2016.

T4. Punamia B.C., Jain A. K., Jain A. K., Building Construction (11e), S Chand, 2016.

T5. Khurmi R. S., Strenght of Material, S Chand, 2016

T6. Timoshenko S., Young D.H., Rao J.V., Pati S., Engineering Mechanics (5e), Mcgraw Hill, 2013.

T7. SP41 Handbook on Functional Design of Buildings, Bureau of Indian Standards 2013.

Reference Books

R1. Timoshenko S., Young D.H., Rao J.V., Pati S., Engineering Mechanics (5e), Mcgraw Hill, 2013.

R2. SP41 Handbook on Functional Design of Buildings, Bureau of Indian Standards 2013.

F. Lecture Plan:

Lec No	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1,2	Introduction	Scope of Civil Engineering, Role of Civil Engineer in Society,	Lecture	1001.1	NA
3	Introduction	Impact of infrastructural development on economy of country	Lecture	1001.1	In Class Quiz
4,5	Surveying	Principles and types of surveying, Site plans, Linear measurements,	Lecture and field visit	1001.2	In Class Quiz End Term
6,7,8	Surveying	Angular measurements, Levelling, ordinary levels and total stations	Lecture and field visit	1001.2	Home Assignment End Term
9,10,11	Surveying	Use of theodolite and plane table, contouring, L- section and cross sections	Lecture and field visit	1001.2	In Class Quiz End Term
12	Building	Properties, uses of Stones, bricks, cement,	Lecture and field visit	1001.3	Class Quiz Mid Term I End Term
13	Building	Timber, steel, plastics and paints.	Lecture and field visit	1001.3	Class Quiz Mid Term I End term
14,15	Building	Properties of concrete.	Lecture	1001.3	Home Assignment Class Quiz Mid Term I End Term
16,17	Building	Selection of site for Buildings, Layout of building Plan, Types of buildings, Plinth Area, Carpet Area, Super built up area, floor space index, building bye laws, ventilation, components of buildings and their functions,	Lecture	1001.3	Class Quiz Mid Term I End Term
18,19	Building	Functional design of buildings, basic concepts of R.C.C., Type of foundations.	Lecture	1001.3	Class Quiz Mid Term I End Term
20	Mechanics of Solids	Forces and Equilibrium,	Lecture	1001.4	Class Quiz End Term
21	Mechanics of Solids	Graphical and analytical treatment of concurrent and non-concurrent co-planer forces, Free body diagram	Lecture	1001.4	Class Quiz Mid Term II End Term
22	Mechanics of Solids	Frictional force in equilibrium problems	Lecture	1001.4	Class Quiz Mid Term II End Term
23,24,25	Mechanics of Solids	Numerical Exercises	Lecture	1001.4	Class Quiz Mid Term II End Term

26	Mechanics of Solids	Centroid and centre of gravity,	Lecture	1001.4	Class Quiz Mid Term II End Term
27	Mechanics of Solids	Moment of inertia of simple and composite areas.	Lecture	1001.4	Class Quiz End Term
28,29,20,31	Mechanics of Solids	Numerical Exercises	Lecture	1001.4	Class Quiz End Term
32	Mechanics of Solids	Normal stress and strain, Hooke's law	Lecture	1001.5	Class Quiz End Term
33	Mechanics of Solids	Modulus of elasticity, modulus of rigidity	Lecture	1001.5	Class Quiz End Term
34	Mechanics of Solids	Allowable stress, shear stress and shear strain	Lecture	1001.5	Class Quiz End Term
35, 36	Mechanics of Solids	Numerical Exercises	Lecture	1001.5	Class Quiz End term
37	Structure Analysis	Analysis of plane truss, Method of joints,	Lecture	1001.5	Class Quiz
38	Structure Analysis	Method of sections	Lecture	1001.5	Class Quiz Mid Term II End Term
39,40,41	Structure Analysis	Numerical Exercises	Lecture	1001.5	Class Quiz Mid Term II End Term
42	Estimation and Costing	Types of estimates and Contracts,	Lecture	1001.5	Class Quiz Mid Term II End Term
43	Estimation and Costing	Tenders, NIT, EMD and Security deposits,	Lecture	1001.5	Class Quiz End Term
44	Estimation and Costing	Award of work, measurements, billing and payments	Lecture	1001.5	Class Quiz End Term
45,46	Estimation and Costing	Numerical Exercises	Lecture	1001.5	Class Quiz End Term

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CV 1001.1	Importance and role of Civil Engineering and civil engineer in development of Society.			1			1	2			1		1
CV 1001.2	Get familiar with surveying and the type of instruments used for surveying.	2	1	2	3	3				3			
CV 1001.3	Describe the scientific terminologies related to building materials and components of building.	3	3	2		2	2	1		2			3
CV 1001.4	Assess the force acting on a materials, centre of gravity and moment of inertia of composite area.	3	3										
CV 1001.5	Calculate the different type of stress like, simple stress, shear stress, and direct stress and strain in the material, and analysis of truss. Familiar to basic terminologies related to Estimation and Costing which create employability, and entrepreneurship.	3	2	1							2	3	3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

MANIPAL UNIVERSITY JAIPUR

Faculty of Engineering
Department of Chemistry
Course Hand-out
Engineering Chemistry | CY1001 | 3 Credits | 2 1 0 3
Session: 2019-20(odd sem) | Coordinator: Arunava Agarwala | Class: B.Tech. (I and II Sem)

A. Introduction: This course is offered by Dept. of Chemistry for all 1st year B.Tech. students. The objective of the course is to acquaint the students with the basic concepts of chemistry relevant to engineering field. The students with the knowledge of basic chemistry, will understand and explain scientifically the various chemistry related problems in the industry/engineering field.

B. Course Objectives: At the end of the course, students will be able to

[1001.1]. Understand and apply concepts of various types of fuel technology
[1001.2]. Develop skill of synthesis and applications of polymer and some advanced materials.
[1001.3]. Explain different the water softening methods.
[1001.4]. Understand and apply the concepts in electrochemistry and corrosion science in protecting metallic objects.
[1001.5]. Apply the concept of phase rule to construct phase diagram
[1001.6]. Develop skill in various modern analytical techniques.

C. Program Outcomes and Program Specific Outcomes

[PO.1]. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. **Problem analysis**: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public healthand safety, and the cultural, societal, and environmental considerations

[PO.4]. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal,health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineeringpractice

[PO.7]. **Environment and sustainability**: Understand the impact of the professional engineering solutions insocietal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of theengineering practices

[PO.9]. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverseteams, and in multidisciplinary settings

[PO.10]. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projectsand in multidisciplinary environments

[PO.12]. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Term Examination I	20
	Mid Term Examination II	20
	Quiz tests (Accumulated and Averaged)	20
End Term Exam (Summative)	End Term Exam (Closed Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work at home/ hostel especially before a quiz test or MTE-I/MTE-II. A student is expected to participate and perform these assignments with full zeal since the activity.	

E. Syllabus

Unit-I Classification of Fuels, Gross Calorific value and Net Calorific value. Solid, Liquid and Gaseous fuels.

Unit-II: Advanced materials and polymers: Liquid crystals, ceramics, composites, bio-materials, nanomaterials, thin films and their properties and applications.

Unit-III: Water treatment technology.

Unit- IV: Concept of corrosion and its importance, types of corrosion, factors affecting corrosion, Corrosion control methods. Chemistry of primary and secondary batteries. Working principles of fuels cells and their applications.

Unit-V: Theory and application phase rule (up to two component system).

Unit VI; General methods of chemical analysis, Instrumental methods. Introduction to spectroscopic methods of analysis: Electromagnetic radiation (EMR), Interaction of EMR with matter, Numerical Problems. Concepts of rotational, vibrational and electronic spectra, Laws of spectrophotometry

F. Text Books

T1. Jain P.C. and Jain M., Engineering Chemistry, Dhanpat Rai and Sons, Delhi, Revised, 15th Edn. 2006.

T2. Kuriacose J.C., Raja R. J., Chemistry in Engineering and Technology, Vol. I/II TMH 1988

G. Reference Books

No reference books required for this course.

H. Lecture Plan:

Lec No	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1.	**Chemical fuels:** Introduction, Classification, Calorific value. Gross calorific value and net Calorific value. Determination of calorific value by Bomb calorimeter.	To acquaint and clear teachers expectations and understand student expectations	Lecture	1001.1	Class Quiz End Term
2.	Determination of calorific value by Boys; Numerical problems based on Bomb and Boys calorimeter.	Working of the calorimeter	Lecture, Activity	1001.1	Class Quiz Mid Term I
3.	Dulong formula; Numerical problems.	Analyse and solve numerical problems	Lecture, Activity	1001.1	Class Quiz End Term
4.	Solid fuels – Coal and its analysis – Proximate and Ultimate analysis.	Analyse and solve numerical problems	L Lecture, Activity	1001.1	Home Assignment End Term
5.	Liquid Fuels: Fractional Distillation, Petroleum cracking - catalytic cracking (Fixed Bed and moving bed) and Reforming of petroleum, Synthetic Petrol: Burgius process, Fisher Trophch method. Composition and applications of water gas, Producer gas.	Principles of distillation, cracking	Lecture	1001.1	Class Quiz End Term
6.	Numerical based on Combustion (By Weight Type and By Volume Type)	Analyse and solve numerical problems	Lecture, Activity	1001.2	Class Quiz Mid Term I End Term
7.	**Advanced materials and polymers:** Introduction, Definition, classification of polymers – based on origin, thermal behaviour, Polymerization reactions and applications, Tacticity. Functionality, Degree of polymerization, Co-polymerization – alternating, random, block and graft polymers	Describe the working of polymer	Lecture	1001.2	Class Quiz Mid Term I End term
8.	Mechanism of free radical polymerization and ionic polymerization. Mechanism of coordination polymerization, Condensation polymerization reactions, Glass transition temperature & factors affecting it	Describe mechanization of polymerization	Lecture	1001.2	Class Quiz Mid Term I End Term
9.	Molecular weight of polymers, Number	Analyse and solve numerical problems	Lecture, Activity	1001.2	Class Quiz Mid Term I

	average and weight average molecular weights, Numerical problems.				End Term
10.	Preparation, properties and applications of Polythene (LDPE and HDPE), Nylon(6:6, 6, 6:10, 11), PF resins and Polyester. Natural rubber, Processing of Natural Rubber, Vulcanization, Compounding of rubber; Synthetic Rubber: Buna-N, Buna-S	Identify alternative ways to synthesize rubbers.	Lecture	1001.2	Class Quiz Mid Term I End Term
11.	Liquid crystals: their properties and applications	Gain knowledge of liquid crystals	Lecture	1001.2	Class Quiz End Term
12.	Ceramics: Properties and applications	Gain knowledge of ceramics	Lecture	1001.2	Class Quiz Mid Term I End Term
13.	Composites and bio-materials: properties and applications	Gain knowledge of bio-materials	Lecture	1001.2	Class Quiz Mid Term I End Term
14.	Nanomaterials and thin films: Properties and applications	Understand basics of nanochemistry	Lecture	1001.2	Class Quiz Mid Term I End Term
15.	Revision	Recall and recap the lessons learnt during last 14 lectures	Lecture, Activity		Class Quiz Mid Term I End Term
16.	**Water Technology:** Introduction, Characteristics imparted by impurities in water, Hardness of water Degree of hardness.	Describe the properties of water and its aplication	Lecture	1001.3	Class Quiz Mid Term II End Term
17.	Determination of hardness by EDTA method. Numerical problems.	Describe working hardness/softness of water	Lecture, Activity	1001.3	Class Quiz Mid Term II End Term
18.	Softening of hard water: Internal treatment by phosphate and calgon condition. Softening of hard water: External treatment by lime soda process.	Describe working hardness/softness of water	Lecture	1001.3	Class Quiz Mid Term II End Term
19.	Softening of hard water: Ion exchange method; Zeolite methods	Describe working hardness/softness of water	Lecture.	1001.3	Class Quiz Mid Term II End Term
20.	Softening of hard water, internal treatment by phosphate, calgon condition and colloid conditioning	Describe working hardness/softness of water	Lecture	1001.3	Class Quiz Mid Term II End Term
21.	Numerical problems based on lime soda process.	Analyse and solve numerical problems	Lecture, Activity	1001.3	Class Quiz Mid Term II End Term
22.	**Corrosion and its Control:** Introduction, significance, types of corrosion, dry corrosion.	Describe corrosion and its preventions	Lecture, Activity	1001.4	Class Quiz Mid Term II End Term

	Nature of oxide layers; PB Rule				
23.	Wet Corrosion: Electrochemical corrosion	Describe corrosion and its preventions	Lecture	1001.4	Class Quiz Mid Term II End Term
24.	Galvanic corrosion; Differential aeration corrosion: Pitting corrosion, Water line corrosion, Crevice corrosion.	Describe corrosion and its preventions	Lecture	1001.4	Class Quiz Mid Term II End Term
25.	Factors affecting corrosion: Nature of the metal, Nature of the Environment	Describe corrosion and its preventions	Lecture	1001.4	Class Quiz Mid Term II End Term
26.	Corrosion prevention by material selection and design alternation of environment by changing medium; Stress corrosion – Caustic embrittlement	Describe corrosion and its preventions	Lecture	1001.4	Class Quiz Mid Term II End Term
27.	Cathodic protection – sacrificial anode and impressed voltage methods, Anodic protection; Inhibitors – Anodic and Cathodic inhibitors, Protective coating – Metal coating (Electroplating, galvanization, Tinning).	Describe corrosion and its preventions	Lecture	1001.4	Class Quiz Mid Term II End Term
28.	Introduction and theory of batteries and fuel cells.	Gain knowledge of batteries	Lecture	1001.4	Class Quiz Mid Term II End Term
29.	Chemistry (working) of primary and secondary batteries.	Gain knowledge of batteries	Lecture	1001.4	Class Quiz Mid Term II End Term
30.	Working principles of fuels cells and their applications.	Gain knowledge of fuel cells	Lecture	1001.4	Class Quiz Mid Term II End Term
31.	**Revision**	Recall and recap the lessons learnt during last 14 lectures	Lecture, Activity		Class Quiz Mid Term II End Term
32	**The Phase Rule:** Definition, Phase rule equation, Phase, Component; Degree of freedom, examples to solve number of phase, component and degree of freedom	Gain knowledge of phase rule	Lecture	1001.5	Class Quiz End Term
33	One component system: Water system; Sulphur system	Gain knowledge of phase rule	Lecture	1001.5	Class Quiz End Term
34	Lead Silver system; Pattinson's process, Limitations of phase rule	Gain knowledge of phase rule	Lecture	1001.5	Class Quiz End Term
35	**General methods of chemical analysis, Instrumental methods:** Introduction, pH metric analysis, Conductrometric	Gain skill in various modern analytical techniques.	Lecture	1001.6	Class Quiz End Term

	analysis. Chromatographic techniques.				
36	Paper chromatography (R_f value); Thin layer chromatography; Gas Chromatography;	Gain skill in various chromatographic techniques.	Lecture	1001.6	Class Quiz End Term
37	Introduction to spectroscopic analysis. Beer-Lambert's law; Numerical problems.	Gain skill in various modern analytical techniques.	Lecture, Activity	1001.6	Class Quiz End Term
38	Principle of UV visible spectroscopy.	Gain skill in analytical techniques using Uv-Vis spectroscopy.	Lecture	1001.6	Class Quiz End Term
39	Instrumentation of UV visible spectroscopy	Gain skill in analytical techniques using Uv-Vis spectroscopy.	Lecture	1001.6	Class Quiz End Term
40	Principle of IR (vibrational) spectroscopy.	Gain skill in analytical techniques using IR spectroscopy.	Lecture	1001.6	Class Quiz End Term
41	Instrumentation of IR spectroscopy	Gain skill in analytical techniques using IR spectroscopy.	Lecture	1001.6	Class Quiz End Term
42	Revision	Recall and recap the lessons learnt during the semester	Lecture, Activity		Class Quiz End Term

I. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CY 1001 .1	Understand and apply concepts of various types of fuel technology.	2						3			2		2
CY 1001 .2	Understand the synthesis and applications of polymer and some advanced materials			2					2				3
CY 1001 .3	Develop understanding about the water softening methods.	2				3					3		2
CY 1001 .4	Understand and apply the concepts in electrochemistry and corrosion science in protecting metallic objects.								2				2
CY 1001 .5	Develop concept of phase rule		2			2			2				3
CY 1001 .6	Understand various modern analytical techniques.	2				3			2				3

2- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

MANIPAL UNIVERSITY JAIPUR

School of Basic Sciences
Department of Chemistry
Course Hand-out
Environmental Studies | CY 1002 | 3 Credits | 3 0 0 3
Ssession: 2019-20 (odd sem) | Co-ordinator: Dr. M. Prabhu Inbaraj | Class: B. Tech (I Semester)

A. Introduction: This course is offered to B. Tech. first year students for understanding the different aspects of our environment and issues related to it. The course aims at exposure to various environmental issues (regional, national and international), relevant sources of information about different issues including environmental systems and functions, environmental problems and solutions, role of public and Govt., etc. The course aims at generating useful ideas, concepts for meaningful field work in the immediate environment and self-study of books, journals, and magazines on the subject. The course introduces multi-disciplinary approach to the study of various environmental issues. The approach will facilitate participatory learning about importance of conservation, preservation and protection of the environment and striving towards a life in perfect harmony with nature.

B. Course Outcomes: At the end of the course, students will be able to;

[1002.1]. Develop fundamental skills in understanding the environment, ecology and ecosystem for sustainable development saving the environment.

[1002.2]. Apprehend environmental problems and its linkage to health and safety of society; think and act with a sense of responsibility, committing to the professional ethics.

[1002.3]. Impart knowledge on the application of the techniques / procedures to predict / qualitatively assess the reduction in the environmental impact for sustainable development.

[1002.4]. Promote the active involvement of oneself and society in designing the activities / processes with which the environment and ecosystem would be preserved, considering public health and safety.

[1002.5]. Explore the impacts of various man-made activities from an environmental context. Students can demonstrate the knowledge by participating in class debates and presentations on various topics of environmental concern with effective communication.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4]. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	20
	Sessional Exam II (Closed Book)	20
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	20
End Term Exam (Summative)	End Term Exam (Closed Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

Environmental Studies – Meaning, multidisciplinary nature of environmental science, applications in engineering disciplines, environmental ethics, sustainable development. **Ecology** – Types and Structure of Ecosystem. **Biodiversity** – Importance, classification, conservation methods. **Natural Resources** – Renewable and non-renewable, Resource consumption, different types of energy, Conventional sources & Non-Conventional sources of energy. **Environmental Engineering –** Environmental Pollution and control: Air / Water / Soil / Noise pollution, Water demand, Water quality standards, basics of water treatment, Conservation of water, Characteristics of sewage, treatment and disposal, Solid waste management. **Disaster Management** – meaning, natural disasters especially earthquakes & Manmade disasters. **Environmental crisis & legislations** – Global environmental problems, Environmental acts, Laws and Policies, EIA, Case studies of the past related to environmental issues, Practical activity related to environmental problems and its impacts on environment.

F. TEXT BOOKS

T1. Rajagopalan, R., Environmental Studies; From Crisis to Cure 3rd Edition, Oxford University Press, 2016.
T2. De, A. K. and De, A. K., Environmental Studies 2nd Edition, New Age International Publishers, New Delhi, 2009.
T3. Bharucha, E., Text book of Environmental Studies for undergraduate courses 4th Edition, Universities Press, Hyderabad, 2013.

G. REFERENCE BOOKS

R1. Tyler Miller, Jr. and Scott E. Spoolman., Environmental Science 13th Edition, Brooks/Cole, Cengage Learning, Belmont, CA, USA, 2010.
R2. Daniel B. Botkin and Edward A. Keller., Environmental Science - Earth as a Living Planet 8th Edition, John Wiley & Sons, INC. 2011.

H. Lecture Plan:

Lec No	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1	**Multidisciplinary Nature of Environmental Studies:** Scope of environmental studies, a multidisciplinary view, Importance of environmental studies	Explain the uniqueness / importance of Environmental Studies as an interdisciplinary subject	Lecture	**1002.1**	Mid Term I End Term
2	**Components of the Earth:** Spheres of the earth: Atmosphere, Lithosphere, Hydrosphere, Biosphere	Recall the importance and role played by each spheres in Earth	Lecture	**1002.1**	Mid Term I End Term
3	**Environmental Ethics:** systematic and critical study of practices, holistic approach	Describe the role of ethics in having concern for other creatures other than human beings, preservation and conservation of all species	Lecture	**1002.1**	Mid Term I End Term
4	**Ecology**: Structure / function / components of the ecosystem	In-depth knowledge on the importance of basics in ecology	Lecture	**1002.1**	Mid Term I End Term
5	**Ecosystem:** Classification, Energy transfer, Ecological pyramids	Explain ecosystem with structure, flow of energy, food chain and food webs	Lecture	**1002.1**	Mid Term I End Term
6	**Bio-geochemical cycles:** Hydrological, Oxygen, Nitrogen	Explain chemical elements cycle through different ecosystems	Lecture	**1002.1**	Mid Term I End Term
7	**Bio-geochemical cycles:** Carbon, Sulphur, Phosphorous	Explain chemical elements cycle through different ecosystems	Lecture	**1002.1**	Mid Term I End Term
8	**Ecological succession:** Primary & Secondary	Explain the power of nature to reclaim itself without the intervention of humans	Lecture	**1002.1**	Mid Term I End Term
9	**Biodiversity:** Importance and classification	Explain services provided by biodiversity, different type of biodiversity and Biogeographic zones of India	Lecture	**1002.2**	Mid Term I End Term
10	**Threats to biodiversity:** Species extinction, Threatened, Invasive species	Explain biodiversity loss, biological invasive species and their impact on biodiversity	Lecture	**1002.2**	Mid Term I End Term
11	**Conservation of biodiversity:** IUCN, Hotspots, CBD	Explain different measures to conserve biodiversity, description of National parks, wildlife sanctuaries etc.	Lecture	**1002.2**	In Class Quiz Mid Term I End Term
12	**Revision for MTE I**	Revision for preparation for mid-term exam	Lecture	NA	NA
13	**Energy Resources**: Conventional and non-conventional	Recall different energy resources including coal, oil, nuclear and their environmental impacts on the environment and on human health	Lecture	**1002.3**	Mid Term II End Term
14	**Water Resources**	Explain importance of sources of water, stress on water consumption and it's conservation	Lecture	**1002.3**	Mid Term II End Term
15	**Forest Resources**	Explain importance of forest resources, it's ecological role, deforestation and conservation	Lecture	**1002.3**	Mid Term II End Term
16	**Land and Mineral Resources**	Explain kinds of mining, it's impact and remediation	Lecture	**1002.3**	Mid Term II End Term

17	**Energy Resources:** Conservation and Management	Explain the importance of conserving the different energy resources	Lecture	**1002.3**	Mid Term II End Term
18	**Environmental pollution**: Air pollution – sources and classification of air pollutants	Recall air pollution, explain different air pollutants and their impacts on environment and human health	Lecture	**1002.3**	Mid Term II End Term
19	**Air pollution control:** Source control, equipment control, diffusion	Describe control methods of air pollutants like ESP, Scrubber	Lecture	**1002.3**	Mid Term II End Term
20	**Water pollution:** Sources of water pollution, classification of water pollutants	Describe water pollutants types and classifications	Lecture	**1002.3**	Mid Term II End Term
21	**Water pollution:** Effects of water pollution, Water quality parameters	Explain the negative impact of water pollution on humans and environment	Lecture	**1002.3**	Mid Term II End Term
22	**Wastewater treatment process:** Primary, Secondary and Tertiary	Detailed knowledge on various types / stages involved in wastewater treatment	Lecture	**1002.3**	In Class Quiz Mid Term II End Term
23	**Soil pollution:** Sources, effects and control of soil pollution	Explain the Causes, effects and control of soil Pollution	Lecture	**1002.3**	Mid Term II End Term
24	**Noise pollution:** sources, effects and control of noise pollution	Explain the Causes, effects and control of noise Pollution	Lecture	**1002.3**	Mid Term II End Term
25	**Municipal Solid-Waste Management:** sources, characteristics and control measures	Explain the Causes, effects and control of solid waste	Lecture	**1002.3**	Mid Term II End Term
26	**Hazardous-Waste Management:** Land Disposal and Integrated Waste Management (3Rs)	Explain the safe disposal of hazardous wastes	Lecture	**1002.3**	Mid Term II End Term
27	**Revision for MTE II**	Revision for preparation for mid-term exam	Lecture		Mid Term II End Term
28	**Disaster Management:** Natural disasters	Describe natural disasters and their impact	Lecture	**1002.4**	End Term
29	**Disaster Management:** Manmade disasters	Explain measures of man-made disaster management	Lecture	**1002.4**	End Term
30	**Global warming / Climate change:** Causes, effects and control measures	Describe global warming, climate change with its effects and control	Lecture	**1002.4**	End Term
31	**Acid rain:** Causes, effects and control measures	Describe the Acid Rain with its effects and control	Lecture	**1002.4**	End Term
32	**Ozone depletion:** Causes, effects and control measures	Explain the importance of ozone layer and causes of its depletion, control measures	Lecture	**1002.4**	End Term
33	**Environmental Laws/Acts:** Air, Water, Forest & Wildlife	Describe the provision of Water Act, 1974, Air Act, 1981 for prevention and control of water and air pollution, Explain EPA, 1986	Lecture	**1002.4**	End Term
34	**Environmental Movements:** Chipko, Narmada dam, Silent valley, etc.,	Describe different movement in India for conserving environment and their socio-economic importance	Lecture	**1002.4**	End Term
35	**International Environmental Policies:** CBD, Montreal, Kyoto	Role of international policies towards curbing the global environmental issues	Lecture	**1002.4**	End Term
36	**Environment and Human health**	Explain the inter-relationship between humans and environment	Lecture	**1002.4**	End Term

37	**Environmental impact assessment (EIA):** Methodology and importance	Explain the stages involved in EIA and it's importance before initiating a project	Lecture	**1002.4**	In Class Quiz End Term
38	**Human Population and the Environment:** Population growth, variation among nations, Population explosion – Family Welfare Program	Explain how population expansion is directly correlated to environmental degradation	Lecture	**1002.5**	End Term
39	**Case studies of Environmental issues**	Analyse case studies from different perspective and finding solutions	Lecture	**1002.5**	End Term
40	Practical activity related to environmental problems	In-class practical activity / discussion on environmental issues	Practical	**1002.5**	End Term
41	Practical activity related to environmental problems	In-class practical activity / discussion on environmental issues	Practical	**1002.5**	End Term
42	**Revision for ETE**	Revision for preparation for end term exam	Lecture	NA	NA
43	**Revision for ETE**	Revision for preparation for end term exam	Lecture	NA	NA

I. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
[1002.1].	Apply the fundamental knowledge of environment, ecology and ecosystem to save the environment for sustainable development.	3		1			1	2					3
[1002.2].	Apprehend environmental problems and its linkage to the health and safety of society; think and act with a sense of responsibility, committing to the professional ethics.		3				3		3	2			
[1002.3].	Know the application of the technique / procedures to predict / qualitatively assess the reduction in the environmental impact for sustainable development.	3	1			3	2	3		1			3
[1002.4].	Realise the active involvement of oneself and society in designing the activities / processes with which the environment and ecosystem would be preserved, considering public health and safety.			1	1					3			
[1002.5].	Explore the impacts of various man-made activities from an environmental context. Students can demonstrate the knowledge by participating in class debates and presentations on various topics of environmental concern with effective communication.	2			2		3					1	3

3- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

Faculty of Engineering
Department of Chemistry
Course Hand-out
Engineering Chemistry Laboratory| CY1030 | 1 Credit | 0 0 2 1
Session: 2019-20 (odd sem) | Coordinator: Arunava Agarwala | Class: B.Tech. (I and II Sem)

A. Introduction: This course is offered by Dept. of Chemistry for all 1st year B.Tech. students. The objective of the course is to acquaint the students with the basic methods applied in chemical science laboratory relevant to engineering field.

B. Course Objectives: At the end of the course, students will be able to

- **[1001.7].** Develop skill in quantitative chemical analysis.
- **[1001.8].** Apply concept of synthetic chemistry.
- **[1001.9].** Analyse physical property of materials.

C. Program Outcomes and Program Specific Outcomes

[PO.1]. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. **Problem analysis**: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public healthand safety, and the cultural, societal, and environmental considerations

[PO.4]. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal,health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineeringpractice

[PO.7]. **Environment and sustainability**: Understand the impact of the professional engineering solutions insocietal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of theengineering practices

[PO.9]. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverseteams, and in multidisciplinary settings

[PO.10]. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projectsand in multidisciplinary environments

[PO.12]. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Class wise assessment (Viva; Practical performance)	60
End Term Exam (Summative)	End Term Exam (Closed Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Homework/ Home Assignment/ Activity Assignment (Formative)	A student is expected to participate and perform all the experiments with full zeal.	

E. Syllabus

Alkalimetric titration; Redox titration; Estimation of total hardness of water; pK value of an acid by pH-metric titration; Conductometric acid base titrations; pH Metric acid base titrations; Synthesis of a resin; Determination of coefficient of viscosity of liquid; Determination cloud and pour point of a given sample of lubricating oil using cloud and pour point apparatus; Determine the water equivalent of bomb calorimeter using benzoic acid as fuel.

F. Text Books

T1. Jain P.C. and Jain M., Engineering Chemistry, Dhanpat Rai and Sons, Delhi, Revised, 15th Edn. 2006.

T2. Kuriacose J.C., Raja R. J., Chemistry in Engineering and Technology, Vol. I/II TMH 1988

G. Reference Books

No Reference books required for this course.

H. Lecture Plan:

Lec No	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1.	Determination of trength of given unknown ferrous ammonium sulphate solution by titrating against standard $K_2Cr_2O_7$ using diphenylamine as an internal indicator	Develop skill in quantitative chemical analysis.	Activity	1030.1	Practical Assessments and End Term Lab Assessment
2.	Determination of strength of given unknown ferrous ammonium sulphate solution by titrating against standard $K_2Cr_2O_7$ using potassium ferricyanide as an external indicator.	Develop skill in quantitative chemical analysis.	Activity	1030.1	Practical Assessments and End Term Lab Assessment
3.	Determination of the total, permanent and temporary hardness of given water sample by complexometric titration using EDTA solution	Develop skill in quantitative chemical analysis.	Activity	1030.1	Practical Assessments and End Term Lab Assessment
4.	Determination of the strength of sodium carbonate and sodium hydroxide in given alkali mix. (water sample) hydrochloric acid is used as an intermediate solution, methyl orange and phenolphthalein used as indicators	Develop skill in quantitative chemical analysis.	Activity	1030.1	Practical Assessments and End Term Lab Assessment
5.	Determination of the strength of ferrous Ammonium Sulphate by titrating against $KMnO_4$ solution	Develop skill in quantitative chemical analysis.	Activity	1030.1	Practical Assessments and End Term Lab Assessment
6.	Preparation of urea formaldehyde resin	Apply concept of synthetic chemistry.	Activity	1030.2	Practical Assessments and End Term Lab Assessment
7.	Determination of strength of given HCl solution using a standard NaOH solution by performing a pH-metric titration.	Analyse physical property of materials	Activity	1030.1	Practical Assessments and End Term Lab Assessment
8.	Determination of strength of given HCl solution using a standard NaOH solution by performing a conductometric titration.	Analyse physical property of materials	Activity	1030.1	Practical Assessments and End Term Lab Assessment
9.	Determination of strength of given CH_3COOH solution using a standard NaOH	Analyse physical property of materials	Activity	1030.1	Practical Assessments and End Term Lab Assessment

	solution by performing a pH-metric titration.				
10.	Determination of pK_{a1} and pK_{a2} of phosphoric acid.	Analyse physical property of materials	Activity	1001.3	Practical Assessments and End Term Lab Assessment
11.	Titration of a mixture of strong acid HCl and weak acid CH_3COOH and determine the Determination of unknown strength of HCl and CH_3COOH pH-metrically	Analyse physical property of materials	Activity	1001.3	Practical Assessments and End Term Lab Assessment
12.	the equivalent conductance of given an electrolyte	Analyse physical property of materials	Activity	1001.3	Practical Assessments and End Term Lab Assessment
13.	Determination of the viscosity of a given lubricating oil at various temperatures using Redwood Viscometer No. 1 or No. 2. / Determination of cloud and pour point of a given sample of lubricating oil using cloud and pour point apparatus	Analyse physical property of materials	Activity	1001.3	Practical Assessments and End Term Lab Assessment
14.	Demonstration of working of bomb calorimeter.	Analyse physical property of materials	Activity	1001.3	Practical Assessments and End Term Lab Assessment

I. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CY 1030.1	Develop skill in quantitative chemical analysis.	2						3			2		2
CY 1030.2	Apply concept of synthetic chemistry.			2					2				3
CY 1030.3	Analyse physical property of materials.	2				3					3		2

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Electrical, Electronics & Communication Engineering (SEEC)
Course Hand-out

Basic Electronics | EC 1101| 4 Credits | 2 1 0 3

Session: Jan 19 – May 19 | Faculty: Vishal Das **| Class: Core Subject**

A. Introduction:

The growth of mobile telephony, broadband and wireless internet has led to the growth of career opportunities in the field of communication engineering. This course is a basic overview of electronic components and their common uses. It covers the characteristics and applications of analog and digital circuit components. Emphasis is placed on analysis, selection and applications. The coverage is not as deep as an electronics course aimed at electrical engineers. There are a number of physical applications demonstrated in this course that serve to motivate a wider audience. The course is ideal for someone who wants to gain a basic understanding of electrical circuits, hobbyists, or for someone who is considering electrical engineering as a career.

Review of physics, introduction to semiconductor devices: diodes and transistors. Equivalent circuits and models of semiconductor devices. DC biasing circuits for transistors. Analysis and design of transistor amplifiers. Operational amplifier systems. Number System, Boolean Algebra, Specification and implementation of combinational and sequential systems. Introduction to basic electronic communication systems.

B. Course Outcomes: At the end of the course, students will be able to

[EC1101.1] Apply principles of physics to describe and analyse the working of semiconductor devices and integrated circuits their impacts and hence develop employability skills.

[EC1101.2] Analyse different biasing configurations of bipolar junction transistor and hence result in scope of entrepreneurship.

[EC1101.3] Analyse inverting or non-inverting amplifier structures comprising of operational amplifiers for lifelong learning and encouraging entrepreneurship.

[EC1101.4] Demonstrate interconversion on different number systems

[EC1101.5] Demonstrate minimization of Boolean expressions

[EC1101.6] Identify different parameters pertaining to analog modulation techniques

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. **Engineering knowledge**: Demonstrate and apply knowledge of Mathematics, Science, and Engineering to classical and recent problems of electronic design & communication system.

[PO.2]. **Problem analysis**: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

[PO.3]. **Design/development of solutions**: Design a component, system, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

[PO.4]. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and

IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

[PSO.1]. An ability to understand the concepts of basic Electronics & Communication Engineering and to apply them to various areas like Signal processing, VLSI, Embedded systems, Communication Systems, Digital & Analog Devices, etc.

[PSO.2]. An ability to solve complex Electronics and Communication Engineering problems, using latest hardware and software tools, along with analytical skills to arrive cost effective and appropriate solutions.

[PSO.3]. Wisdom of social and environmental awareness along with ethical responsibility to have a successful career and to sustain passion and zeal for real-world applications using optimal resources as an Entrepreneur.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Open Book)	15
	Sessional Exam II (Open Book)	15
	In class Quizzes , Activity feedbacks (Accumulated and Relative)	30
End Term Exam (Summative)	End Term Exam (Open Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked	

	blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.

E. SYLLABUS

PN Junction: Formation of depletion region, Effect of forward and reverse bias on depletion region, I-V characteristics and equivalent circuits of ideal and practical diode, Diode equation.

Application of Diode: Series and parallel combination of diodes circuits, Half Wave and Full Wave rectifiers, Capacitor filter, clipper, clamper circuits, Zener Diode; I-V Characteristics, Zener Regulators, LEDs.

Bipolar Junction Transistor: Construction, schematic diagram and characteristic of CE, CB Configuration, CC configuration w.r.t. CE, Relation between α and β, transistor biasing, Q-point, load line, fixed bias, self-bias, bias stabilization, Transistor as amplifiers, frequency response.

Operational Amplifier: Characteristics of an Op. Amp., Inverting and Non-inverting, amplifiers, Linear Circuit applications as voltage follower, integrator, differentiator, summing amplifier, subtractor.

Digital Electronics: Number systems, Boolean algebra, DeMorgan's Theorem, logic gates; Truth tables, SOP, POS form, K-map for minimization of Boolean expressions, Implementation of Boolean expressions with logic gates, Designing combinational circuits: Half and full adders, Half and full subtractor. Flip-flop: S-R flip-flops.

Communication Systems: Elements of communication systems, Examples of communication systems: Analog and optical communications.

F. TEXT BOOKS

1. R. L. Boylestad, L. Nashelsky, Electronic Devices and Circuit Theory, Ninth edition, PHI.
2. A. P. Malvino, David J Bates, Electronic Principles, Seventh edition, TMH.
3. G. Kennedy, B. Davis, Electronic Communication systems, TMH.

G. REFERENCE BOOKS

Refer all course related books, other than text books here.

1. J. Millman and C. C. Halkias, Integrated Electronics, Tata McGraw Hill, New Delhi. (1994).
2. B. P. Singh and Rekha Singh, Electronic Devices and Circuits, Second Edition, Pearson Education, 2013.

H. Lecture Plan:

LEC NO.	TOPICS	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1	Overview of Semiconductors	Recall concept of Semiconductors		EC1101.1 (CO 1)	Class Quiz, Mid Term I, End Term
2	Introduction to Extrinsic Semiconductors	Understanding of Doping	Lecture	EC1101.1 (CO 1)	Class Quiz, Mid Term I, End Term
3	Introduction to PN junction diode, Formation of depletion Region	Understanding of switches	Lecture	EC1101.1 (CO 1)	Class Quiz, Mid Term I, End Term
4	Forward and reverse bias, I-V Characteristics	Understanding of switch operation and their characteristics	Lecture	EC1101.1 (CO 1)	Class Quiz, Mid Term I, End Term
5, 6	Equivalent circuits of ideal and practical diode	Model of the diode for circuits	Lecture	EC1101.1 (CO 1)	Class Quiz, Mid Term I, End Term
7	Diode equation	Introduction to the drift and diffusion in diode equation.	Lecture	EC1101.1 (CO 1)	Class Quiz, Mid Term I, End Term
8	Tutorial				
9-11	Application to Diodes: Series and Parallel combination of diode circuits	Use of switches to get different function in electrical circuits	Lecture	EC1101.1 (CO 1)	Class Quiz, Mid Term I, End Term
12	Half and Full wave rectifiers	Introduction to pulsating D.C	Lecture	EC1101.1 (CO 1)	Class Quiz, Mid Term I, End Term
13	Capacitor Filter	Introduction to Filters	Lecture	EC1101.1 (CO 1)	Class Quiz
14,15	Clipper circuits	Understanding of wave shaping circuits	Lecture	EC1101.1 (CO 1)	Class Quiz, Mid Term I, End Term
16	Clamper circuits	Understanding of wave shaping circuits	Lecture	EC1101.1 (CO 1)	Class Quiz, Mid Term I, End Term
17	Zener diode and its I-V characteristics	Understanding of voltage regulating device.	Lecture	EC1101.1 (CO 1)	Class Quiz, Mid Term II, End Term
18, 19	Zener regulators, LEDs	Understanding of voltage regulating circuits	Lecture	EC1101.1 (CO 1)	Class Quiz, Mid Term II, End Term
20	Tutorial		Quiz 1		

21	Introduction to BJT	Understanding of three terminal devices	Lecture	EC1101.2 (CO 2)	Class Quiz
22	Operation of BJT	Understanding of minority carrier movemen t	Lecture	EC1101.2 (CO 2)	Class Quiz
23	Transistor configuration: symbolic representation and CB Characteristics.	Characteristics of BJT under various config.	Lecture	EC1101.2 (CO 2)	Class Quiz
24	Transistor configuration: symbolic representation and CE Characteristics,	Characteristics of BJT under various config.	Lecture	EC1101.2 (CO 2)	Class Quiz
25	CC configuration w.r.t. CE, Relation between α and β	Characteristics of BJT under various config.	Lecture	EC1101.2 (CO 2)	Class Quiz, Mid Term II, End Term
26	Transistor Biasing, Q-point, Load line	Effect of load on the characteristics	Lecture	EC1101.2 (CO 2)	Class Quiz, Mid Term II, End Term
27	Fixed biasing	Effect of load on the characteristics	Lecture	EC1101.2 (CO 2)	Class Quiz, Mid Term II, End Term
28	Self-biasing, Bias stabilization	Effect of load on the characteristics	Lecture	EC1101.2 (CO 2)	Class Quiz, Mid Term II, End Term
29	Transistor as an amplifier, Frequency response	Understanding of amplifier characteristic and its response with frequency variation	Lecture	EC1101.2 (CO 2)	Class Quiz
30	Tutorial		Quiz 2		
31	Introduction to Operational Amplifier, Op. Amp Characteristics.	Understanding the OPAMP characteristics and it's difference from BJT as an amplifier.	Lecture	EC1101.3 (CO 3)	Class Quiz
32	Inverting amplifier	Application of OPAMP	Lecture	EC1101.3 (CO 3)	Class Quiz, Mid Term II, End Term
33	NON-Inverting amplifier, Linear applications of Op. Amp as voltage follower	Application of OPAMP	Lecture	EC1101.3 (CO 3)	Class Quiz, Mid Term II, End Term
34	Summing amplifier, Subtractor	Application of OPAMP	Lecture	EC1101.3 (CO 3)	Class Quiz,

					End Term
35	Integrator, Differentiator	Application of OPAMP	Lecture	EC1101.3 (CO 3)	Class Quiz, End Term
36	Tutorial		Quiz 3		
37	Digital Electronics: Number System	Mathematical understanding of Number System	Lecture	EC1101.4 (CO 4)	Class Quiz, End Term
38	Number conversion, Binary addition	Application of a Number System in Digital Electronics.	Lecture	EC1101.4 (CO 4)	Class Quiz, End Term
39	Binary subtraction with complements (1’s and 2’s complement)	Understanding of Subtraction in Digital Electronics	Lecture	EC1101.4 (CO 4)	Class Quiz, End Term
40	Boolean algebra, DeMorgan’s theorem	Understanding the Algebra in Digital Electronics	Lecture	EC1101.5 (CO 5)	Class Quiz, End Term
41	Logic gates, Truth table.	Basic entities of Digital Electronics	Lecture	EC1101.5 (CO 5)	Class Quiz, End Term
42	Implementation of Boolean expression with logic gates	Use of Logic Gates to implement any Logic in Digital	Lecture	EC1101.5 (CO 5)	Class Quiz, End Term
43	SOP, POS forms	Understanding of various forms to represent a Logic	Lecture	EC1101.5 (CO 5)	Class Quiz, End Term
44	K-Map for minimization of Boolean expressions	A systematic way to minimize the given logic	Lecture	EC1101.5 (CO 5)	Class Quiz, End Term
45	Combinational Circuits: Half and Full adders	Understanding of Basic Combinational Circuits	Lecture	EC1101.5 (CO 5)	Class Quiz
46	Half and Full Subtractors	Understanding of Basic Combinational Circuits	Lecture	EC1101.5 (CO 5)	Class Quiz
47	S-R Flip Flop	Understanding of Basic Sequential Circuits	Lecture	EC1101.5 (CO 5)	Class Quiz
48	Tutorial				
49	Introduction to communication System	Basic concept of Communication	Lecture	EC1101.6 (CO 6)	Class Quiz
50	Analog and Digital communication	Understanding of different Communication Systems	Lecture	EC1101.6 (CO 6)	Class Quiz
51	Modulation techniques, Need for modulation	Understanding the importance of a Carrier and its Modulation	Lecture	EC1101.6 (CO 6)	Class Quiz
52	Types of Modulations.	Understanding the different ways to modulate a carrier	Lecture	EC1101.6 (CO 6)	Class Quiz, End Term
53	Tutorial		Quiz 4		

I. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
[EC1101.1]	Apply principles of physics to describe and analyse the working of semiconductor devices and integrated circuits their impacts and hence develop employability skills.	3	2	3	1			1					1	2	1	1
[EC1101.2]	Analyse different biasing configurations of bipolar junction transistor and hence result in scope of entrepreneurship.	3	2	1	2	1							**1**	2		1
[EC1101.3]	Analyse inverting or non-inverting amplifier structures comprising of operational amplifiers for lifelong learning and encouraging entrepreneurship.	3	3	3	2	**2**							1	2	1	
[EC1101.4]	Demonstrate interconversion on different number systems	3	2	3	2	**2**		1					1	2		
[EC1101.5]	Demonstrate Minimization of Boolean Expressions	**3**	3	1	**2**	**2**							1	2	1	1
[EC1101.6]	Identify different parameters pertaining to analog modulation techniques	**3**	2	**2**	2		1						2	2	1	

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

MANIPAL UNIVERSITY JAIPUR

School of Electrical, Electronics and Communication
Department of Electrical Engineering
Course Hand-out
Basic Electrical Technology | EE 1101 | 4 Credits | 2 1 0 3
Session: 2019-20 (odd sem) | Faculty: Dr. Manish Kumar Thukral | Class: First Year (All Branches)

A. Introduction: This course is offered by Dept. of Electrical Engineering as a basic fundamental subject to impart essential knowledge and information of Electrical Technology and their applications. The learning objective would cover the following aspects: -

a) To develop circuit designing skills through general insight of circuit laws and theorems.
b) To analyse the magnetic & electric circuit and calculate different parameters
c) To develop and analyse the single and three phase circuits.
d) To understand the concepts of basic construction & operation of transformer.
e) To understand the fundamentals of DC & Induction motors and measuring Instruments.

B. Course Outcomes: At the end of the course, students will be able to

[1101.1]. Recall basic circuit laws and apply theorems to analyse different types of DC circuits.
[1101.2]. Understand and apply the basic concepts of electromagnetism.
[1101.3]. Identify and evaluate different configurations of single phase & three phase ac circuits.
[1101.4]. Understand and apply the construction and operating principle of transformer.
[1101.5]. Illustrate the basic operating principles of DC machines & Induction motors and fundamental measuring Instruments

C. Program Outcomes and Program Specific Outcomes

[PO.1]. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4]. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

D. Assessment Rubrics:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	20
	Sessional Exam II (Closed Book)	20
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	20
End Term Exam (Summative)	End Term Exam (Closed Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. Syllabus

DC circuits, Independent sources, Resistance, Network reduction techniques, Mesh and Node voltage analysis, Superposition, Thevenin's and Maximum power transfer theorems, Transient behaviour of inductance and capacitance, Self and Mutual inductances, Coupled coils, Dot rule, Average and RMS values of sinusoidal waves, Series and Parallel AC circuits, Phasor Analysis, Power factor improvement, Series and Parallel resonance, Three phase star and delta connected loads, Measurement of power in three phase circuits, Electrical power system, Emf Equation, Construction & Types of Transformers, DC motors, BLDC, Induction motors, Synchronous motors, Stepper motors, Fundamentals of Electrical Measuring Instruments.

F. TEXT BOOKS

1. Nagasarkar & Sukhija, Basic Electrical Engineering, Oxford University Press, 2006.
2. S.K. Sahdev, Fundamentals of Electrical Engineering & Electronics, Dhanpat Rai & Co, 2010.
3. D. C. Kulsheshtha, Basic Electrical Engineering, McGraw Hill Education India, 2011.

G. REFERENCE BOOKS

1. S. N. Singh, Basic Electrical Engineering, PHI, 2011.
2. D. P. Kothari. & I. J. Nagarath, Basic Electrical Technology, TMH 2004.

H. Lecture Plan:

Lec No	Topics	Session Outcomes	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
L1	Introduction to the Course	To acquaint students with the outcome based education (OBE) and Course outcome (CO) and program outcome (PO) assessment process	Lecture		NA
L2	Basic circuit elements, Source Transformation	Recall the basic elements of a DC network	Lecture	[1101.1]	Class Quiz
L3	Series & parallel resistive circuits, Review of Kirchhoff's laws	Identify different series and parallel network configurations and their equivalent resistance calculation	Lecture	[1101.1]	Home Assignment Class Quiz
L4-L5	Star-Delta transformation	Explain the need of star-delta transformation and their applications	Lecture	[1101.1]	Home Assignment Class Quiz
T1	L1 – L5	Numerical problems based on L1-L5	Tutorial	[1101.1]	Mid Term Exam
L6 – L7	DC Circuit Analysis – Mesh & Node analysis methods	Recall KVL and KCL and apply them to find solution of different dc network problems using Mesh & Node analysis methods	Lecture	[1101.1]	Mid Term Exam
T2-T3	L6 – L7	Numerical problems based on L6-L7	Tutorial	[1101.1]	Mid Term Exam
L8-L11	DC Network Theorems: Superposition, Thevenin, Norton, Maximum Power Transfer	Analyze and solve different dc network problems using all mentioned theorems	Lecture	[1101.1]	Home Assignment Class Quiz Mid Term Exam
T4-T5	L8-L11	Numerical problems based on L8-L11	Tutorial	[1101.1]	Mid Term Exam
L12	Capacitor, Series & Parallel connections, Charging & Discharging, Energy stored	Recall series and parallel connection of capacitors and energy stored	Lecture	[1101.2]	Class Quiz
L13	Inductor, Series & parallel connections, Growth & Decay of current in inductive circuit, Energy Stored	Recall series and parallel connection of inductors and energy stored	Lecture	[1101.2]	Class Quiz
T6	L12 – L13	Numerical problems based on L12-L13	Tutorial	[1101.2]	Class Quiz
L14–L15	Magnetic circuits, Terminologies, Analysis of series and parallel circuits	Recall the concept of magnetic circuits and their configurations	Lecture	[1101.2]	Class Quiz
L16	Review of Electromagnetism, Electromagnetic Induction, Fleming's left & right hand rules, Lenz's Law	Recall the Fleming's rule, Lenz's law, Faraday's law and review the concept of Electromagnetism	Lecture	[1101.2]	Class Quiz
L17–L18	Induced emf in a conductor & coil, Mutual Inductance, Coupling Coefficient and dot rule	Describe the concept of emf induced in coil, dot rule and Coupling Coefficient	Lecture	[1101.2]	Class Quiz
T7-T8	L14– L18	Numerical problems based on L14-L18	Tutorial		Class Quiz
L19-L20	Single phase circuits: Generation, Emf induced, Average value, RMS value, Peak factor, Form factor	Describe the concept of generation of ac voltage and waveform analysis	Lecture	[1101.3]	Class Quiz

L21 – L24	Phasors, Analysis of pure R, L, C, Series RL, RC and RLC circuits, Impedance, Power, Power factor	Describe the phasor operations and calculation of different quantities pertaining to different combinations of series ac circuits	Lecture	[1101.3]	Mid Term Exam
L25-L26	Analysis of Parallel RL, RC and RLC circuits	Analyze and calculate different quantities pertaining to parallel ac circuits	Lecture	[1101.3]	Mid Term Exam
T9-T10	L19 – L26	Numerical problems based on L19-L26	Tutorial	[1101.3]	Mid Term Exam
L27 – L28	Series & Parallel Resonance, Resonant frequency, Voltage & Current magnification	Recall and examine the series and parallel resonance phenomenon	Lecture	[1101.3]	Class Quiz
T11	L27– L28	Numerical problems based on L27-L28	Tutorial	[1101.3]	Class Quiz
L29-L30	Three phase ac circuits, Advantages, Types of connections, Voltage & Currents, Line & Phase values	Identify and analyse different types of Three phase ac circuits	Lecture	[1101.3]	Class Quiz
L31-L32	Analysis of balanced 3 wire & 4 wire star and delta connected systems, Phasor diagrams	Analyze three phase balanced star and delta connected systems	Lecture	[1101.3]	Mid Term Exam
L33	Measurement of three phase power by two wattmeter method	Examine two wattmeter method for three phase power Measurement	Lecture	[1101.3]	Mid Term Exam
T12-T13	L29 – L33	Numerical problems based on L29-L33	Tutorial	[1101.3]	Class Quiz
L34	Single phase transformer: Introduction, types, Construction, Operating principle, Emf equation	Recall and analyse operating principle of Single phase transformer and their types	Lecture	[1101.4]	Class Quiz
L35 – L36	Ideal & practical transformer, Losses and Efficiency, Voltage regulation	Compare the ideal and practical transformer and analyse different performance parameters	Lecture	[1101.4]	Mid Term Exam
T14	L34 – L36	Numerical problems based on L34-L36	Tutorial	[1101.4]	Class Quiz
L37 - L38	Introduction of single and three phase induction motors	Describe the operating principle of single and three phase induction motors	Lecture	[1101.5]	Class Quiz
L39-L40	DC Machine: Introduction, Construction, Types	Describe the construction and operating principle of DC machine	Lecture	[1101.5]	Class Quiz
L41-L42	Fundamentals of Electrical Measuring Instruments	Describe the construction and operating principle of different Measuring Instruments	Lecture	[1101.5]	Class Quiz

I. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
EE 1101.1	Develop circuit designing skills through general insight of circuit laws and theorems.	3	2										2
EE 1101.2	Understand the basic concepts of electromagnetism	2	1										2
EE 1101.3	Identify and evaluate different configurations of single phase & three phase ac circuits.	1	2										3
EE 1101.4	Understand the construction and operating principle of transformer and evaluate efficiency.	2	2	1			1	1					2
EE 1101.5	Illustrate the basic operating principles of DC & Induction motors and fundamental measuring Instruments.						1	1					

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Humanities and Social Sciences

DEPARTMENT OF LANGUAGES

Course Hand-out

Communication Skills in English | LN 1001 | 2 Credits | 2 0 0 2

Session: 2019-20(odd sem) | Faculty: Dr Arun Kumar Poonia| Class: B-Tech I Semester

A. Introduction: This course is offered by the Department of Languages as a common course to the students of B. Tech in Semester-I/II. The course offers an in-depth knowledge of language as an important branch of English language studies. It covers basic concepts such as role of communication, vocabulary, comprehension, composition, and presentation skills. It also focuses on the enhancement of critical thinking, reasoning abilities, active listening, proper and appropriate writing skills in various practical situations.

B. Course Outcomes: At the end of the course, students will be able to

[LN1001.1] Apply the fundamental principles of effective communication in day to day life as well as in the professional world.

[LN1001.2] Develop critical and creative thinking abilities for communicative competence

[LN1001.3] Organize and express ideas clearly in speech

[LN1001.4] Develop ideas with precision and coherence in writing

[LN1001.5] Utilize analytical communicative skills for effective presentations during employment opportunities and later on working in a team.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. Engineering knowledge: Demonstrate and apply knowledge of Mathematics, Science, and Engineering to classical and recent problems of electronic design & communication system.

[PO.2]. Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

[PO.3]. Design/development of solutions: Design a component, system, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

[PO.4]. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

[PO.5]. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

[PO.6]. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

[PO.7]. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

[PO.8]. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices.

[PO.9]. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

[PO.10]. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

[PO.11]. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

[PO.12]. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	20
	Sessional Exam II (Closed Book)	20
	CWS (In class Assignments & 3 Quizzes- Best2 Assignments & Quizzes will be counted)	10+10=20
End Term Exam (Summative)	End Term Exam (Closed Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who miss a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work at home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

Communication: Definition, process, features, types, modes, and barriers; **LSRW Skills- Listening:** Listening to groups and individuals- active listening, response, and feedback; comprehending conversations and lectures; **Reading:** Analysis of passages; skimming and scanning; contextual meaning; advanced vocabulary; **Writing**: Paragraph writing; Writing Creative and Critical responses; Formal letters; Emails; Résumés; Statement of Purpose; **Speaking:** Presentation, Discussion, and Debate on current affairs, scientific enquiry, philosophical attributions, literary sensibilities, socio-political awareness, and cultural sensitivity; Telephonic Etiquettes; Role Play; Team Work; Time Management; Grooming; Exploring multiple perspectives- critical reasoning, constructive feedback, persuasive arguments, and effective interpersonal communication.

F. REFERENCES:

1) Meenakshi Raman and S. Sharma, Technical Communication: Principles and Practice, (2/e), Oxford University Press, 2013.
2) N. Krishnaswamy, Modern English: A Book of Grammar Usage and Composition, Macmillan India, 2018.
3) Sanjay Kumar and Pushplata, Communication Skills, Oxford University Press, 2016.
4) Sunita Mishra and C. Muralikrishna, Communication Skills for Engineers, Pearson, 2014.

G. Lecture Plan:

DAY	TOPICS	Programme objective	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
Day 1	Introduction about the course hand-out/ Examination scheme/Internal Assessment and Communication skills.	Review communication as a process with greater awareness	Lecture, PPT, Discussion	1001.1	Quizzes, I Sessional, End Term Examination
Day 2 & 3	Definition, process, features, types, modes, and barriers	Display enhanced competence in oral communication	Lecture, PPT, Discussion	1001.1, 1001.2	Quizzes, I Sessional, End Term Examination
Day 4 & 5	LSRW Skills- Listening: Listening to groups and individuals- active listening, response, and feedback	Display enhanced competence in oral and written communication	Lecture, PPT, Discussion	1001.1, 1001.2	Quizzes, I Sessional, End Term Examination
Day 6	Comprehending conversations and lectures	Use appropriate co mmunication skills in specific contexts and for specific purposes	Lecture, PPT, Discussion	1001.1, 1001.2	Quizzes, I Sessional, End Term Examination

Day 7& 8	**Reading:** Analysis of passages; skimming and scanning; contextual meaning	Use appropriate co mmunication skills in specific contexts and for specific purposes	Lecture, PPT, Discussion	1001.1, 1001.2	Quizzes, II Sessional, End Term Examination
Day 9	Advanced vocabulary	Demonstrate meaningful group communication exchanges	Lecture, PPT, Discussion	1001.2, 1001.3, 1001.4	Quizzes, II Sessional, End Term Examination
Day 10	**Writing**: Paragraph writing; Writing Creative and Critical responses	Develop critical and creative thinking abilities for communicative competence	Lecture, PPT, Discussion	1001.1, 1001.2, 1001.4	Quizzes, II Sessional, End Term Examination
Day 11 & 12	Formal letters; Emails	Develop critical and creative thinking abilities for communicative competence	Lecture, PPT, Discussion	1001.1, 1001.2, 1001.4	Quizzes, II Sessional, End Term Examination
Day 13 & 14	Resume and Statement of Purpose	Develop critical and creative thinking abilities for communicative competence	Lecture, PPT, Discussion	1001.1, 1001.2, 1001.4	Quizzes, II Sessional, End Term Examination
Day 15	**Speaking:** Presentation Skills and discussion.	Use appropriate co mmunication skills in specific contexts and for specific purposes	Lecture, PPT, Discussion	1001.1, 1001.2, 1001.3, 1001.5	Quizzes, End Term Examination
Day 16-18	Debate on current affairs, scientific enquiry, philosophical attributions, literary sensibilities, socio-political awareness, and cultural sensitivity	Use appropriate co mmunication skills in specific contexts and	Lecture, Discussion and any case study	1001.1, 1001.2, 1001.3	Quizzes

		for specific purposes			
Day 19	Telephonic Etiquettes	Use appropriate communication skills in specific contexts and for specific purposes	Lecture, PPT, Discussion	1001.1, 1001.3	Quizzes, End Term Examination
Day 20 & 21	Role Play and Team Work	Use appropriate communication skills in specific contexts and for specific purposes	Lecture, PPT, Discussion	1001.1, 1001.5	Quizzes
Day 22 & 23	Time Management and grooming	Develop critical and creative thinking abilities	Lecture and Discussion	1001.1, 1001.3, 1001.5	Quizzes
Day24-26	Exploring multiple perspectives- critical reasoning, constructive feedback, persuasive arguments	Develop critical and creative thinking abilities	Lecture, PPT, Discussion, any case study	1001.1, 1001.2, 1001.3	Quizzes
Day 27 & 28	Effective interpersonal communication	Use appropriate communication skills in specific contexts and for specific purposes	Lecture, PPT, Discussion, any case study	1001.1, 1001.3, 1001.5	Quizzes

H. Course Articulation Matrix: (Mapping of COs with POs & PSOs)

CO	STATEMENT	Correlation with Program Outcomes **(POs)**											
		PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
[LN1001 .1]	Apply the fundamental principles of effective communication in day to day life as well as in the professional world						**1**		**2**	**1**	**1**		
[LN1001 .2]	Develop critical and creative thinking abilities for communicative competence		**1**				**1**		**1**				
[LN1001 .3]	Organize and express ideas clearly in speech									**1**	**1**		
[LN1001 .4]	Develop ideas with precision and coherence in writing		**1**								**1**		
[LN1001 .5]	Utilize analytical communicative skills for effective presentations and team work						**1**		**1**	**2**	**2**	**1**	

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

MANIPAL UNIVERSITY JAIPUR

School of Engineering

Department of Mathematics & Statistics

Course Hand-out

Engineering Mathematics-I | MA 1101 | 4 Credits | 3 1 0 4

Session: 2019-20 (odd sem) | **Dr Sunil Joshi** | Class: Ist Year

A. Introduction: An engineering student needs to have some basic mathematical tools and techniques which emphasize the development of rigorous logical thinking and analytical skills. Based on this, the course aims at giving adequate exposure to the theory and applications. The course is aimed at developing the basic Mathematical skills of engineering students that are imperative for effective understanding of engineering

B. Course Outcomes: At the end of the course, students will be able to

[MA1101.1] To describe the concept of ODE and their applications to solve the problems

[MA1101.2] To describe the concept of Interpolation, Numerical differentiation & integration and their applications and in real life problems.

[MA1101.3] To Describe the concept of numerical methods to evaluate the roots of Algebraic & Transcendental equations and solutions of ODE though which one could develop programming skills to develop the skill of solving the complex problems which intern become employable in corporate sector

[MA1101.4] To Describe the concept of rank for the matrix by solution of the system of linear equations and developed their skill to solve engineering application based problems.

[MA1101.5] To Describe the basic concepts of vector space and to analysis the problems having engineering applications.

C. Program Outcomes and Program Specific Outcomes

[PO.1]. **Engineering Knowledge:** Apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

[PO.2]. **Problem Analysis:** Identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences**.**

[PO.3]. **Design/ Development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations.

[PO.4]. **Conduct investigations** of complex problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions**.**

[PO.5]. **Modern Tool Usage:** Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modelling to complex engineering activities with an under- standing of the limitations.

[PO.6]. **The Engineer and Society:** Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.

[PO.7]. **Environment and Sustainability:** Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.

[PO.8]. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

[PO.9]. **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.

[PO.10]. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.

[PO.11]. **Project Management and Finance:** Demonstrate knowledge and understanding of engineering and management principles and apply these to owners own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

[PO.12]. **Life-long Learning:** Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	20
	Sessional Exam II (Closed Book)	20
	Quizzes (Open Book/Close Book) and Assignments	20
End Term Exam (Summative)	End Term Exam (Closed Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Homework/ Home Assignment/ (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. A student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. Syllabus

Matrices-inverse and rank, solution of linear system of equations, Eigen value problems. Vector spaces, basis, linear transformations, inner product spaces and Orthogonalization. First and higher order differential equations and their solutions; finite difference and interpolation for equal and unequal intervals, Numerical differentiation and integration. Solution of algebraic and transcendental equations, solutions of ordinary differential equations.

F. Text Book:

1. Grewal B. S., *Higher Engineering Mathematics*, (42e), Khanna Publishers, 2013

G. Reference Book:

1. Kreyszig E., Advanced *Engineering Mathematics*, (10e), Wiley Eastern, 2011
2. Lay David C., *Linear Algebra and applications*, (3e), Pearson Education, 2009
3. Sastry S. S., *Introductory methods of Numerical analysis*, (4e), PHI, 2007
4. Iyengar S.R.K. and Jain, Rajendra K., *Advance Engineering Mathematics (3e)*, Narosa book distributors Pvt Ltd-New Delhi, 2007
5. Ramana B. V., *Higher Engineering Mathematics* (6th reprint), Tata Mcgraw-Hill, New Delhi, 2008

H. Lecture Plan:

Lecture No.	Description of the Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1	Introduction: Basic definitions, solving first order differential equations using Variable separable method.	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.1	Quizzes, assignments, Two Sessional, End Term Examination
2	Homogeneous	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.1	Quizzes, assignments, Two Sessional, End Term Examination
3	reducible to Homogeneous	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.1	Quizzes, assignments, Two Sessional, End Term Examination
4	Tutorial	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Problem solving	1101.1	Quizzes, assignments, Two Sessional, End Term Examination
5	Linear D. E	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.1	Quizzes, assignments, Two Sessional, End Term Examination
6	Bernouli equations	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.1	Quizzes, assignments, Two Sessional, End Term Examination
7	Solution of Exact differential equations	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.1	Quizzes, assignments, Two Sessional, End Term Examination
8	Tutorial	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Problem solving	1101.1	Quizzes, assignments, Two Sessional, End Term Examination
9	Reducible to exact methods	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.1	Quizzes, assignments, Two Sessional, End Term Examination

10	higher order differetial equations - finding CF	Identify, formulate, apply appropriate techniques,_professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.1	Quizzes, assignments, Two Sessional, End Term Examination
11	Inverse differential operator method to calculate P.I for eax , sin (ax+b) and cos (ax+b)	Identify, formulate, apply appropriate techniques,_professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.1	Quizzes, assignments, Two Sessional, End Term Examination
12	Tutorial	Identify, formulate, apply appropriate techniques,_professional ethics, Communicate effectively & life-long learning	Problem solving	1101.1	Quizzes, assignments, Two Sessional, End Term Examination
13	Inverse differential operator method to calculate P.I for xm, eax v	Identify, formulate, apply appropriate techniques,_professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.1	Quizzes, assignments, Two Sessional, End Term Examination
14	P.I using method of variation of parameters	Identify, formulate, apply appropriate techniques,_professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.1	Quizzes, assignments, Two Sessional, End Term Examination
15	Finite difference operators and relation among them.	Identify, formulate, apply appropriate techniques,_professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.2	Quizzes, assignments, Two Sessional, End Term Examination
16	Tutorial	Identify, formulate, apply appropriate techniques,_professional ethics, Communicate effectively & life-long learning	Problem solving	1101.2	Quizzes, assignments, Two Sessional, End Term Examination
17	Newton-Gregory forward and backward interpolations	Identify, formulate, apply appropriate techniques,_professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.2	Quizzes, assignments, Two Sessional, End Term Examination
18	Stirlings formula	Identify, formulate, apply appropriate techniques,_professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.2	Quizzes, assignments, Two Sessional, End Term Examination
19	Lagrange's and inverse interpolation for unequal intervals.	Identify, formulate, apply appropriate techniques,_professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.2	Quizzes, assignments, Two Sessional, End Term Examination

20	Tutorial	Identify, formulate, apply appropriate techniques,_professional ethics, Communicate effectively & life-long learning	Problem solving	1101.2	Quizzes, assignments, Two Sessional, End Term Examination
21	Numerical Differentiation - forward and backward formulas	Identify, formulate, apply appropriate techniques,_professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.2	Quizzes, assignments, Two Sessional, End Term Examination
22	Numerical Differentiation - Central formula	Identify, formulate, apply appropriate techniques,_professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.2	Quizzes, assignments, Two Sessional, End Term Examination
23	Numerical differentiation for unequal intervals	Identify, formulate, apply appropriate techniques,_professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.2	Quizzes, assignments, Two Sessional, End Term Examination
24	Tutorial	Identify, formulate, apply appropriate techniques,_professional ethics, Communicate effectively & life-long learning	Problem solving	1101.2	Quizzes, assignments, Two Sessional, End Term Examination
25	Numerical Integration- Newton Cotes formula	Identify, formulate, apply appropriate techniques,_professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.2	Quizzes, assignments, Two Sessional, End Term Examination
26	Trapezoidal and Simpson's 1/3 rd rules of integration	Identify, formulate, apply appropriate techniques,_professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.2	Quizzes, assignments, Two Sessional, End Term Examination
27	Simpson's 3/8 th rule of integration,Weddle rule	Identify, formulate, apply appropriate techniques,_professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.2	Quizzes, assignments, Two Sessional, End Term Examination
28	Tutorial	Identify, formulate, apply appropriate techniques,_professional ethics, Communicate effectively & life-long learning	Problem solving	1101.2	Quizzes, assignments, Two Sessional, End Term Examination
29	Solution of algebraic and transcendental equations : Bisection method	Identify, formulate, apply appropriate techniques,_professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.3	Quizzes, assignments, Two Sessional, End Term Examination

30	Regula –Falsi method	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.3	Quizzes, assignments, Two Sessional, End Term Examination
31	Solution by Newton Raphson's method	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.3	Quizzes, assignments, Two Sessional, End Term Examination
32	Tutorial	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Problem solving	1101.3	Quizzes, assignments, Two Sessional, End Term Examination
33	Numerical solution of ordinary differential equations- by Taylor series method	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.3	Quizzes, assignments, Two Sessional, End Term Examination
34	Numerical solution of ordinary differential equations- by Euler 's method and modified Euler's method	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.3	Quizzes, assignments, Two Sessional, End Term Examination
35	Runge-Kutta method order 4	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.3	Quizzes, assignments, Two Sessional, End Term Examination
36	Tutorial	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Problem solving	1101.3	Quizzes, assignments, Two Sessional, End Term Examination
37	Matrices and their properties, Elementary row transformations and Echelon matrix	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.4	Quizzes, assignments, Two Sessional, End Term Examination
38	Rank of the matrix with problems	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.4	Quizzes, assignments, Two Sessional, End Term Examination
39	Consistency of the system of homogeneous/non homogeneous equations: Solution by Gauss elimination	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.4	Quizzes, assignments, Two Sessional, End Term Examination

40	Tutorial	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Problem solving	1101.4	Quizzes, assignments, Two Sessional, End Term Examination
41	Gauss Jordan method for inverse evaluation, examples	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.4	Quizzes, assignments, Two Sessional, End Term Examination
42	Iterative method for solving system of equations: Gauss Jacobi method	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.4	Quizzes, assignments, Two Sessional, End Term Examination
43	Gauss Seidel method	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.4	Quizzes, assignments, Two Sessional, End Term Examination
44	Tutorial	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Problem solving	1101.4	Quizzes, assignments, Two Sessional, End Term Examination
45	Eigen values , eigen vectors and their properties	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.4	Quizzes, assignments, Two Sessional, End Term Examination
46	Linear combination of vectors, Linear span, some theorems on Linear span	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.5	Quizzes, assignments, Two Sessional, End Term Examination
47	Linear dependency and independency of vectors with problems	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.5	Quizzes, assignments, Two Sessional, End Term Examination
48	Tutorial	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Problem solving	1101.5	Quizzes, assignments, Two Sessional, End Term Examination
49	Definition of Basis, Spanning set with problems	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.5	Quizzes, assignments, Two Sessional, End Term Examination

50	Inner product space	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.5	Quizzes, assignments, Two Sessional, End Term Examination
51	Orthogonal basis and orthonormal basis. Gram Schmidt orthogonalization to construct Orthonormal basis	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.5	Quizzes, assignments, Two Sessional, End Term Examination
52	Tutorial	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Problem solving	1101.5	Quizzes, assignments, Two Sessional, End Term Examination

I. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
MA1101.1	To describe the concept of ODE and their applications to solve the problems	3	3	1	3	1				2		2	1
MA1101.2	To describe the concept of Interpolation, Numerical differentiation & integration and their applications and in real life problems.	3	2	2	2	2				2		1	1
MA1101.3	To Describe the concept of numerical methods to evaluate the roots of Algebraic & Transcendental equations and solutions of ODE though which one could develop programming skills to develop the skill of solving the complex problems which intern become employable in corporate sector	3	2	2	2	2				3		3	1
MA1101.4	To Describe the concept of rank for the matrix by solution of the system of linear equations and	3	3	2	3	2				1		2	1

	developed the their skill to solve engineering application based problems.												
MA1101.5	To Describe the basic concepts of vector space and to analysis the problems having engineering applications.	2	2	1	2	3				2		2	1

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

School of Automobile Mechanical and Mechatronics Engineering
Department of Mechanical Engineering
Course Hand-out
BASIC MECHANICAL ENGINEERING| ME 1001 | 3 Credits | 3 0 0 3
Session: 2019-20 (odd sem) | Faculty: Hemant Raj Singh | Class: I Year

A. **Introduction:** Basic Mechanical Engineering is a brief overview of mechanical engineering that makes the students familiar with the basic concepts of Mechanical Engineering. It provides a systematic introduction to the basic elements of mechanical systems while emphasizing the underlying working principles important in understanding the functioning of mechanical systems and processes which involves energy carrier (working fluid i.e. steam), energy and its transformation, steam generator, refrigeration and air-conditioning, power producing and consuming devices, power transmission devices and manufacturing processes.

B. **Course Outcomes:** At the end of the course, students will be able to

[ME1001.1] Understand the fundamental concepts to the basic elements of mechanical systems while emphasizing the underlying working principles important in understanding the functioning of mechanical systems and processes.

[ME1001.2]. Apply laws of thermodynamics on engineering processes.

[ME1001.3] Design and analyse the concepts of components, (I.C. Engine, Steam Generator, Refrigerator, Steam Turbine, Machine Tools, Power Transmitting devices and Manufacturing Processes etc.).

[ME1001.4] Analyse the concepts of manufacturing in the context of mechanical applications.

[ME1001.5] Apply the concept of thermodynamics and manufacturing processes to design/utilize the power generating, power consuming and manufacturing devices thus increasing the employability in industries.

C. **Program Outcomes and Program Specific Outcomes**

[PO.13]. **Engineering Knowledge:** Apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

[PO.14]. **Problem Analysis:** Identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

[PO.15]. **Design/ Development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations.

[PO.16]. **Conduct investigations** of complex problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.

[PO.17]. **Modern Tool Usage:** Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modelling to complex engineering activities with an under- standing of the limitations.

[PO.18]. **The Engineer and Society:** Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.

[PO.19]. **Environment and Sustainability:** Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.

[PO.20]. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

[PO.21]. **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.

[PO.22]. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.

[PO.23]. **Project Management and Finance:** Demonstrate knowledge and understanding of engineering and management principles and apply these to owners own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

[PO.24]. **Life-long Learning:** Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

D. Assessment Rubrics:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Close Book)	20
	Sessional Exam II (Close Book)	20
	Quizzes(10) and Assignment (10)	20
End Term Exam (Summative)	End Term Exam (Close Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Quizzes	3 Quizzes (Close Book)	

E. Syllabus

Working Fluid: Properties of steam, Steam tables, Steam Generators, Classification, Construction and working of Simple boiler. **Refrigeration and Air Conditioning:** Definition, concept, Vapour Compression cycle, C.O.P., working principles and schematic diagrams of Refrigerator, Air Conditioner. **Internal Combustion Engine**: Classification, Otto and Diesel cycles, Construction and working of SI and CI engine, Two stroke and Four stroke engine, Calculation of thermal efficiency of cycles. Introduction of **Lubrication**: Need, Methods of lubrication, Splash & Force lubrication. **Steam turbines**: Definition, function, classification and parts of steam turbine, Impulse and reaction turbine - working principle, P – V diagram. **Power Transmission:** Classification and applications of mechanical drives like belts, ropes, chains and gear drives and their velocity ratios, length of belts, power transmitted, ratio of tensions in belts and ropes, gear trains, Calculation of different parameters. **Machine Tools**: Construction, Working and specification of Lathe, Drilling machine, Shaper and Milling machine. **Foundry:** Foundry tools and equipments, Procedure for moulding. **Welding:** Definition, Gas and Arc welding, Soldering and Brazing. **Forging:** Definition, applications, tools Different Forging operations.

F. Text Book:

T1. Elements of Mechanical Engineering, Mathur, Mehta and Tiwari, Jain Brother, (Thirteenth Edition), 2016.

G. Reference Book:

R1. Thermodynamics: An Engineering Approach, Y.A. Cengel and M.A. Boles, McGraw Hill (Fifth Edition), 2006.

R2. Workshop Technology, Vol. I, W. A. J. Chapman, CBS Publishers & Distributors(Fifth Edition), 2001

F. Lecture Plan:

Lec No	Topics	Session Objective	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1	Introduction, aims and objectives of the course and elementary fundamentals of thermodynamics	Know the basics of the course and understand its applications	Lecture	ME1001.1	Class Quiz Mid-Term I End-Term
2	**Properties of steam:** formation of steam experiment	Discuss the terms system and surroundings, thermodynamic properties and describe their use	Lecture	ME1001.1	
3	Different states of steam, enthalpy of steam and Measurement of Dryness fraction	Understand the type of steams	Lecture	ME1001.1	
4	Numerical on properties of steam	Estimating the properties of steam using steam tables.	Lecture/Activity	ME1001.1 ME1001.2	
5	**Steam Boilers** – definition, function and classification	Know the basics of the steam boiler and understand its applications	Lecture	ME1001.1	
6	Lancashire boiler – construction, working principle and applications	Understand the concept of Lancashire boiler	Lecture	ME1001.1	
7	Boiler mountings & accessories, Comparison between boiler mountings & accessories	Know the basics of the Boiler its accessories and mounting	Lecture	ME1001.1	
8	**Refrigeration**: Principle and major parts of an refrigeration system and Air Conditioner	Understand various thermodynamic principles related with refrigeration	Lecture/Activity/Lab Visit	ME1001.1	Class Quiz Mid-Term I End-Term
9	Vapour compression refrigeration system: working principle	Know the basics of the Vapour compression refrigeration system	Lecture	ME1001.2 ME1001.3 ME1001.4	
10	Classification of refrigerants and properties of an ideal refrigerant Commonly used refrigerants	Know the criteria in selection of refrigerants and their use	Lecture	ME1001.1	
11	**I. C. Engines**: classification, parts and I.C Engine terms	Know the basics of the I.C. Engine and understand its applications	Lecture/ Activity/ Lab visit	ME1001.1 ME1001.2	
12	working of four stroke petrol engine	Know the basics of the four S SI engine and understand its applications	Lecture	ME1001.1 ME1001.2	
13	Working of four stroke diesel engine	Know the basics of the four S CI engine and understand its applications	Lecture	ME1001.1 ME1001.2	
14	Two stroke engines and Working of two stroke petrol engine, Working of two stroke diesel engine	Know the basics of the two S Engine and understand its applications	Lecture	ME1001.1 ME1001.2 ME1001.3	

15	comparison between petrol & diesel engines	Analyse the differences	Lecture	ME1001.2 ME1001.3	
16	Comparison between four stroke & two stroke engines and Important definitions	Analyse the differences	Lecture	ME1001.1 ME1001.2 ME1001.3	
17	Problems on I. C. Engines	Estimating the properties of IC Engine	Lecture/Activity	ME1001.2 ME1001.3	
18	**Lubrication:** Methods of lubrication, Splash & Force lubrication,	Know the basics of the lubrication and understand its applications	Lecture	ME1001.1	Class Quiz Mid-Term II End-Term
19	**Steam turbines** :definition, function, classification and comparison with steam engine	Know the basics of the steam turbine and understand its applications	Lecture	ME1001.1	
20	Impulse turbine - working principle and P – V diagram, Reaction turbine - working principle,	Understand the impulse and reaction turbine	Lecture	ME1001.1 ME1001.3	
21	Reaction Turbine-PV diagram (Continued),Difference between impulse & reaction turbine	Compare and understand the steam turbines	Lecture	ME1001.3	
22	**Power Transmission:** Introduction, Significance and definitions, Different methods of power transmission, types of belt drives,	Know the basics of power transmission and understand its applications	Lecture	ME1001.1	Class Quiz Mid-Term II End-Term
23	types of pulleys and its application, V – belt introduction and advantages	Know the type of belt and its use	Lecture	ME1001.1	
24	Derivation of length of belt (open and cross)	Estimate the length of belt drives	Lecture/Activity	ME1001.1	
25	Calculation of Velocity ratio for belt drive, introduction of slip and creep	Estimating the velocity ratio of belt drive	Lecture/Activity	ME1001.3 ME1001.5	
26	Calculation of Tension in belt drive (open), Power transmitted in belt drive and Numerical on belt drives	Estimating the tension in belt	Lecture/Activity	ME1001.3 ME1001.5	
27	Gear drives, types of gears and their application	Know the basics of the gear drives and understand its applications	Lecture	ME1001.1 ME1001.3 ME1001.5	
28	Calculation of velocity ratio for gear drive, gear train (simple and compound)	Estimating the velocity ratio of gear drive	Lecture	ME1001.3 ME1001.5	
29	**Machine tools**: Introduction **Lathe**- Basic introduction , explanation of principal parts of lathe with the help of diagram and working principle	Know the basics of the machine tool and understand its applications	Lecture	ME1001.1 ME1001.3 ME1001.5	Class Quiz End-Term
30	Specification of lathe Machine, Types of operations- Turning, Facing, Knurling, Parting, Grooving, Chamfering, taper turning	Analyse the Lathe Machine and its operation	Lecture	ME1001.1 ME1001.2 ME1001.3 ME1001.5	
31	**Drilling**: Introduction, classification of drilling machines, operations	Know the basics of the Drilling and understand its applications	Lecture	ME1001.1 ME1001.3	
32	Introduction to Shaper and Milling machine	Know the basics of the Milling and shaper	Lecture/ Workshop Visit	ME1001.1 ME1001.3	

		and understand its applications			
33	**Foundry:** Usage of Foundry tools and equipments,	Know the basics of the Foundry and understand its applications	Lecture	ME1001.1 ME1001.3 ME1001.5	Class Quiz End-Term
34	Procedure of moulding process	Know the Procedure for moulding.	Lecture	ME1001.1 ME1001.2 ME1001.3 ME1001.5	
35	**Welding:** Definition, Classification majorly Gas and Arc welding,	Know the basics of the welding and understand its applications	Lecture	ME1001.1 ME1001.2 ME1001.3	
36	Principle of Oxy-Acetylene gas welding, flames and its application	Understand the gas welding	Lecture	ME1001.1 ME1001.2 ME1001.3 ME1001.5	
37	Principle of electric arc welding, Soldering and Brazing.	Understand the arc welding	Lecture	ME1001.1 ME1001.2 ME1001.3	
38	**Forging:** Definition, applications, tools Different Forging operations	Know the basics of the forging and understand its applications	Lecture/ workshop visit	ME1001.1 ME1001.2 ME1001.3 ME1001.5	

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
ME100 1.1	Understand the fundamental concept to the basic elements of mechanical systems while emphasizing the underlying working principles important in understanding the functioning of mechanical systems and processes.	3											
ME100 1.2	Apply laws of thermodynamics on engineering processes.	3	2										
ME100 1.3	Design and analyse the concept of components, (I.C. engine, Steam generator, Refrigerator, turbine, Machine tools, power transmitting devices and Manufacturing processes etc.).	3		3	2								
ME100 1.4	Analyse the concept of second law and entropy in the context of thermal applications.	3	2	3	2		2	2					
ME100 1.5	Apply the concept of thermodynamics and manufacturing processes to design/utilize the power generating, power consuming and manufacturing devices.	3	3	3			2	2					

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

School of Automobile, Mechanical and Mechatronics

DEPARTMENT OF MECHANICAL ENGINEERING

Course Hand-out

Engineering Graphics| ME 1002 | 3 Credits | 0 0 6 3

Session: 2019-20(odd sem) | Course Coordinator: Dr. Mithilesh Kumar Dikshit | Class: I Year B.Tech

A. Introduction: This course teaches the basics of engineering drawing utilising free hand sketching, mechanical drawing, and computer aided drafting. The fundamental principles of orthographic projection as well as the topics of dimensioning, sectional views, isometric and perspective pictorials views, descriptive geometry and assembly drawings are taught.

B. Course Outcomes: Upon successful completion of this course:

[ME1002.1]. Students will be able to understand the conventions and the methods of engineering drawing.

[ME1002.2]. Students will be able to understand the theory of projections. Draw orthographic projection of lines, planes and solids.

[ME1002.3]. Students will learn to apply sectional views to most practically represent engineered parts**.** Students will have skill to prepare basic engineering models.

[ME1002.4]. Student will learn design and drafting in autocad. Understand the application of industry standards and techniques applied in engineering graphics.

C. Program Outcomes and Program Specific Outcomes

[PO.1] Engineering Knowledge: Apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

[PO.2] Problem Analysis: Identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

[PO.3] Design/ Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations.

[PO.4] Conduct investigations of complex problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.

[PO.5] Modern Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modelling to complex engineering activities with an under- standing of the limitations.

[PO.6] The Engineer and Society: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.

[PO.7] Environment and Sustainability: Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.

[PO.8] Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

[PO.9] Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.

[PO.10] Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.
[PO.11] Project Management and Finance: Demonstrate knowledge and understanding of engineering and management principles and apply these to owners own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
[PO.12] Life-long Learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Performance on sheets (Manual Drawing)	30
	Performance on AUTOCAD	20
	Viva voce	10
End Term Exam (Summative)	End Term Exam	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester Examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to his/her faculty about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	

E. Syllabus

Principle of Orthographic Projections: Points, straight lines parallel to one ref. plane (HP/VP) and inclined to other ref. plane; Straight lines inclined to both HP and VP; Straight lines inclined to both HP & VP and parallel to PP; Straight lines with traces; Practical problems on straight lines. Projections of Plane surfaces: Perpendicular one ref. plane (HP/VP) and inclined to other ref. plane, Inclined to both HP & VP, Inclined to both HP & VP and perpendicular to PP. Projections of Solids (right regular) by change of position method: Axis parallel to one ref. plane (HP/VP) and inclined to other ref. plane, Resting on one of the ref. plane, axis inclined to both HP & VP, Suspended freely, axis inclined to both HP & VP, Axis inclined to both HP & VP parallel to PP. Projections of solids by Auxiliary plane method: Axis inclined to both HP and VP. Sections of solids (right regular and no spheres): Using Horizontal and vertical section planes using section plane perpendicular to one ref. plane and inclined to the other ref. plane, Given the regular true shapes of various solids and find the inclination of section plane. Development of surfaces: Parallel line development, Radial line development, Triangulation development. Isometric projections: Plane surfaces and simple solids (prisms & cylinders), Frustum and combination of solids, Simple machine elements. Introduction to Computer Aided Drafting.

F. Text Books:

1. Bhat N. D., Engineering Drawing Charotar Publishing House, Anand , 2000.
2. Jeyapoovan T. Engineering Drawing and graphics Using AutoCAD, 3rd Ed. Vikas Publishing House Pvt. Ltd.,2010.

G. Reference Books:

1. Gopalkrishna K. R., Engineering Graphics, Suhas Publications, Bangalore, 2001.
2. Venugopal K., Engineering Drawing and Graphics + Autocad Newage International Publishers, Delhi (2001).
3. Narayana K. L. and Kannaiah P., Text book on Engineering Drawing, Scitech Publications, Chennai (2002).

H. List of Sheets

1. Projection of Points
2. Projection of Lines (inclined to one plane and parallel to other)
3. Projection of Lines inclined to both the planes and Traces of a line
4. Projection of Planes
5. Projection of Solids
6. Projection of Sections of Solids & Development of Surfaces
7. Isometric projections

CAD

1. Introduction to Auto-CAD and commands
2. Questions on projection of lines
3. Questions on projection of lines inclined to both the planes
4. Questions on projection of planes
5. Basic concept of 3D drafting and drawing

I. Lecture Plan:

Lecture Number	Topics	Session Outcomes	Mode of delivery	**Corresponding CO**	Assessments
1	Introduction to Engineering Graphics	Layout of drawing sheet, conventions, scales, Dimensioning, Letterings and Numberings	Board/PPT	ME1002.1	Sheet performance in class/End terms
2	Theory of projection. Projection of Points	Types of Projections, orthographic projections, plane of projection, Quadrants, Angles of projections	Board/PPT	ME1002.1	
3	Problems on projection of points	Position of point, to find distance between any two points	Board/PPT	ME1002.1	
4	Projection of lines inclined to one plane and perpendicular to another plane	Position and projection of straight line, Methods for determining true length and true inclinations.	Board/PPT	ME1002.2	Sheet performance in class/End terms
5	Problems practice of lines inclined to one plane and parallel to other plane	Classroom practice.	Board/PPT	ME1002.2	
6	Projection and traces of straight line inclined to both planes	Projection of straight line inclined to both planes, determining	Board/PPT	ME1002.2	

		apparent top view and apparent front view, angle of inclinations with both the planes.			
7	Problems practice on Lines inclined to both planes and traces of a line	Projection of straight line and traces.	Board/PPT	ME1002.2	
8	Projection of planes	Introduction to plane, location of plane, types of planes, Projection concepts	Board/PPT	ME1002.2	Sheet performance in class/End terms
9	Problems practice on projection of planes inclined to one plane and planes inclined to both planes	Projection of planes, perpendicular planes, plane inclined to reference planes	Board/PPT	ME1002.2	
10	Projection of Solids (right regular and by change of position method)	Introduction, types of solids, position of solids w.r.t. HP and VP	Board/PPT	ME1002.2	Sheet performance in class/End terms
11	Problems practice on projection of solids	Projection of solids in simple positions, Position of solids in typical positions	Board/PPT	ME1002.2	
12	Problems on projection of solids inclined to both planes	Oblique solids, Frustum of cone and Pyramid, Truncated solids	Board/PPT	ME1002.2	
13	Problems on projection of solids	suspended freely and axis inclined to both planes, Axis inclined to both HP & VP, parallel to PP	Board/PPT	ME1002.2	
14	Problems on projection of solids	Projection of solids by auxiliary plane method; Axis inclined to both HP & VP	Board/PPT	ME1002.2	
15	Projection of sections of solids	Introduction, section of solids, Different terminology, classifications	Board/PPT	ME1002.3	Sheet performance in class/End terms
16	Projection of sections of solids	Section perpendicular to VP and parallel to HP, Section perpendicular to HP and parallel to VP	Board/PPT	ME1002.3	
17	Problems on projection of sections of solids	Section perpendicular to VP and inclined to HP, Section perpendicular to HP and inclined to VP	Board/PPT	ME1002.3	
18	Development of surfaces	Parallel line development, Radial line development and Triangular development	Board/PPT	ME1002.3	Sheet performance in class/End terms

19	Development of Surfaces	Problems on Development of Surfaces for prism, pyramid, cone cylinder	Board/PPT	ME1002.3	
20	Isometric view and projection	Introduction, Difference between isometric view and isometric projection, Isometric axis, isometric lines and isometric planes	Board/PPT	ME1002.3	Sheet performance in class/End terms
21	Problems on Isometric view and projection of planes and solids	Dimensioning on isometric projection Isometric view and projection of plane geometries, Four center method to draw isometric view and projection of circle, Isometric view of right solids	Board/PPT	ME1002.3	
22	Problems on Isometric projection of planes and solids	Isometric view and projection of Truncated solids, frustum	Board/PPT	ME1002.3	
23	Introduction to Auto CAD	Introduction, CAD applications, AUTOCAD workspace, Setting up drawing space, sheet layout, command execution	PPT	ME1002.4	Classroom Test
24	Commands and Projection of lines and lines inclined to both planes using Auto CAD	Methods of locating a point, Drawing lines and curves, texting and dimensioning of drawings	AUTOAD	ME1002.4	
25	Commands and Projection of planes using AUTOCAD	Drawing of polygons using commands, editing commands like OFFSET, FILLET, CHAMFER, TRIM, EXTEND, BREAK, ROTATE, MIRROR etc.	AUTOCAD	ME1002.4	
26	3D objects	Commands: EXTRUDE, CYLINDER, CONE, BOX, UNION, SUBSTRACT and SECTION	AUTOCAD	ME1002.4	

J. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	Correlation With Program Outcomes											
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
ME1002.1	Students will be able to understand the conventions and the methods of engineering drawing.	3	1	2	1								2
ME1002.2	Students will be able to understand the theory of projections. Draw orthographic projections of lines, planes and solids.	3	2	2	1								2
ME1002.3	Students will learn to apply sectional views to most practically represent engineered parts**.** Students will have **skill** to prepare basic engineering models.	3	3	3	1								2
ME1002.4	Student will learn **design and drafting** in autocad. Understand the application of industry standards and techniques applied in engineering graphics.	3	3	3	2	3							2

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Automobile Mechanical and Mechatronics Engineering
Department of Mechanical Engineering
Course Hand-out
Basic Workshop Practice| ME 1030 | 1 Credits
Session: 2019-20 (odd sem) | Faculty: Ashish Sharma

A. **Introduction:** This course is offered by Dept. of Mechanical Engineering which focuses on mainly hands on learning based on various working shops like lathe machine, welding, engines, UTM, residential wiring design, power supply and building plan. This course gives an overview of fundamental working of various machine tools, compressive strength of building materials and electrical- electronics instruments.

B. **Course Outcomes:** At the end of the course, students will be able to

ME1030.1 Understand about the various measuring, marking and cutting tools and Comprehend the safety measures required to be taken while using tools.

ME1030.2 Acquire skills and Knowledge about lathe machine, welding machines and 2S-4S engines and their operations.

ME1030.3 Learn different techniques for quality assurance check of building materials.

ME1030.4 Analyse the profile of existing ground for any infrastructure development project

ME1030.5 Understand about the basic construction and working principle of fluorescent lamp, ceiling fan and three Phase Induction machine

ME1030.6 Analyse the characteristics of different electronic components and CRO.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. **Problem analysis**: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4]. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Job preparation-	30
	File/Records-	15
	Viva-	15
End Term Exam (Summative)	End Term Exam (External Practical Exam)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup class on the job done on the day of absence will be given which has to be completed within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These jobs are limited to a maximum of 2 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

Study of parts of lathe machine and lathe operations
Perform different operations on lathe machine like Facing, Turning, Taper Turning and knurling on MS cylindrical work piece
Study of types of welding process and perform welding of different types of joint on MS plate with arc welding process
Study of two stroke and four stroke engines.
Layout of a small building plan on ground.
Levelling around Academic block.
Measurement of tensile strength of reinforcement bar using UTM.
Measurement of compressive strength of Brick/Cement by CTM.
Designing of residential wiring and study of three phase induction motor.
Study of the working of fluorescent lamp and ceiling fan.
Use of electronic Instruments and tools.
Building DC Regulated Power Supply.

F. TEXT BOOKS

T1. Hajra Choudhury S. K and Bose S. K, Elements of Workshop Technology, Vol I, Media Promoters & Publishing Pvt. Ltd., Mumbai, 2012.
T2. Raghuvanshi S.S, Workshop Technology, Dhanpat Rai and Sons, Delhi, 2002.

T3. Punmia B. C, Surveying, Laxmi Publications, Bangalore, 2012.
T4. Uppal S.L., Electrical Wiring, Estimating and Costing, Khanna Publishers, 1978.
T5. Bishop Owen, Electronics: A First Course, (2e), NEWNES, An Imprint of Elsevier, 2006.

G. Lecture Plan:

Lec No	**Topics**	**Session Outcome**	**Mode of Delivery**	**Corresponding CO**	**Mode of Assessing the Outcome**
1	Study of parts of lathe machine and lathe operations	Understanding building of tools and lathe machines	Lecture+Lab	1030.1	Lab Experiment
2	Perform different operations on lathe machine like Facing, Turning, Taper Turning and knurling on MS cylindrical work piece	Performance of different operations	Lecture+Lab	1030.1	Lab Experiment
3	Study of types of welding process and perform welding of different types of joint on MS plate with arc welding process	Understanding of welding processes	Lecture+Lab	1030.2	Lab Experiment
4	Study of two stroke and four stroke engines.	Knowledge of IC engines	Lecture+Lab	1030.2	Lab Experiment
5	Layout of a small building plan on ground.	Understanding of building layout	Lecture+Lab	1030.3	Lab Experiment
6	Levelling around Academic block.	Have information regarding levelling	Lecture+Lab	1030.3	Lab Experiment
7	Measurement of tensile strength of reinforcement bar using UTM.	UTM experiment	Lecture+Lab	1030.4	Lab Experiment
8	Measurement of compressive strength of Brick/Cement by CTM.	CTM experiment	Lecture+Lab	1030.4	Lab Experiment
9	Designing of residential wiring and study of three phase induction motor.	Gain knowledge about residential wiring	Lecture+Lab	1030.5	Lab Experiment
10	Study of the working of fluorescent lamp and ceiling fan.	Study of lamp and ceiling fan	Lecture+Lab	1030.5	Lab Experiment

11	Use of electronic Instruments and tools.	Analyze the characteristics of different electronic components and its applications.	Lecture+Lab	1030.6	Lab Experiment
12	Building DC Regulated Power Supply.	Understanding of small circuits.	Lecture+Lab	1030.6	Lab Experiment

H. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
ME1030.1	Understanding about the various measuring, marking and cutting tools and Comprehend the safety measures required to be taken while using tools.	1				1		1		1			1
ME1030.2	Acquire skills and Knowledge about lathe machine, welding machines and 2S-4S engines and their operations.		1							1			
ME1030.3	Learn different techniques for quality assurance check of building materials.	1	1			1							1
ME1030.4	Analyse the profile of existing ground for any infrastructure development project	1				1				1			1
ME1030.5	Understand about the basic construction and working principle of fluorescent lamp, ceiling fan and three Phase Induction machine	1				1				1		1	1
ME1030.6	Analyze the characteristics of different electronic components and CRO.	1	1					1		1			1

4- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Basic Sciences
Department of Physics
Course Hand-out
Engineering Physics | PY1001 | 4 Credits | 3 1 0 4
Session: 2019-20 (odd sem)| Faculty: Dr. Saikat | Class: B.Tech. I Sem.

A. Introduction: The mission of the Engineering Physics course is to prepare students for careers in engineering where physics principles can be applied to the advancement of technology. The course work will develop sufficient depth in physics skills to produce engineers who can relate fundamental physics to practical engineering problems, and will possess the versatility to address new problems in our rapidly changing technological base. The present course is meant to provide a more thorough grounding in applied physics for a selected specialty such as optics, quantum physics, atomic & molecular physics and solid-state physics. The discipline is also meant for cross-functionality and bridges the gap between theoretical science and practical engineering. It is notable the term “engineering physics" is also called as "technical physics" in several universities and colleges.

B. Course Objectives: At the end of the course, students will be able to

[1001.1] identify clearly the wide range of diversity in science and technology with the help of knowledge of the basic Physics.
[1001.2] justify and explain various processes involved in understanding the nature of light.
[1001.3] categorize and investigate the problems and applications of quantum physics.
[1001.4] understand and relate the fundamentals of quantum mechanics and apply the skills to solve one dimensional motion of particles.
[1001.5] impart the knowledge of empirical laws based on Solid State Physics and Atomic and Molecular Physics.
[1001.6] develop skills in imparting practical knowledge to real time solution of industrial problems

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1] Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
[PO.2] Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
[PO.3] Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with

appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4] Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5] Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6] The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7] Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8] Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9] Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10] Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11] Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12] Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	20
	Sessional Exam II (Closed Book)	20
	In class Quizzes and Assignment (Accumulated and Averaged)	20
End Term Exam (Summative)	End Term Exam (Closed Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

Optics: Two source interference, double slit interference, coherence, intensity in double slit interference, thin film interference, air-wedge, Newton`s rings, Michelson`s interferometer, diffraction and wave theory of light, single-slit diffraction, intensity in single-slit diffraction (using phasor method), diffraction at a circular aperture, double-slit interference and diffraction, combined-intensity in double-slit diffraction (qualitative approach), diffraction of light through multiples slits, diffraction gratings, dispersion and resolving power of gratings, polarization of electromagnetic waves, polarizing sheets, polarization by reflection, double refraction; **Quantum Physics:** Black body radiation and Planck`s hypothesis, Stefan`s Law, Wein`s displacement law, Photoelectric effect, Compton effect, photons and electromagnetic waves, wave properties of particles, de Broglie hypothesis, Davisson-Germer experiment, quantum particle (wave packet, phase velocity, group velocity), the uncertainty principle; **Quantum Mechanics:** An interpretation of quantum mechanics, wave function and its significance, Schrödinger equation, particle in a box, particle in a well of finite height (qualitative), Tunneling through a potential barrier and its applications, the simple harmonic oscillator (qualitative); **Atomic Physics & Molecular Physics:** Atomic spectra of gases, energy states and spectra of molecules (rotational and vibrational energy levels), X-rays spectrum, Moseley's law, spontaneous and stimulated transitions, He-Ne and Ruby laser, application of lasers; **Solid State Physics:** band theory of solids, electrical conduction in metals, insulators and semiconductors, Superconductivity, type-I and type-II superconductors, Meisner effect, BCS theory (Introductory) and applications of superconductivity.

F. TEXT BOOKS

1. Halliday, Resnick, Krane, PHYSICS, Volume 2, 5th edition, John Wiley & Sons, Inc, 2011
2. Beiser & Mahajan, Modern Physics, Mc Graw Hill, 6th edition., 2009

G. REFERENCE BOOK

Serway & Jewett, PHYSICS for Scientists and Engineers with Modern Physics; Volume 2,6th edition, 2013

H. Lecture Plan:

Lec. No.	**Topics**	**Session Outcome**	**Mode of Delivery**	**Corresponding CO**	**Mode of Assessing the Outcome**
1	Discussion of Lecture Plan	To acquaint and clear teachers expectations and understand student expectations	Lecture	**1001.1**	NA
2	Introduction to OPTICS	To make the student understand the difference between physical and geometrical optics. Recall elementary idea of transverse and longitudinal waves. Develop mathematical representation of waves.	Flipped Classroom	**1001.1 & 1001.2**	In Class Quiz (Not Accounted)
3	Interference of light, Young's double slit	Understanding of the concept of coherent waves and interference	Lecture	**1001.2**	Class Quiz – I Home Assignment - I

	interference, coherence				Mid Term I End Term
4	Intensity in double slit interference using Phasor method	Derivation of the formula for intensity distribution in double slit interference	Lecture	**1001.2**	Class Quiz – I Home Assignment - I Mid Term I End Term
5	Interference in thin film, antireflection coatings	Understand the concept of thin-film interference	Lecture	**1001.2 & 1001.6**	Class Quiz – I Home Assignment - I Mid Term I End Term
6	TUTORIAL:1		Activity (Think Pair Share)		
7	Interference in wedge shaped air film	Understand the concept of interference in wedge shaped films and introduction to Newton's ring	Lecture	**1001.2 & 1001.6**	Class Quiz – I Home Assignment - I Mid Term I End Term
8	Newton's rings – theory and experiment	Describe the Newton's ring experiment and develop the theory of Newton's ring	Lecture	**1001.2**	Class Quiz – I Home Assignment-I Mid Term I End Term
9	**TUTORIAL: 2**		Activity (Think Pair Share)		
10-11	Michelson interferometer – construction & theory (Qualitative approach only), Applications of Michelson interferometer (determination of wavelength)	Description of Michelson interferometer and derivation of the formula for determination of wavelength using it.	Lecture	**1001.2**	Class Quiz – I Home Assignment - I Mid Term I End Term
12	**TUTORIAL: 3**		Activity (Think Pair Share)		
13-14	Diffraction and wave theory of light, Fraunhoffer diffraction at single slit – theory and intensity distribution	Introduction to diffraction and understand the difference between Fraunhoffer and Fresnel diffraction	Lecture, Activity	**1001.2**	Class Quiz – 2 Home Assignment-2 Mid Term I End Term
15-16	Analysis by Phasor method, Intensity distribution curve,	Develop the theory and formula for single slit diffraction	Lecture	**1001.2**	Class Quiz – 2 Home Assignment - 2

	Diffraction at a circular aperture				Mid Term I End Term
17	**TUTORIAL:4**		Activity (Think Pair Share)	**1001.2**	
18	Fraunhoffer diffraction at double slit – theory (Qualitative approach only) and intensity distribution	Qualitatively develop the formula for intensity distribution in double slit diffraction	Lecture	**1001.2**	Class Quiz – 2 Home Assignment - 2 Mid Term I End Term
19	Fraunhoffer diffraction at multiple slit – theory and intensity distribution, Diffraction grating	Understand the multiple slit diffraction pattern and diffraction grating	Lecture	**1001.2**	Class Quiz – 3 Home Assignment- 2 Mid Term I End Term
20	**TUTORIAL:6**		Activity (Think Pair Share)	**1001.2**	
21	Rayleigh's criteria of resolution, Dispersion and resolving power of grating	Understand the Raleigh's criteria for resolution and derive the expression for dispersive and resolving power	Lecture	**1001.2**	Class Quiz – 3 Home Assignment- 2 Mid Term I End Term
22	**TUTORIAL:7**		Activity (Think Pair Share)	**1001.2**	
23-24	Polarization of EM Waves, Polarizing sheets, Polarization by reflection, Double refraction, Malus law & Brewsters law	Understand the phenomena of polarisation and different approaches to polarise EM waves	Lecture	**1001.2**	Class Quiz – 3 Home Assignment - 3 Mid Term I End Term
25	**TUTORIALS: 8**		Activity (Think Pair Share)	**1001.2**	
26-27	Black body radiation , Wein's law, Stefan-Boltzmann law, Raleigh-Jeans Law,	Understand the laws of Black Body radiation and introduction to Planck's hypothesis	Flipped Class, Lecture	**1001.1 & 1001.3**	Class Quiz – 4 Home Assignment - 4 Mid Term II End Term

	UV Catastrophe, Planck's hypothesis and Planck's law of black body radiation				
28-29	Photoelectric effect, Experimental observations of Photoelectric effect, Compton effect (Qualitative approach)	Describe the theory of Photoelectric effect and Compton effect	Lecture	**1001.1 & 1001.3**	Class Quiz – 4 Home Assignment - 4 Mid Term II End Term
30	**TUTORIAL:9**		Activity (Think Pair Share)	**1001.3**	
31	Photons and electromagnetic waves, de-Broglie hypothesis of matter wave, Davisson-Germer Experiment	Understand the concept of de-Broglie hypothesis and describe the Davission-Germer Experiment	Lecture	**1001.1 & 1001.3**	Class Quiz – 5 Home Assignment - 4 Mid Term II End Term
32-33	Quantum particle, Concept of wave packet. Group and phase velocity, Relation between V_g & V_p in dispersive medium, Uncertainty Principle (Statement and expression only) and its Physical significance	Understand the Group Velocity and Phase Velocity and the concept of Uncertainty Principle	Flipped Classroo m, Lecture	**1001.3**	Class Quiz – 5 Home Assignment - 5 Mid Term II End Term
34	**TUTORIAL: 10**		Activity (Think Pair Share)	**1001.3**	
35	An Interpretation of Quantum mechanics, Wave function and its physical significance, SchrŐdinger wave equation	Introduction to wave function and Schrodinger wave equation	Lecture	**1001.3**	Class Quiz – 5 Home Assignment - 5 Mid Term II End Term

36	Particle in a box of infinite potential height	Derive the wave-function and energy of a particle confined in a one dimensional box	Lecture	**1001.3**	Class Quiz – 6 Home Assignment - 5 Mid Term II End Term
37	**TUTORIAL: 11**		Activity (Think Pair Share)	**1001.3**	
38-39	Particle in a well of finite height (qualitative), Tunnelling through a potential barrier (qualitative) and its applications	Qualitatively describe the phenomena of particle in a finite well and the phenomena of tunnelling	Lecture	**1001.3**	Class Quiz – 6 Home Assignment - 5 Mid Term II End Term
40	Quantum mechanical simple harmonic oscillator (Qualitative)	Qualitative discussion of the wave function and energy of a harmonic oscillator	Lecture	**1001.1 & 1003.4**	Class Quiz – 6 Home Assignment - 5 Mid Term II End Term
41	**TUTORIAL: 12**		Activity (Think Pair Share)		
42-43	Bohr's Theory, Atomic Spectra of gases, Continuous and characteristic X-rays, Duane – Hunt relation, Moseley's law	Recall Bohr's theory and atomic spectra. Understand the continuous and characteristic X-rays and derive the related formula.	Flipped Classroom, Lecture	**1001.1 & 1001.4**	Class Quiz (Not Accounted) Home Assignment - 6 End Term
44-45	Energy states and spectra of molecules (Rotational and Vibrational spectra)	Qualitative discussion of Rotational and Vibrational spectra and the related formulas	Lecture	**1001.4**	Class Quiz – 7 Home Assignment - 6 End Term
46	**TUTORIAL: 13**		Activity (Think Pair Share)		
47	Lasers- Spontaneous and stimulated transitions, Population inversion and metastable state,	Understand the lasers and the related optical phenomena.	Lecture	**1001.4 & 1001.5**	Class Quiz – 7 End Term

48-49	Construction and working of Ruby laser , Construction and working of He-Ne laser, Energy level diagram of He-Ne laser, Application of Laser	Description of Ruby laser and He-Ne laser and understand their working	Flipped Classroom, Lecture	**1001.5**	Class Quiz – 7 End Term
50	**TUTORIAL: 14**		Activity (Think Pair Share)		
51	Band Theory of solids, Electrical conduction in Metals, Insulators, and Semiconductors	Understand qualitatively the band theory of solids	Lecture	**1001.5 & 1001.6**	Class Quiz – 8 End Term
52-53	Superconductivity: Type- I and Type-II Superconductivity, Meisner effect	Introduction to super conductivity and superconductors and the related phenomena	Lecture	**1001.5 & 1001.6**	Class Quiz – 8 End Term
54	**TUTORIAL: 15**		Activity (Think Pair Share)		
55	BCS Theory (Introductory) and Applications of superconductivity	Qualitatively understand the BCS theory and their applications	Lecture	**1001.5 & 1001.6**	Class Quiz – 8 End Term
56	**TUTORIAL: 16**		Activity (Think Pair Share)		

I. Course Articulation Matrix: (Mapping of COs with POs and PSOs)

CO	**STATEMENT**	CORRELATION WITH PROGRAM OUTCOMES															
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12				
PY 1001.1	understand the wide range of diversity in science and technology with the help of knowledge of	3	2			1	2	1	2		2		1				

	the basic Physics.																
PY 1001.2	explain various processes involved in understanding the nature of light.	3	3	3	2	2	2		1	1	2		2				
PY 1001.3	identify the problems and applications of Quantum Physics.	1		3		1			1	2			2				
PY 1001.4	fundamentals of quantum mechanics and apply to one dimensional motion of particles	2	3	3				1		2	1		2				
PY 1001.5	impart the knowledge of empirical laws based on Solid state Physics and Atomic and Molecular Physics.				1		1	2		1		2	2				
PY 1001.6	develop skills in imparting practical knowledge to real time solution of industrial problems	2	1		2	1		2	1		2	1					

5- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

School of Basic Sciences
Department of Physics
Course Hand-out
Engineering Physics Lab | PY1030 | 1 Credit | 0 0 2 1
Session: July- Nov, 2019| Faculty: Dr. Saikat | Class: B. Tech. I Sem.

A. **Introduction:** The mission of the Engineering Physics course is to prepare students for careers in engineering where physics principles can be applied to the advancement of technology. The course work will develop sufficient depth in physics skills to produce engineers who can relate fundamental physics to practical engineering problems, and will possess the versatility to address new problems in our rapidly changing technological base. The present course is meant to provide a more thorough grounding in applied physics for a selected specialty such as optics, quantum physics, atomic & molecular physics and solid-state physics. The discipline is also meant for cross-functionality and bridges the gap between theoretical science and practical engineering. It is notable the term “engineering physics" is also called as "technical physics" in several universities and colleges.

B. **Course Objectives:** At the end of the course, students will be able to

[1030.1] clearly explain the different type of errors like backlash error, parallax etc.
[1030.2] assess the behaviour of basic instruments like Vernier Callipers, screw gauge, spherometer and spectrometer etc and it will enhance their skills to use them.
[1030.3] acquire, analyse and process experimental data.
[1030.4] compare and contrast the facts and ideas in handling the practical applications of light, electricity sound and modern physics.
[1030.5] acquire hands on skills on diverse experimental tools related to physics that are essential for engineering students

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1] Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
[PO.2] Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
[PO.3] Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations
[PO.4] Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions
[PO.5] Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6] The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice
[PO.7] Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
[PO.8] Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices
[PO.9] Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
[PO.10] Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
[PO.11] Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
[PO.12] Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Continuous Assessment/Viva	60
End Term Exam (Summative)	End Term Exam	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

Experiments on interference, diffraction and dispersion, experiments on quantum theory of radiation, Experiments on band theory of solids, semiconductors, Experiments on resonance circuits, Hall-effect.

F. TEXT BOOKS

1. Jewett & Serway, PHYSICS for Scientists and Engineers with Modern Physics (7e), Cengage Learning, 2008.
2. Worsnop & Flint, Advanced Practical Physics for Students (9e), Methuen & Co. Ltd, London 1987.

G. Lecture Plan:

Lec No	**Topics**	**Session Outcome**	**Mode of Delivery**	**Corresponding CO**	**Mode of Assessing the Outcome**
1	Discussion of Lecture Plan	To acquaint and clear teachers expectations and understand student expectations	Lecture	**1030.1**	NA
2	Experiments on interference	To make the student understand the difference between physical and geometrical optics. Recall elementary idea of transverse and longitudinal waves. Develop mathematical representation of waves.	Hands-on training	**1030.1 & 1030.2**	Continuous Assessment/Viva
3	Experiments on diffraction and dispersion	Understanding of the concept of coherent waves and interference	Hands-on training	**1030.2 & 1030.3**	Continuous Assessment/Viva
4	experiments on quantum theory of radiation	Derivation of the formula for intensity distribution in double slit interference	Hands-on training	**1030.2 & 1030.3**	Continuous Assessment/Viva
5	Experiments on band theory of solids	Understand the concept of thin-film interference	Hands-on training	**1030.3 & 1030.4**	Continuous Assessment/Viva
6	Experiments on semiconductors		Hands-on training	**1030.3, 1030.4 & 1030.5**	Continuous Assessment/Viva
7	Experiments on resonance circuits	Understand the concept of interference in wedge shaped films and introduction to Newton's ring	Hands-on training	**1030.3, 1030.4 & 1030.5**	Continuous Assessment/Viva
8	Experiments on Hall-effect		Hands-on training	**1030.3 & 1030.4**	Continuous Assessment/Viva

H. Course Articulation Matrix: (Mapping of COs with POs and PSOs)

CO	**STATEMENT**	CORRELATION WITH PROGRAM OUTCOMES															
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12				
PY 1030.1	understand different type of error like backlash error, parallax etc. and its role in making conclusions.	3	3		1	2	1			3	1		1				

PY 1030.2	gain knowledge on the behaviour of basic instruments like Slide Callipers, Vernier Callipers, screw gauge and spherometer etc.	3	2		2	2				1	2		1				
PY 1030.3	acquire, analyse and process experimental data.	1	1	1			3	2		1	2	1	2				
PY 1030.4	understand the facts and ideas in handling the practical applications of light, electricity sound and modern physics.				1	2			2	2	1		1				
PY 1030.5	acquire hands on skills on diverse experimental tools related to physics that are essential for engineering students	1	3	1				3				2					

6- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Computing and IT

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Course Hand-out

Computer Organisation and Architecture | CS 1301 | 4 Credits | 3 0 1 4

Session: Jul 19 – Dec 19 | Faculty: Dr. Umashankar Rawat | Class: B.Tech. III Semester

A. **Introduction:** This course is offered by Dept. of Computer Science and Engineering for third semester students. The core objective of this course is to describe the general organization and architecture of a computer system. It covers in detail various functional units of a computer system, machine instructions, addressing techniques and instruction sequencing. It provides a detailed coverage of logic circuits to perform various arithmetic operations and use of pipelining in the design of high-performance processors.

B. **Course Outcomes:** At the end of the course, students will be able to

[1301.1]. Describe the interconnection between various functional units of a computer system and able to assess the performance of a computer.

[1301.2]. Describe various data representations and analyse the design of fast arithmetic circuits.

[1301.3]. Formulate assembly language programs for a given high level language construct.

[1301.4]. Describe various parts of a system memory hierarchy and caching techniques.

[1301.5]. Evaluate the performance of CPU, memory and I/O operations.

[1301.6]. Build the required skills to read and research the current literature in computer architecture.

C. **PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES**

[PO.1] **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2] **Problem analysis**: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3] **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes_that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4] **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5] **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools_including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6] **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues_and the consequent responsibilities relevant to the professional engineering practice

[PO.7] **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8] **Ethics**: Apply ethical principles and commit to professional ethics_and responsibilities and norms of the engineering practices

[PO.9] **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10] Communication: Communicate effectively_on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11] Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12] Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

[PSO.1] Will be able to design, develop and implement efficient software for a given real life problem.

[PSO.2] Will be able to apply knowledge of AI, Machine Learning and Data Mining in analyzing big data for extracting useful information from it and for performing predictive analysis.

[PSO.3] Will be able to design, manage and secure wired/ wireless computer networks for transfer and sharing of information.

D. Assessment Plan:

Criteria	Description	Date	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	Sept 05 – Sept 09	15
	Sessional Exam II (Closed Book)	Nov 04 – Nov 06	15
	Quizzes and Assignments (Accumulated and Averaged)	Regularly	30
End Term Exam (Summative)	End Term Exam (Closed Book)	Nov 29 – Dec 13	40
	Total		100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.		
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.		
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.		

E. SYLLABUS

Basic Structure of computers: Computer types, functional units, basic operational concepts, bus structures, software, performance; **Machine Instructions and programs**: Numbers, arithmetic operations and characters, Memory locations and addresses; Memory operations, Addressing modes; **Arithmetic**: Addition and subtraction of signed numbers, Adders, ALU design, Bit slice processor, Multiplication of positive numbers Signed operand multiplication, Fast multiplication, Integer division, Floating point numbers and operations; **Memory Systems**: Introduction, Basic concepts, Design methods; RAM memories, Read only memories, Speed size and cost, Cache memories, Performance considerations, Virtual memories, Memory, Management Requirements, Secondary storage; **Input / Output organization**: Accessing I/O devices, Interrupts, Direct memory access, Buses, Interface circuits; **Introduction to Parallel Processing:** Flynn Classification**,** Multi-Core Architecture, Pipelining.

TEXTBOOKS

T1. C. Hamacher, Z. Vranesic, S. Zaky, *"Computer Organization",* Tata McGraw Hill (TMH), 5th Edition, 2002.

T2. M. Morris Mano, *"Computer System Architecture"*, Pearson, 3rd Edition Revised, 2017.

REFERENCE BOOKS

R1. W. Stallings, *"Computer Organization and Architecture –Designing for Performance",* PHI, 2009.

R2. David A. Patterson, John L. Hennessy, *"Computer Organization and Design: The Hardware/Software Interface",* Morgan Kauffmann, 4th Edition, 2010.

R3. John P. Hayes, *"Computer Architecture and Organization",* TMH, 3rd Edition, 1999

F. Lecture Plan:

Lecture No	Topics	Session Outcomes	Mode of Delivery	Corresponding CO	Mode of Assessing CO
1.	Introduction and Course Hand-out briefing	To acquaint and clear teachers' expectations and understand student expectations	Lecture Interaction	NA	NA
2.	Introduction to basic structure of computers	Describe the interconnection between various functional units of a computer system and various factors that effects the performance of a computer.	Lecture	1301.1	Mid Term I, Quiz & End Term
3.	Functional units		Lecture	1301.1	Mid Term I, Quiz & End Term
4.	Basic operational concepts		Lecture	1301.1	Mid Term I, Quiz & End Term
5.	Bus structures, software		Lecture	1301.1	Mid Term I, Quiz & End Term
6.	Performance		Flipped Class	1301.1	Mid Term I, Quiz & End Term
7.	Tutorial		Activity	1301.1, 1301.5	Mid Term I, Quiz & End Term
8.	Numbers, Arithmetic Operations and Characters	Perform mathematical operations using different number representations, write assembly language programs using various instruction types.	Flipped Class	1301.2	Mid Term I, Quiz & End Term
9.	Memory Locations and Addresses, Memory Operations		Lecture	1301.2	Mid Term I, Quiz & End Term
10.	Instructions and Instruction Sequencing		Lecture	1301.2 & 1301.3	Mid Term I, Quiz & End Term
11.	Register Transfer Notation, Assembly Language Notation		Lecture	1301.2	Mid Term I, Quiz & End Term
12.	Basic Instruction Types, Instruction Execution and Straight-Line Sequencing		Lecture	1301.2 & 1301.3	Mid Term I, Quiz & End Term
13.	Branching, Condition Codes, Generating Memory Addresses	Use various conditions for flow control and addressing modes for accessing data. Formulate assembly language programs for a given high level language construct.	Lecture	1301.2	Mid Term I, Quiz & End Term
14.	Addressing Modes, Implementation of Variables and Constants, Indirection and Pointers		Flipped Class	1301.2	Mid Term I, Quiz & End Term
15.	Indexing and Arrays, Relative Addressing		Lecture	1301.2	Mid Term I, Quiz & End Term
16.	Additional Modes		Lecture	1301.2	Mid Term I, Quiz & End Term
17.	Basic I/O operations, Additional Instructions		Lecture	1301.2 & 1301.3	Mid Term I, Quiz & End Term
18.	Example programs		Lecture	1301.2 & 1301.3	Mid Term I, Quiz & End Term
19.	Tutorial		Activity	1301.2	Mid Term I, Quiz & End Term
FIRST SESSIONAL EXAM					
20.	Addition and Subtraction of Signed Numbers		Flipped Class	1301.2	Mid Term I, Quiz & End Term

21.	Design of Fast Adders	Analyse the design of various fast adder circuits.	Lecture	1301.2 & 1301.6	Mid Term II, Quiz & End Term
22.	Carry Look Ahead Adders- Bit Stage Cell,4 Bit CLA		Lecture	1301.2 & 1301.5	Mid Term II, Quiz & End Term
23.	Carry Look Ahead Adders 16 Bit		Lecture	1301.2 & 1301.5	Mid Term II, Quiz & End Term
24.	Tutorial		Activity	1301.2	Mid Term II, Quiz & End Term
25.	Multiplication of Positive Numbers-Array Sequential Circuit	Perform multiplication and division operation using different methods, access their performance.	Flipped Class	1301.2 & 1301.5	Mid Term II, Quiz & End Term
26.	Signed Operand Multiplication-Booth Algorithm		Lecture	1301.2	Mid Term II, Quiz & End Term
27.	Fast Multiplication-Bit Pair Recoding of Multipliers		Lecture	1301.2	Mid Term II, Quiz & End Term
28.	Carry-save addition of summands		Flipped Class	1301.2	Mid Term II, Quiz & End Term
29.	Integer Division-Restoring		Lecture	1301.2	Mid Term II, Quiz & End Term
30.	Integer Division-Nonrestoring		Lecture	1301.2	Mid Term II, Quiz & End Term
31.	Floating Point Numbers & Operation-Standards Exceptions, check to uncheck Exception	Introduce floating point representation in computer system, various associated operations and standards to represent them in memory using IEEE 754 format.	Lecture	1301.2	Mid Term II, Quiz & End Term
32.	Arithmetic Operations on Floating Point Numbers		Lecture	1301.2	Mid Term II, Quiz & End Term
33.	Examples on Arithmetic Operation on Floating Point Numbers		Lecture	1301.2	Mid Term II, Quiz & End Term
34.	Tutorial		Activity	1301.2	Mid Term II, Quiz & End Term
35.	Memory Systems: Basic Concepts	Specify the significance of various cache mapping techniques and apply them in examples. Calculate the performance improvement with cache memories with different mapping techniques and replacement algorithms.	Flipped Class	1301.4	Mid Term II, Quiz & End Term
36.	Speed, Size & Cost		Lecture	1301.4 & 1301.5	Mid Term II, Quiz & End Term
37.	Cache Memories-Mapping Functions		Lecture	1301.4 & 1301.5	Mid Term II, Quiz & End Term
38.	Replacement Algorithms		Lecture	1301.4 & 1301.5	Mid Term II, Quiz & End Term
39.	Example of Mapping Techniques		Flipped Class	1301.4	Mid Term II, Quiz & End Term

40.	Performance Considerations: Hit Rate & Miss Penalty, Caches on Processor Chip		Lecture	1301.4 & 1301.5	Mid Term II, Quiz & End Term
		SECOND SESSIONAL EXAM			
41.	Virtual Memories	Explain virtual memory concept and address translation mechanism	Lecture	1301.4 & 1301.6	Mid Term II, Quiz & End Term
42.	Address Translation		Lecture	1301.4	Mid Term II, Quiz & End Term
43.	Tutorial		Activity	1301.4	Mid Term II, Quiz & End Term
44.	Accessing I/O Devices, Interrupts	Explain interaction between input output devices and various techniques used by processor to handle the related hardware using interrupts and DMA.	Lecture	1301.5	Quiz & End Term
45.	Interrupt H/W, Enabling Disabling Interrupts		Lecture	1301.5	Quiz & End Term
46.	Handling Multiple Devices, Controlling Device Requests, Exceptions		Lecture	1301.5	Quiz & End Term
47.	Use of interrupts in Operating Systems, Direct Memory Access		Lecture	1301.5	Quiz & End Term
48.	Flynn Classification, Multi-Core Architecture	Specify the significance of pipelining with examples. Analyse various hazards that cause performance degradation in pipelined processors and means for mitigating their effect.	Lecture	1301.5 &1301.6	Quiz & End Term
49.	Pipelining		Flipped Class	1301.5	Quiz & End Term
50.	Data Hazards		Lecture	1301.5	Quiz & End Term
51.	Instruction Scheduling: Static and Dynamic		Lecture	1301.5 & 1301.6	Quiz & End Term
52.	Control Hazard		Lecture	1301.5	Quiz & End Term
53.	Branch Prediction		Lecture	1301.5	Quiz & End Term
54.	Tutorial		Activity	1301.5	Quiz & End Term
		END TERM EXAM			

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CS 1301.1	Describe the interconnection between various functional units of a computer system and able to assess the performance of a computer.	**2**	**1**										**1**	**1**		
CS 1301.2	Describe various data representations and analyse the design of fast arithmetic circuits.	**3**	**2**										**1**			
CS 1301.3	Formulate assembly language programs for a given high level language construct.	**2**	**2**	**1**									**1**	**1**		
CS 1301.4	Describe various parts of a system memory hierarchy and caching techniques.	**3**	**2**										**2**			**1**
CS 1301.5	Evaluate the performance of CPU, memory and I/O operations.	**3**	**2**	**1**									**2**	**1**	**1**	**1**
CS 1301.6	Build the required skills to read and research the current literature in computer architecture.												**2**	**1**		**1**

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Computing and IT
Department of Computer Science and Engineering
Course Hand-out
Data Structures | CS 1303 | 4 Credits | 3 1 0 4
ssion: July 19 – Nov 19 | Faculty: Dr. Prakash Ramani | Class: B.Tech III Semester

A. **Introduction:** This course is offered by Computer Science and Engg. Dept., targeting students who wish to pursue development and research in industries or higher studies in field of Computer Science, IT and Communication Engineering. This course will form the base of computer science and engineering and hence this course is introduced at this level to make the students understand various ways of organizing data and storing it into memory and use the type depending upon the application.

B. **Course Outcomes:** At the end of the course, students will be able to

[1303.1] Explain basic concepts of various data structures

[1303.2] Describe how arrays, linked lists, stacks, queues, trees and graphs are represented in memory and their operations

[1303.3] Select and/or apply appropriate data structures to solve problems and assess the trade-offs involved in the design choices and hence develop employability skills

[1303.4] Describe and analyze various sorting algorithms like bubble, selection ,insertion, merge sort, heap sort and quick sort

C. **PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES**

[PO.1] **Engineering Knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2] **Problem Analysis**: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3] **Design/Development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4] **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5] Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6] The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7] Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8] Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9] Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10] Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11] Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12] Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

[PSO.1] Will be able to design, develop and implement efficient software for a given real life problem.

[PSO.2] Will be able to apply knowledge of AI, Machine Learning and Data Mining in analysing big data for extracting useful information from it and for performing predictive analysis.

[PSO.3] Will be able to design, manage and secure wired/ wireless computer networks for transfer and sharing of information.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	15
	Sessional Exam II (Closed Book)	15
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Closed Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

Introduction: Algorithm specification; **Performance Analysis**: Time and Space Complexity, Asymptotic notation; pointer declaration and definition, memory allocation functions, array of pointers; The type definition, enumerated types, accessing structures, complex structures, arrays of structures, structures and functions; Recursive definition & processes, Recursion in C, writing recursive programs efficiency of recursion, Examples: Tower of Hanoi, GCD, Fibonacci Definition and examples, Representing **Stacks** in C, Evaluation of expressions, multiple stacks and queues; Applications: infix, postfix and prefix and their conversions. **Linked lists** representations, Singly, doubly, header node, circular, Applications: linked stacks and queues, polynomial and long integer arithmetic, union, intersection, Basic terminologies, binary tree representation, recursive/ non recursive, Binary search tree, AVL trees; **Applications**: Expression **Trees**, inserting, deleting, searching, height of BST Terminology and representations, **Graph** operations, spanning trees, minimum cost spanning tree, shortest path and transitive closure, Binary and linear search, insertion, quick, merge, heap, radix sort Static Hashing.

F. TEXT BOOKS

T1. Aaron M. Tenenbaum, Yedidyah Langsam, Moshe J. Augenstein, “Data Structures using C”, Pearson Education, 2013.

G. REFERENCE BOOKS

R1. Ellis Horowitz, Sartaj Sahni and Susan Anderson-Freed, "Fundamentals of Data Structures in C", University Press (India) Pvt. Ltd., 2014.

R2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "*Data Structures and Algorithms*", Pearson Education, 2012

R3. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, " *Introduction to algorithms*", PHI, Third Edition, 2009

R4. Seymour Lipschutz, "*Data Structures with C* (Schaum's Outline Series)", McGraw Hill Education Private Limited, 2011.

R5. Mark Allen Weiss, *"Data structures and Algorithm Analysis in C",* Pearson, Second edition, 2014.

H. LECTURE PLAN

Lec No	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode Of Assessing CO
1.	Introduction to data structures, Algorithm Specifications, How to Write Algorithms	define data structure and list various data structure.	Lecture	CS1303.1	Class Quiz End Term
2.	Performance Analysis- Time and Space Complexity, Asymptotic Analysis, Example , Functions in 'C', Example Programs on Functions	analyze time complexity of simple algorithms.	Lecture	CS1303.1 CS1303.1	Class Quiz Home Assignments I Sessional End Term
3.	Example Programs on Functions, Arrays : Introduction, Single Dimensional Arrays : Declaration, Initialization, Operations (Insertion and Deletion of Element)	define arrays and apply knowledge on single dimensional arrays in writing programs.	Lecture	CS1303.1 CS1303.2	Class Quiz Home Assignments I Sessional End Term
4.	Sorting Algorithms – Selection Sort, Bubble Sort and Insertion Sort	construct searching and sorting algorithms and write programs using single dimensional arrays.	Lecture	CS1303.2	Class Quiz Home Assignments I Sessional End Term
5.	Multidimensional Arrays, Two Dimensional Arrays : Declaration, Initialization, Addition of Two	explain row major and column major memory allocation in 2-D arrays, Apply knowledge on two dimensional arrays in writing programs	Lecture	CS1303.1 CS1303.2	Class Quiz Home Assignments I Sessional

	Matrices, Row Major and Column Major Representation				End Term
6.	Example Programs on Two Dimensional Arrays, Row Major and Column Major Representation	apply knowledge on two dimensional arrays in writing programs.	Lecture	CS1303.2 CS1303.3	Class Quiz Home Assignments I Sessional End Term
7.	Pointers : Introduction, Example Programs on Pointers, Pointers and Arrays, Dynamic Memory Allocation	illustrate dynamic memory allocation using pointers in solving problems requiring list of values.	Lecture	CS1303.1 CS1303.2	Class Quiz Home Assignments I Sessional End Term
8.	Dynamic Memory Allocation: Dynamic Array creation, Dynamic structure creation.	apply knowledge on pointers in writing programs.	Lecture	CS1303.1 CS1303.2	Class Quiz Home Assignments I Sessional End Term
9.	Problems solving by students on array	analyze the applicability of array as appropriate Data Structure to solve the problem and develop an algorithm/program to provide the solution to a given problem through it.	Tutorial	CS1303.3	Class Quiz Home Assignments I Sessional End Term
10.	Problems solving by students on array	structure mapping and model a given real world problem into array.	Tutorial	CS1303.3	Class Quiz Home Assignments I Sessional End Term
11.	Linked List : Introduction, Basic Terminologies, Advantages over Arrays, Applications, Structures in ‘C’,	describe linked list data structure, disadvantages of array based storage and need of linked list data structure, develop structures in ‘C’ and dealing it with pointers.	Lecture	CS1303.1 CS1303.2	Class Quiz Home Assignments I Sessional End Term

	Example Programs on Structures and pointer to Structure				
12.	Passing Structures to Functions, Singly Linked List : Introduction , Operations	pass structures to functions, to explain self-referential structures and functions, describe linked list storage structure and basic operations.	Lecture	CS1303.1 CS1303.2	Class Quiz Home Assignments I Sessional End Term
13.	Singly Linked List : Operations (Continued)	implement singly linked list storage structure and basic operations (insertion, deletion and searching) defined over it.	Lecture	CS1303.1 CS1303.2	Class Quiz Home Assignments I Sessional End Term
14.	Circular Linked List : Introduction, Operations	understand and implement circular linked list storage structure and basic operations (insertion, deletion and searching) defined over it.	Lecture	CS1303.1 CS1303.2	Class Quiz Home Assignments I Sessional End Term
15.	Doubly Linked List : Introduction, Operations	understand and implement circular linked list storage structure and basic operations (insertion, deletion and searching) defined over it.	Lecture	CS1303.1 CS1303.2	Class Quiz Home Assignments I Sessional End Term
16.	Some Example Programs on Linked List	implement linked list operations like reversing a linked list, finding middle of the list, sorting a list etc.	Lecture	CS1303.3	Class Quiz Home Assignments I Sessional End Term
17.	Problems solving by students on linked list	analyze the applicability of linked list as appropriate Data Structure to solve the problem and develop an algorithm/program to provide the solution to a given problem through it.	Tutorial	CS1303.3	Class Quiz Home Assignments I Sessional End Term

18.	Problems solving by students on linked list	structuring, mapping and model a given real world problem into linked list.	Tutorial	CS1303.3	Class Quiz Home Assignments I Sessional End Term
19.	Recursive Functions, Example Programs on Recursive Functions, Stack : About, Applications	explain the working philosophy of stack and how the system stack stores local function calls.	Lecture /Expert -Lecture	CS1303.1 CS1303.3	Class Quiz Home Assignments II Sessional End Term
20.	Stack : Operations, Implementation of Stack using Array and Linked List	develop a stack based application and realize the stack functioning using arrays as well as linked list and compare their implementations.	Lecture /Expert -Lecture	CS1303.1 CS1303.2	Class Quiz Home Assignments II Sessional End Term
21.	Expression Notations : Polish Notation, Reverse Polish Notation, Infix Notation, Evaluation of Expression written in Polish Notation	explain various forms of mathematical notations to express an expression and their evaluation	Lecture	CS1303.3	Class Quiz Home Assignments II Sessional End Term
22.	Evaluation of Expression written in Reverse Polish Notation Evaluation of Expression written in Infix Notation	evaluate the postfix(infix) expression using stacks	Lecture	CS1303.3	Class Quiz Home Assignments II Sessional End Term
23.	Conversion of Expression from one Notation to Another	explain how to realize a mathematical expression using stacks and to convert an infix expression to postfix notation using stack.	Lecture	CS1303.3	Class Quiz Home Assignments II Sessional End Term
24.	Conversion of Expression from one Notation to Another	convert an infix expression to prefix notation using stack	Lecture	CS1303.3	Class Quiz

					Home Assignments II Sessional End Term
25.	Problems solving by students on stack applications	develop recursive code, to handle the problem using stacks, to analyze the applicability of stack with respect to a given problem	Tutorial	CS1303.3	Class Quiz Home Assignments II Sessional End Term
26.	Linear Queue : Introduction, Applications, Operations, Implementation using Array and Linked List	explain Queue Data structure, its application in real world and its operations enqueue and dequeue, to implement queue data structure using array and linked list.	Lecture	CS1303.1 CS1303.2	Class Quiz Home Assignments II Sessional End Term
27.	Circular Queue : About, Applications, Operations, Implementation using Array and Linked List	explain Circular Queue Data structure, its application in real world and its operations enqueue and dequeue	Lecture	CS1303.1 CS1303.2	Class Quiz Home Assignments II Sessional End Term
28.	Priority Queue and Deques : About, Applications, Operations, Implementation using Array and Linked List	explain Priority Queue Data structure and Deques, its application in real world and its operations enqueue and dequeue.	Lecture	CS1303.1 CS1303.2	Class Quiz Home Assignments II Sessional End Term
29.	Problems solving by students on queue applications	analyze the applicability of queue as appropriate Data Structure to solve the problem, to develop an algorithm/program to provide the solution to a given problem through it.	Tutorial	CS1303.3	Class Quiz Home Assignments II Sessional End Term

30.	Trees : Introduction , Basic Terminology, Types of Trees, Binary Search Tree : Creation, : Searching an Element , Insertion of Node	describe about binary tree (BT), tree-terminology, types of BT, creation of Binary Search Tree, search operations	Lecture	CS1303.1 CS1303.2	Class Quiz Home Assignments II Sessional End Term
31.	Binary Search Tree : Deletion of Node, Determining Height	describe about deletion of a node in BST and computing height	Lecture	CS1303.2	Class Quiz Home Assignments II Sessional End Term
32.	Binary Search Tree : Traversal (In-order, Pre-order and Post- order)	explain different traversal in BST	Lecture	CS1303.2	Class Quiz Home Assignments II Sessional End Term
33.	Threaded Binary tree : Introduction, Creation , Insertion of Node, Deletion of Node and Traversal of Tree	describe about Threaded Binary tree, its applications and operations	Lecture	CS1303.1 CS1303.2	Class Quiz Home Assignments End Term
34.	AVL Tree : Introduction , Applications Creation , Searching an Element, Insertion of Node	describe drawbacks of BST, Use of AVL tree, how to insert a value in AVL and then required rotations (LL, RR , LR and RL)	Lecture	CS1303.1 CS1303.2	Class Quiz Home Assignments End Term
35.	AVL Tree : Deletion of Node	describe how to delete a node from AVL tree and then required rotations	Lecture	CS1303.2	Class Quiz Home Assignments End Term
36.	Heaps : Insertion of Node , Binary Heap: Creation, Insertion of Element, Deletion of Element	describe what is heap, types, creations of max and min heaps, heap sort, use of heap in priority queue implementation	Lecture	CS1303.1 CS1303.2	Class Quiz Home Assignments End Term

37.	B and B+ Trees	Applications of B and B+ Trees, Construction of B and B+ Trees, Insertion and Deletion of nodes in B and B+ Trees	Lecture	CS1303.1 CS1303.2	Class Quiz Home Assignments End Term
38.	Problems solving by students on tree and its use	construct BST and AVL tree from given sequence of values	Tutorial	CS1303.3	Class Quiz Home Assignments End Term
39.	Problems solving by students on tree and its use	construct heap from given sequence of values and implement priority queue	Tutorial	CS1303.3	Class Quiz Home Assignments End Term
40.	Graphs : Introduction, Basic Terminology, Applications, Representation of Graphs : Adjacency Matrix Representation	describe representation of graph in term of adjacency matrix with their complexity	Lecture	CS1303.1 CS1303.2	Class Quiz Home Assignments End Term
41.	Representation of Graphs : Adjacency List Representation	describe representation of graph in term of adjacency list with their complexity	Lecture	CS1303.1 CS1303.2	Class Quiz Home Assignments End Term
42.	Graph Traversal : Breadth First Traversal, Depth First Traversal	conceptualize on the various methods of graph traversal and understand the concept of Queue and Stack data structure	Lecture	CS1303.2	Class Quiz Home Assignments End Term
43.	Minimum Spanning Tree, Prims Algorithm, Kruskal’s Algorithm	understand the application of graph such as TSP problem	Lecture	CS1303.2	Class Quiz Home Assignments End Term
44.	Shortest Path Algorithms: Dijkstra's Algorithm, Floyd's Algorithm	understand the application of graph such as computer networking(Routing System)	Lecture	CS1303.2	Class Quiz Home Assignments End Term

45.	Problems solving by students on graph algorithms	find shortest path using Dijkstra's Algorithm and Floyd's Algorithm for a given graph	Tutorial	CS1303.3	Class Quiz Home Assignments End Term
46.	Problems solving by students on graph algorithms	find MST using Prims Algorithm and Kruskal's Algorithm for a given graph	Tutorial	CS1303.3	Class Quiz Home Assignments End Term
47.	Sorting : Introduction, Bubble Sort, Insertion Sort	describe the concept of sorting with various sorting algorithm	Lecture	CS1303.1	Class Quiz Home Assignments End Term
48.	Sorting (Continued) : Quick Sort, Merge Sort	describe the application of sorting such as medical monitoring	Lecture	CS1303.1 CS1303.4	Class Quiz Home Assignments End Term
49.	Sorting (Continued) : Radix Sort , Heap Sort	describe the concept of priority queue with the help of heap sort	Lecture	CS1303.1 CS1303.4	Class Quiz Home Assignments End Term
50.	Hashing : Introduction, Applications, Hash Functions	describe different hashing techniques/functions	Lecture	CS1303.1 CS1303.2 CS1303.4	Class Quiz Home Assignments End Term
51.	Hash Collisions, Collision Resolution : Open Addressing, Chaining	describe different collision resolving techniques with examples	Lecture	CS1303.1 CS1303.2	Class Quiz Home Assignments End Term
52.	Problems solving by students on soring and its application	develop program for searching and sorting	Tutorial	CS1303.3	Home Assignments End Term

I. Course Articulation Matrix: (Mapping of COs with POs)

CO	**STATEMENT**	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CS 1303.1	Explain basic concepts of various data structures	3	2										2	3		
CS 1303.2	Describe how arrays, linked lists, stacks, queues, trees and graphs are represented in memory and their operations		1	2									2	2		2
CS 1303.3	Select and/or apply appropriate data structures to solve problems and assess the trade-offs involved in the design choices.		1	2									2	3		2
CS 1303.4	Describe and analyze various sorting algorithms like bubble, selection ,insertion, merge sort, heap sort and quick sort		1	2									2	3		1

1- **Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation**

MANIPAL UNIVERSITY JAIPUR

School of Computing and IT
Department of Computer Science and Engineering
Course Hand-out
Data Structures Lab | CS 1331 | 1 Credit | 0 0 2 1
ssion: July 19 – Nov 19 | Faculty: Dr. Prakash Ramani | Class: B.Tech III Semester

A. Introduction: This course is offered by Computer Science and Engg. Dept., targeting students who wish to pursue development and research in industries or higher studies in field of Computer Science, IT and Communication Engineering. This course will form the base of computer science and engineering and hence this course is introduced at this level to make the students understand various ways of organizing data and storing it into memory and use the type depending upon the application.

B. Course Outcomes: At the end of the course, students will be able to

[1303.1] Explain basic concepts of various data structures

[1303.2] Describe how arrays, linked lists, stacks, queues, trees and graphs are represented in memory and their operations

[1303.3] Select and/or apply appropriate data structures to solve problems and assess the trade-offs involved in the design choices and hence develop employability skills

[1303.4] Implement various sorting and searching algorithms

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1] **Engineering Knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2] **Problem Analysis**: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3] **Design/Development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4] **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5] **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6] **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7] **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8] **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9] **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10] **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11] **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12] **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

[PSO.1] Will be able to design, develop and implement efficient software for a given real life problem.

[PSO.2] Will be able to apply knowledge of AI, Machine Learning and Data Mining in analysing big data for extracting useful information from it and for performing predictive analysis.

[PSO.3] Will be able to design, manage and secure wired/ wireless computer networks for transfer and sharing of information.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Continuous Assessments	70
Exam (Summative)	Exam (Small Project/Exam)	30
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a lab will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 2 throughout the entire semester.	

E. SYLLABUS

Review of C and programs on Recursion, Stacks, Stacks, Queues, lists, Trees, Graphs, using C language.

F. TEXT BOOKS

T1. Aaron M. Tenenbaum, Yedidyah Langsam, Moshe J. Augenstein, “Data Structures using C”, Pearson Education, 2013.

G. REFERENCE BOOKS

R1. Ellis Horowitz, Sartaj Sahni and Susan Anderson-Freed, “Fundamentals of Data Structures in C”, University Press (India) Pvt. Ltd., 2014.

R2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, “Data Structures and Algorithms”, Pearson Education, 2012

R3. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, “ Introduction to algorithms”, PHI, Third Edition, 2009

R4. Seymour Lipschutz, “Data Structures with C (Schaum's Outline Series)”, McGraw Hill Education Private Limited, 2011.

R5. Mark Allen Weiss, “Data structures and Algorithm Analysis in C”, Pearson, Second edition, 2014.

H. LAB PLAN

Lec No	**Topics**	**Session Outcome**	**Mode of Delivery**	**Corresponding CO**	**Mode of Assessing the Outcome**
1.	**Arrays**	Programs based on 1-D array operations	Lab	CS1331.1 CS1331.3	Internal Evaluation Home Assignments External Evaluation
2.		Programs based on 2-D array operations	Lab	CS1331.1 CS1331.3	Internal Evaluation Home Assignments External Evaluation
3.		Programs based on 2-D array operations with pointer notations	Lab	CS1331.1 CS1331.2	Internal Evaluation Home Assignments External Evaluation
4.	**Linked List**	Programs to implement singly linked-list list operations	Lab	CS1331.2 CS1331.3	Internal Evaluation Home Assignments External Evaluation
5.		Programs to implement Circular Linked list and Doubly-linked list operations	Lab	CS1331.1 CS1331.2	Internal Evaluation Home Assignments External Evaluation
6.	**Stacks**	Programs to implement stack and its operations	Lab	CS1331.2 CS1331.3	Internal Evaluation Home Assignments External Evaluation
7.		Programs based on implementation of stack	Lab	CS1331.1 CS1331.2	Internal Evaluation Home Assignments External Evaluation
8.	**Queue**	Programs based on implementation of queue and its operations	Lab	CS1331.2 CS1331.3	Internal Evaluation Home Assignments External Evaluation
9.	**Tree**	Programs to implement tree and its operations	Lab	CS1331.1 CS1331.2 CS1331.3	Internal Evaluation Home Assignments External Evaluation
10.		Programs based on implementation of trees	Lab	CS1331.3	Internal Evaluation Home Assignments External Evaluation
11.	**Graph**	Programs to implement graph and its operations	Lab	CS1331.1 CS1331.2	Internal Evaluation Home Assignments External Evaluation
12.		Programs based on implementation of graphs	Lab	CS1331.2 CS1331.3	Internal Evaluation Home Assignments External Evaluation
13.	**Sorting and Searching**	Programs to perform sorting using different sorting techniques over data	Lab	CS1331.2 CS1331.4	Internal Evaluation Home Assignments External Evaluation

Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CS 1303.1	Explain basic concepts of various data structures	3	2										2	3		
CS 1303.2	Describe how arrays, linked lists, stacks, queues, trees and graphs are represented in memory and their operations		1	2									2	2		2
CS 1303.3	Select and/or apply appropriate data structures to solve problems and assess the trade-offs involved in the design choices.		1	2									2	3		2
CS 1303.4	Describe and analyze various sorting algorithms like bubble, selection ,insertion, merge sort, heap sort and quick sort		1	2									2	3		1

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Department of Computer Science and Engineering

Course Hand-out

Object Oriented Programming using Java Lab | CS 1332 | 1 Credits | 0 0 2 1

Session: July 19-December 19 | Faculty: Dr. Sunita Singhal, Mr. Ankit Srivastava | Class: B. Tech. (CSE) III SEM

A. **Introduction:** This course will introduce the basic principles of object oriented programming. It will cover the basic programming principle of java. It will introduce the concept of classes and object, Multi-threading, Graphical user interface and Event driven programming.

B. **Course Outcomes:** At the end of the course, students will be able to

[CS1304.1]: Identify basic programming construct of java language

[CS1304.2]: Identify and develop different classes based on real world scenario.

[CS1304.3]: To identify and experiment with different class to demonstrate polymorphism and inheritance and exception handling model

[CS1304.4]: Understand Multi-threading Model and built classes to demonstrate multi-threading programming

[CS1304.5]: Analyse real world problem and model Graphical user interface to solve problem

C PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

PROGRAM OUTCOMES

[PO.1]. Engineering knowledge: : Apply the knowledge of basic science and fundamental computing in solving complex engineering problems

[PO.2]. Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

[PO.3]. Design/development of Computing solutions: Design solutions for complex IT engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the Information oriented public health and safety, and the cultural, societal, and environmental considerations

[PO.4]. Conduct investigations of complex problems: Use IT domain research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations

[PO.6]. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse IT teams, and in multidisciplinary settings.

[PO.10]. **Communication**: Communicate effectively on complex computing engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

Program Specific Outcomes (PSOs)

At the end of the B Tech CSE program, the student:

[PSO.1]. Will be able to design, develop and implement efficient software for a given real life problem.

[PSO.2]. Will be able to apply knowledge of AI, Machine Learning and Data Mining in analysis big data for extracting useful information from it and for performing predictive analysis.

[PSO.3]. Will be able to design, manage and secure wired/ wireless computer networks for transfer and sharing of information.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Weekly evaluation (record+execution+viva)	50
	Mini project	20
End Term Exam (Summative)	End Term Exam	30
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

E. SYLLABUS

Introduction: OOP paradigm, the creation of java, the java buzzwords; C, C++ and Java comparison;**Java Basics:** Compilation and execution of a java program, access modifiers, garbage collection; **Class and Objects:** Class definition, creating objects, role of this keyword, garbage collection, finalize() method, method overloading, objects as parameters, argument passing, returning objects, access control, final, nested and inner classes; **I/O Basics:** Reading console input, writing console output, Files **Array and Strings:** Arrays in java, 1-D, 2-D and dynamic arrays, string basics, string comparison and manipulation; **Inheritance:** Inheritance and its types, abstract class, inner and outer class, super, final, static keywords; **Package and Interface:** In-built packages and user define packages, role of interface, polymorphism via inheritance; **Collection Framework**

& Generics: List, set, map, generic classes; **Exception Handling:** Errors and exceptions, types of exceptions, handling exceptions, **Multithreading:** Thread class, runnable, thread life cycle, synchronization, thread priority; **Event Handling and GUI Programming:** Events, action listener, swing package;

TEXT BOOKS

T1. The Complete Reference (9th Edition), By Herbert Schildt, McGraw Hill Education, ISBN-10:0071808558, ISBN-13: 978-0071808552

REFERENCE BOOKS

R1. Balagurusamy E, "Object Oriented Programming with Java", Tata McGraw Hill, 2011.
R2. Arnold K, & Gosling J, "The Java Programming Language", 2002.
R3. Horstmann CS, "Big Java", Wiley's Interactive Edition, 2015.

H . Lecture Plan

Lec No	**Topics**	**Session Outcome**	**Mode of Delivery**	**Corresponding CO**	**Mode of Assessing the Outcome**
1-2	Introduction to Eclipse IDE and Java Basics	Understand project structure of eclipse and learn how to compile and run java program.	Lecture	CS1304.1	Continuous Evaluation, Project
3-4	Reading Inputs and Basics of Class Design	Demonstrate the use of class and Build class to model real world object and their behaviour	Lecture Demonstration	CS1304.1 CS1304.2	Continuous Evaluation, Project
5-6	Packages, Arrays and Vectors in Java Inheritance in Java	Understand polymorphism and experiment with different class to model inheritance	Demonstration	CS1304.2 CS1304.3	Continuous Evaluation, Project
7-8	Exception Handling in Java , String Handling in Java	Analyze different exception classes and experiment with different construct to handle them.	Lecture Demonstration	CS1304.2 CS1304.3	Continuous Evaluation, project, End Term
9-10	Multithreading in Java	Illustrate multithreading programming and solve real world problem using multithreading model	Lecture Demonstration	CS1304.2 CS1304.3 CS1304.4	Continuous Evaluation, project, End Term
11-12	Collections Framework in Java	Analyze real world scenario and develop GUI and event handler to solve problem	Lecture Demonstration	CS1304.2 CS1304.3 CS1304.5	Continuous Evaluation, project, End Term

I Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
[CS1304.1]:	Understand basic programming construct of java language	1				1								1		
[CS1304.2]:	Identify and develop different classes based on real world scenario.	1	1	1		1								1		
[CS1304.3]:	To identify and experiment with different class to demonstrate polymorphism and inheritance and exception handling model	1	2	2	1	1								2		
[CS1304.4]:	Understand Multi-threading Model and built classes to demonstrate multi-threading programming	1	2	2	1	1								2		
[CS1304.5]:	Analyse real world scenario and model Graphical user interface to solve problem	1	2	2	1	1								2		

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Department of Computer Science and Engineering

Course Hand-out

Object Oriented Programming using Java | CS 1304 | 4 Credits | 3 1 0 4

Session: July 19-December 19 | Faculty: Dr. Sunita Singhal, Mr. Ankit Srivastava | Class: B. Tech. (CSE) III SEM

A. Introduction: Object oriented techniques have revolutionized the software development process and are used tremendously in IT industry to develop software products of various kinds. The course is designed to give students an in-depth understanding of the basic concepts of object-oriented programming such as encapsulation, inheritance and polymorphism using Java programming language as an aided tool. The course curriculum and structure has been divided into eight basic modules which covers the programming aspects related with object oriented domain such as exception handling, multithreading, GUI programming, event handling etc. The course will be taught with the help of several teaching aides such as power point presentation and via live debugging and execution demonstrations of several programming problems using Eclipse tool.

The main objective of the course are as follows:

- To teach students about the basics of classes and objects using Java programming language
- To enable the students to properly use the basic object oriented pillars such as encapsulation, inheritance and polymorphism.
- To enable the students to understand the basic difference between a class and an interface.
- To teach students about the implementation aspect of various basic data structures such as Linked Lists and Arrays using object oriented techniques
- To teach students how to provide various types of inheritance and polymorphism using classes and interfaces
- To introduce students about the role of modern programming constructs such as exceptions in modern programming languages
- To teach students about the basic of Multithreading, GUI Programming and Event handling

B. Course Outcomes: At the end of the course, students will be able to

[CS1304.1]. Understand and learn how to compile and execute a simple as well as complex Java Application using Command Based Interface as well as using Eclipse Tool.

[CS1304.2]. Learn and apply the concepts of encapsulation and abstraction using class, objects and interfaces for better programming skills.

[CS1304.3]. Describe and Implement various inheritance and polymorphism forms using Java Classes and Interfaces.

[CS1304.4]. Learn and Implement various collection data structure such as linked lists, queues, stacks using Java's collection framework

[CS1304.5]. Understand, Learn and finally implement the use of advanced programming constructs/features such as exception handling, multithreading and event handling in real-life programming domains.

[CS1304.6]. Visualize a real world problem in the form of various collaborating classes and objects for enhancing employability.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

PROGRAM OUTCOMES

[PO.1]. **Engineering knowledge**: : Apply the knowledge of basic science and fundamental computing in solving complex engineering problems

[PO.2]. Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

[PO.3]. Design/development of Computing solutions: Design solutions for complex IT engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the Information oriented public health and safety, and the cultural, societal, and environmental considerations

[PO.4]. Conduct investigations of complex problems: Use IT domain research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations

[PO.6]. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. Individual and team work: Function effectively as an individual, and as a member or leader in diverse IT teams, and in multidisciplinary settings.

[PO.10]. Communication: Communicate effectively on complex computing engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAM SPECIFIC OUTCOMES

The graduation from B.Tech. in computer science and engineering will empowers the student:

[PSO.1]. Will be able to design, develop and implement efficient software for a given real life problem.

[PSO.2]. Will be able to apply knowledge of AI, Machine Learning and Data Mining in analysing big data for extracting useful information from it and for performing predictive analysis.

[PSO.3]. Will be able to design, manage and secure wired/ wireless computer networks for transfer and sharing of information.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Close Book)	15
	Sessional Exam II (Close Book)	15
	In class Quizzes	30

End Term Exam (Summative)	End Term Exam (Close Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

E. SYLLABUS

Introduction: OOP paradigm, the creation of java, the java buzzwords; C, C++ and Java comparison;**Java Basics:** Compilation and execution of a java program, access modifiers, garbage collection; **Class and Objects:** Class definition, creating objects, role of this keyword, garbage collection, finalize() method, method overloading, objects as parameters, argument passing, returning objects, access control, final, nested and inner classes; **I/O Basics:** Reading console input, writing console output, Files **Array and Strings:** Arrays in java, 1-D, 2-D and dynamic arrays, string basics, string comparison and manipulation; **Inheritance:** Inheritance and its types, abstract class, inner and outer class, super, final, static keywords; **Package and Interface:** In-built packages and user define packages, role of interface, polymorphism via inheritance; **Collection Framework & Generics:** List, set, map, generic classes; **Exception Handling:** Errors and exceptions, types of exceptions, handling exceptions, **Multithreading:** Thread class, runnable, thread life cycle, synchronization, thread priority; **Event Handling and GUI Programming:** Events, action listener, swing package;

TEXT BOOKS

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R2. Arnold K, & Gosling J, “The Java Programming Language”, 2002.
R3. Horstmann CS, “Big Java”, Wiley’s Interactive Edition, 2015.

F. Lecture Plan:

Lectures	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode Of Assessing CO
1.	Introduction and Course Hand-out briefing	Understand POs, PSOs & COs	Lecture	NA	
2.	C, C++ and Java Comparison, Java Byte Code ,Java Buzzwords, Java SE 8	Difference between programming languages	Lecture	1304.1	Mid Term I, Quiz & End Term
3.	Lexical issues, java keywords	Learn java keywords	Lecture	1304.1	Mid Term I, Quiz & End Term
4.	OOP Programming, First Simple program	Develop 1st java Program	Lecture	1304.1	Mid Term I, Quiz & End
5.	Control Statements	Use control statements	Flipped Class	1304.1	Mid Term I, Quiz & End Term
6.	Operators	Use of operators	Flipped Class	1304.1	Mid Term I, Quiz & End
7.	Tutorial	Tutorial	Activity	1304.1	Mid Term I, Quiz & End
8.	Primitive Types, Floating point, Characters, Booleans	Understand data types	Flipped Class	1304.1	Mid Term I, Quiz & End
9.	Literals, Variables, Type Conversion and casting, wrapper classes , Boxing and Unboxing	Understand type casting	Lecture	1304.1	Mid Term I, Quiz & End Term
10.	1D Arrays, 2D Array, multi dimension Array, Variable	Learn arrays and its types	Lecture	1304.1	Mid Term I, Quiz & End
11.	Tutorial	Tutorial	Activity	1304.1	Mid Term I, Quiz & End
12.	Class Fundamentals, Declaring Objects	Implementing class	Lecture	1304.2 & 1304.6	Mid Term I, Quiz & End
13.	Methods in Classes, returning values, parameterized	Introduce methods in class	Lecture	1304.2 & 1304.6	Mid Term I, Quiz & End
14.	Constructors, parameterized constructors	Initialize objects	Flipped Class	1304.2 & 1304.6	Mid Term I, Quiz & End
15.	This keyword, This Constructor, Constructor	Initialize object of current class	Lecture	1304.2	Mid Term I, Quiz & End
16.	Tutorial	Tutorial	Activity	1304.2	Mid Term I, Quiz & End
17.	Garbage Collection, finalize() method	De-allocate memory	Lecture	1304.2	Mid Term I, Quiz & End
18.	Overloading Methods, Using Objects as parameters, Argument passing, Returning Objects	Learn polymorphism	Lecture	1304.2	Mid Term I, Quiz & End Term
19.	Recursion, Access Control	Understand public and private	Lecture	1304.2 & 1304.3	Mid Term I, Quiz & End
20.	Tutorial	Tutorial	Activity	1304.2	Mid Term I, Quiz & End
21.	Static, final, Nested and Inner class	Understand constant variables	Lecture	1304.2 & 1304.3	Mid Term II, Quiz & End
22.	Variable length arguments	Using n variables	Lecture	1304.2 & 1304.3	Mid Term II, Quiz & End
23.	Tutorial	Tutorial	Lecture	1304.2 & 1304.3	Mid Term II, Quiz & End
24.	Using Command line arguments ,I/O Basics, reading	Taking input from CMd	Flipped Class	1304.1 & 1304.2	Mid Term II, Quiz & End
25.	PrintWriter Class, Scanner Class	Understanding file handling	Flipped Class	1304.1 & 1304.2	Mid Term II, Quiz & End
26.	reading and Writing Files, Closing files	Understanding file handling	Lecture	1304.1 , 1304.2	Mid Term II, Quiz & End
27.	Inheritance Basics, Using Super, Creating multilevel	Understanding reusability	Lecture	1304.3	Mid Term II, Quiz & End
28.	Method overriding, Dynamic method dispatch, Using	Learn inheritance and overriding	Lecture	1304.3	Mid Term II, Quiz & End
29.	Tutorial	Tutorial	Activity	1304.3	Mid Term II, Quiz & End
30.	Packages, Access protection, Importing packages,	Develop user defined packages	Lecture	1304.3	Mid Term II, Quiz & End

31.	Interfaces	Understand abstraction	Lecture	1304.3	Mid Term II, Quiz & End
32.	Default interface methods	New method in JAVA8	Flipped Class	1304.3	Mid Term II, Quiz & End
33.	static methods in interfaces	Understand static in JAVA9	Lecture	1304.3	Mid Term II, Quiz & End
34.	Tutorial	Tutorial	Activity	1304.3	Mid Term II, Quiz & End
35.	Fundamentals, Exception types, Uncaught Exceptions,	How to handle error/ exception	Lecture	1304.2 & 1304.6	Mid Term II, Quiz & End
36.	Using try and catch, multiple catch clauses, nested try	Using try, catch block	Lecture	1304.2 & 1304.6	Mid Term II, Quiz & End
37.	Throw, throws, finally, built-in exceptions, creating own exception	How to throw an explicit exception	Lecture	1304.2 & 1304.6	Mid Term II, Quiz & End Term
38.	Tutorial	Tutorial	Activity	1304.5	Mid Term II, Quiz & End
39.	Thread Model: thread priorities, synchronization	Learn Multitasking and threading	Flipped Class	11304.2 & 1304.6	Quiz & End Term
40.	main thread, creating single thread and multiple threads,	Handle multiple threads	Lecture	1304.2 & 1304.6	Quiz & End Term
41.	Interthread communication, suspending, resuming and stopping threads, using multithreads	Learn how to stop and start a thread	Lecture	1304.2 & 1304.6	Quiz & End Term
42.	Tutorial	Tutorial	Activity	1304.5	Quiz & End Term
43.	Constructors, Constructor chaining, string	Learn polymorphism	Lecture	1304.4	Quiz & End Term
44.	Character extraction, comparison, searching and	Understand String operations	Lecture	1304.4	Quiz & End Term
45.	String Class Methods and String Buffer Class	Learn String immutable	Flipped Class	1304.4	Quiz & End Term
46.	Collection framework, Arraylist ,	Understand Collections	Lecture	1304.4	Quiz & End Term
47.	LinkList, HashMap,Vector	Learn different data structures	Lecture	1304.4	Quiz & End Term
48.	Making own generics class	Template and generics	Lecture	1304.4	Quiz & End Term
49.	Tutorial	Tutorials	Activity	1304.4	Quiz & End Term
50.	GUI lifecycle, Events, Events listener, adapter classes	Learn Swings for GUI application	Flipped Class	1304.4 & 1304.5	Quiz & End Term
51.	Different Event classes	Learn Actionlistener class	Lecture	1304.4 & 1304.5	Quiz & End Term
52.	Event Listener Interfaces	Understanding of events	Lecture	1304.4 & 1304.5	Quiz & End Term

A. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CS 1304.1	Students will be able to understand and learn how to compile and execute a simple as well as complex Java Application using Command Based Interface as well as using Eclipse Tool.	**1**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**1**	**1**	**1**	**1**	**2**	**-**	**-**
CS 1304.2	Learn and apply the concepts of encapsulation and abstraction using class, objects and interfaces.	**2**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**1**	**2**	**-**	**-**
CS 1304.3	Students will be able to develop and Implement various inheritance and polymorphism forms using Java Classes and Interfaces.	**3**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**1**	**3**	**-**	**-**
CS 1304.4	Student will be able to Implement various collection data structure such as linked lists, queues, stacks using Java's collection framework.	**3**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**1**	**2**	**-**	**-**
CS 1304.5	Student will be able to understand, learn and finally Implement the use of advanced programming constructs/features such as exception handling, multithreading and event handling in real-life programming domains.	**3**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**1**	**2**	**-**	**-**
CS1304.6	Students will be able to visualize a real world problem in the form of various collaborating classes and objects	**1**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**2**	**2**	**-**	**-**

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Course Hand-out

Switching Theory & Logic Design| CS1302 | 4 Credits

Session: July19-Dec 20 | Faculty: Gulrej Ahmed| Class: B.Tech. 2nd Year III Semester

A. **Course Objective:** The main objective of this course is to obtain a basic level of Digital Electronics knowledge and set the stage to perform the analysis and design of complex digital electronic circuits.

B. **Course Outcomes:** At the end of the course, students will be able to

[CS1302.1]: Manipulate numeric information in different forms, e.g. different bases, signed integers, various codes such as ASCII, Gray, and BCD.

[CS1302.2]: Manipulate simple Boolean expressions using the theorems and postulates of Boolean algebra and to minimize combinational functions.

[CS1302.3]: Develop design skills to build larger more complex circuits by using standard combinational functions/building blocks.

[CS1302.4]: Develop design skills to build larger more complex circuits by using standard sequential functions/building blocks.

[CS1302.5]: Understand working and use of logic families like BJT, MOSFET etc.

C. **Program Outcomes and Program Specific Outcomes:**

[PO.1]. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4]. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAM SPECIFIC OUTCOMES (PSO)

PSO 1: Will be able to design, develop and implement efficient software for a given real life problem.

PSO 2: Will be able to apply knowledge of AI, Machine Learning and Data Mining in analysing big data for extracting useful information from it and for performing predictive analysis.

PSO 3: Will be able to design, manage and secure wired/ wireless computer networks for transfer and sharing of information.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	15
	Sessional Exam II (Closed Book)	15
	In class Quizzes and Assignments Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Closed Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. Syllabus

Introduction to logic circuits: Variables and functions, Inversion, Truth tables, Logic gates and networks, Boolean algebra, Introduction to VHDL. **Optimized implementation of logic functions:** Synthesis using AND OR and NOT gates, Karnaugh map, Strategy for minimization,

Minimization of POS forms, Incompletely Specified Functions, Multiple output circuits NAND and NOR logic networks, multilevel NAND and NOR circuits, Analysis of multilevel circuits. **Number representation and arithmetic circuits:** Positional number representation, Addition of unsigned numbers, Signed numbers, Fast adders, Design of arithmetic circuits using VHDL, BCD representation. **Combinational-Circuit building blocks:** Multiplexer, decoder, Encoder, Code converter, Arithmetic comparison circuits, VHDL for Combinational Circuits; Flip Flops, Registers, Counters. **Overview of semiconductor diode:**BJT, MOSFET, TTL–standard, High speed, low-power, low-power schottky, CMOS logic-NAND, NOR

F. Text Books

T1. S.Salivahanan, S.Arivazhagan,"Digital Circuit and Design" Fourth Edition, 2012.

T2. M. Morris Mano, Michael D. Ciletti, "Digital Design", *Prentice Hall of India Pvt. Ltd.*, 2008.

G. Reference Books

R1. P. Leach, A. Malvino, G. Saha, "*Digital Principles and Applications*", TMH, 6th Edition, 2006.

R2. Brian Holdsworth, Clive Woods, "Digital Logic Design", *Elsevier India Pvt. Ltd.*, 2005.

H. Lecture Plan

Lecture No.	Topic(s) to be covered	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1	Number System: Binary, Decimal, Octal ,Hexadecimal	To acquaint the students with Number systems	Lecture	1302.1	Class Quiz Mid Term I End Term
2	1's and 2's Complements and 9's and 10's Complements	Recall working of complements to perform subtraction using addition	Lecture	1302.1	In Class Quiz
3	Binary Coded Decimal (BCD): BCD Addition and Subtraction	Recall working of complements to perform subtraction using addition	Lecture	1302.1	In Class Quiz End Term
4	Introduction, Development of Boolean Algebra	Explain the Boolean algebra for logic design	Lecture	1302.2	Home Assignment End Term
5	Boolean Logic Operation: Logical AND, Logical OR and Logical Complementation(Inversion)	Boolean Logic Operation: Logical AND, Logical OR and Logical Complementation(Inversion)	Lecture	1302.2	In Class Quiz End Term
6	Boolean Addition, Boolean Multiplication, Properties of Boolean Algebra and Principle of Duality.	Recall Properties of Boolean Algebra and Principle of Duality.	Lecture	1302.2	Class Quiz Mid Term I End Term
7	Demorgan's Theorems, Minimization of Boolean expression using algebraic method	Recall Demorgan's Theorems, Minimization of Boolean expression using algebraic method	Lecture	1302.2	Class Quiz Mid Term I End term
8	Sum of Products and Product of Sums : Minterm, Maxterm	To express Boolean function in Sum of Products and Product of Sums : Minterm, Maxterm	Lecture	1302.2	Home Assignment Class Quiz Mid Term I End Term
9	Deriving Sum of Products (SOP) Expressions from a Truth Table, Deriving Product of Sum (POS) Expressions from a Truth Table	To express Boolean function in Sum of Products and Product of Sums : Minterm, Maxterm	Lecture	1302.2	Class Quiz Mid Term I End Term
10	Karnaugh Map :Two-variable map, Three-variable map	To minimize the Boolean function using Karnaugh Map	Lecture	1302.1,1302.2	Class Quiz Mid Term I End Term

11	Four-variable map	To minimize the Boolean function using Karnaugh Map	Lecture	1302.1,1302.2	Class Quiz End Term
12	Five- variable map	To minimize the Boolean function using Karnaugh Map	Lecture	1302.1,1302.2	Class Quiz Mid Term I End Term
13	Quine-McCluskey or Tabular Method of Minimization of Logic Functions	To minimize the Boolean function using Quine-McCluskey or Tabular Method of Minimization of Logic Functions	Lecture	1302.1,1302.2	Class Quiz Mid Term I End Term
14	Examples of Tabular Method	To minimize the Boolean function using Quine-McCluskey or Tabular Method of Minimization of Logic Functions	Lecture	1302.1,1302.2	Class Quiz Mid Term I End Term
15	Examples of Tabular Method	To minimize the Boolean function using Quine-McCluskey or Tabular Method of Minimization of Logic Functions	Lecture	1302.1,1302.2	Class Quiz Mid Term I End Term
16	Logic Gates: OR, AND, NOT, NAND, NOR	Recall Logic Gates: OR, AND, NOT, NAND, NOR	Lecture	1302.1,1302.2	Class Quiz End Term Mid Term II
17	Universal Gates: Realisation of logic function using NAND gates	Realisation of logic function using NAND gates	Lecture	1302.1,1302.2	Class Quiz End Term Mid Term II
18	Realisation of logic function using NOR gates	Realisation of logic function using NOR gates	Lecture	1302.1,1302.2	Class Quiz End Term Mid Term II
19	Exclusive-OR (Ex-OR) Gate, Exclusive-NOR (Ex-NOR) Gate	Realisation of logic function using NAND , NOR gates	Lecture	1302.3	Class Quiz End Term Mid Term II
20	Arithmetic Circuits: Half Adder, Full Adder , K-Map Simplification	Describe the Arithmetic Circuits: Half Adder, Full Adder , K-Map Simplification	Lecture	1302.3	Class Quiz End Term Mid Term II
21	Half Subtractor , Full Subtractor	Describe the Arithmetic Circuits: Half Subtractor , Full Subtractor	Lecture	1302.3	Class Quiz End term Mid Term II
22	4-bit Parallel Adder/Subtractor	Implement 4-bit Parallel Adder/Subtractor	Lecture	1302.3	Class Quiz Mid Term II
23	Fast Adder	To overcome the disadvantage of 4-bit Parallel Adder	Lecture	1302.3	Class Quiz Mid Term II End Term

24	BCD Adder	Implement the BCD Adder using binary adder	Lecture	1302.3	Class Quiz Mid Term II End Term
25	Binary Multiplier	Implement the Binary Multiplier using binary adder	Lecture	1302.3	Class Quiz Mid Term II End Term
26	Combinational Circuits: Multiplexers – Basic Four input Multiplexer	Describe Combinational Circuits: Multiplexers – Basic Four input Multiplexer	Lecture	1302.3	Class Quiz End Term Mid Term II
27	Implementation of Boolean Expression using Multiplexers	Implementation of Boolean Expression using Multiplexers	Lecture	1302.3	Class Quiz End Term Mid Term II
28	Demultiplexers : 1-to-4 Demultiplexer, 1-to-8 Demultiplexer,	Describe Demultiplexers : 1-to-4 Demultiplexer, 1-to-8 Demultiplexer,	Lecture	1302.3	Class Quiz End Term Mid Term II
29	Decoders: Basic Binary Decoder, 3-to-8 Decoder	Describe Decoders: Basic Binary Decoder, 3-to-8 Decoder	Lecture	1302.3	Class Quiz End Term
30	4-to-16 Decoder	Describe 4-to-16 Decoder	Lecture	1302.3	Class Quiz End Term
31	Encoders: Octal-to-Binary Encoder	Describe Encoders: Octal-to-Binary Encoder	Lecture	1302.3	Class Quiz End Term
32	Decimal-to-BCD Encoder	Describe Decimal-to-BCD Encoder	Lecture	1302.3	NA
33	Code Converters: BCD-to-Binary Converters	Perform code conversion : BCD-to-Binary Converters	Lecture	1302.3	In Class Quiz (Not Accounted)
34	Binary-to-Gray Code Converters	Perform code conversion : Binary-to-Gray Code Converters	Lecture	1302.3	In Class Quiz End Term
35	Gray Code-to-Binary Converters	Perform code conversion : Gray Code-to-Binary Converters	Lecture	1302.3	Home Assignment End Term
36	Flip-Flops: Latches	Explain Flip-Flops, Latches as basic block for sequential circuit.	Lecture	1302.4	In Class Quiz End Term
37	S-R Flip-Flop, D Flip-Flop	Explain basic S-R Flip-Flop, D Flip-Flop	Lecture	1302.4	Class Quiz End Term
38	J-K Flip-Flop, T Flip-Flop	Explain basic J-K Flip-Flop, T Flip-Flop	Lecture	1302.4	Class Quiz End term
39	Triggering of Flip-Flop: Level Triggering	Explain Triggering of Flip-Flop: Level Triggering	Lecture	1302.4	Home Assignment Class Quiz

					End Term
40	Edge Triggering	Explain Triggering of Flip-Flop: Edge Triggering	Lecture	1302.4	Class Quiz End Term
41	Master Slave Flip-Flop	Describe Master Slave Flip-Flop	Lecture	1302.4	Class Quiz End Term
42	Realisation of One Flip-Flop using other Flip-Flops.	Realise one Flip-Flop using other Flip-Flops.	Lecture	1302.4	Class Quiz End Term
43	Counters: Asynchronous (Ripple or Serial) Counter	Explain the design of Counters: Asynchronous (Ripple or Serial) Counter as sequential circuit	Lecture	1302.4	Class Quiz End Term
44	Ripple Counter with Decoded Outputs	Explain the design of Counters: Ripple Counter with Decoded Outputs as sequential circuit	Lecture	1302.4	Class Quiz End Term
45	Ripple Counters with Modulus<2^n	Implement Ripple Counters with Modulus<2^n	Lecture	1302.4	Class Quiz End Term
46	Asynchronous Down Counter	Implement Asynchronous Down Counter	Lecture	1302.4	Class Quiz End Term
47	Up-Down Counter	Implement Up-Down Counter	Lecture	1302.4	Class Quiz End Term
48	Design of Synchronous Counters	Recall the overall design of Synchronous Counters	Lecture	1302.4	Class Quiz End Term
49	Registers: Shift Register	Implement Registers: Shift Register	Lecture	1302.4	Class Quiz End Term
50	Shift Register Counters: Ring Counter	Implement Shift Register Counters: Ring Counter	Lecture	1302.4	Class Quiz End Term
51	Johnson Counter	Implement Johnson Counter	Lecture	1302.4	Class Quiz End Term
52	Overview of semiconductor diode:BJT, MOSFET,	Describe the logic families: Overview of semiconductor diode:BJT, MOSFET	Lecture	1302.5	Class Quiz End Term
53	TTL–standard, High speed, low-power, low-power schottky	Describe the logic families: TTL–standard, High speed, low-power, low-power schottky	Lecture	1302.5	Class Quiz End Term
54	CMOS logic-NAND, NOR	Describe the logic families: CMOS logic-NAND, NOR	Lecture	1302.5	Class Quiz End Term

I. Course Articulation Matrix: (Mapping of COs with POs and PSOs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CS [1302.1]:	Be able to manipulate numeric information in different forms, e.g. different bases, signed integers, various codes such as ASCII, Gray, and BCD.	**3**	**3**											**3**		**2**
CS [1302.2]:	Be able to manipulate simple Boolean expressions using the theorems and postulates of Boolean algebra and to minimize combinational functions.	**3**	**3**											**3**		**2**
CS [1302.3]:	Be able to design and analyze small combinational circuits and to use standard combinational functions/building blocks to build larger more complex circuits.	**3**	**3**	**2**										**3**		**2**
CS [1302.4]:	Be able to design and analyze small sequential circuits and devices and to use standard sequential functions/building blocks to build larger more complex circuits.	**3**	**3**	**2**										**3**		**2**
CS [1302.5]:	Be able to understand working and use of logic families like BJT, MOSFET etc.	**3**	**3**	**2**									**3**	**3**	**3**	**2**

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Department of Computer Science & Engineering
Course Hand-out

Relational Database Management Systems| CS 1402 | 4 Credits | 3 1 0 4

Session: Jan '19 – May '19 | Faculty: Dr. Sandeep Joshi, Dr. V. P. S. Dhaka, Dr. Roheet Bhatnagar, Dr. Arvind Dhaka, Mr. Manu Srivastava, Mr. Shashank Sharma, Mr. Virender, Mr. Krishna Kumar, Mr. Saket Acharya, Mr. Satyabrata Roy | Class: B.Tech. 2nd Year IV Semester (Core Course)

A. **Introduction:** This course introduces the concepts of Relational Database Management Systems. More emphasis will be given to understanding the internal working of database management systems and development of database application. Database Management System will be taught using MySQL and ERD plus.

B. **Course Outcomes:** At the end of the course, students will be able to

[CS1402.1] Classify, Compare & recall different file based system, Data Model.

[CS1402.2] Understand and design Entity Relationship Model and illustrate the concept of cardinality, mapping and various constraints.

[CS1402.3] Interpret different query language SQL, Relation Algebra, calculus and apply the techniques and rules in different problems.

[CS1402.4] Understand different normalization technique for optimizing database and analyse database design

[CS1402.5] Understand and summarize transaction processing, concurrency and recovery techniques.

[CS1402.6] Explain different database storage structure and access technique

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4]. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations

[PO.6]. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

Program Specific Outcomes (PSOs)

[PSO.1] Will be able to design, develop and implement efficient software for a given real life problem.

[PSO.2] Will be able to apply knowledge of AI, Machine Learning and Data Mining in analyzing big data for extracting useful information from it and for performing predictive analysis.

[PSO.3] Will be able to design, manage and secure wired/ wireless computer networks for transfer and sharing of information.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	15
	Sessional Exam II (Closed Book)	15
	5 Quizzes (Open Book Mode), 1 MOOC, Video Assignments (Accumulated and Averaged)	20+5+5
End Term Exam (Summative)	End Term Exam (Closed Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

Introduction: Data, data processing requirement, traditional file based system, Def of database, database management system, 3-schema architecture, Benefits of DBMS. Database system applications, Purpose of database systems, Different database users. DBMSs, data driven development, OLAP, OLTP. **Data Modelling and ER/EER diagrams:** Conceptual data model, Conceptual data modelling using E-R data model, entities, attributes, relationships, Generalization, specialization, specifying constraints. **Relational Algebra and Calculus:** Selection and projection set operations, renaming - Joins – Union, intersection, Division, Examples of Algebra overviews, Relational calculus, Tuple relational Calculus, Domain relational calculus, Expressive Power of Algebra and calculus. **Relational Model, ER mapping to corresponding relational models & Relational Algebra:** the relational data model, relational constraints and the relational algebra, relational model concepts, relational constraints and relational database schemas, update operations and dealing with constraints violations, basic relational algebra operations, additional relational operations, examples of queries in relational database design using ER-to-Relational Mapping**. SQL:**

Data definition, Constraints and schema changes in SQL2, Basic queries in SQL, more complex SQL queries, Insert, Delete and Update statements in SQL, Views (Virtual tables) in SQL, Specifying General Constraints as assertion, Additional features of SQL. **Database Design & Normalisation :** Def of relation, relational model operators, Keys, relational model integrity rules, Functional dependencies and normalization for relational databases :Informal design guidelines for schemas, functional dependencies, Normal forms based on Primary keys, General definitions of second and third normal forms, Boyce-Codd normal form, Relational database algorithms and further dependencies: Algorithms for relational database schema design, multivalued dependencies and fourth normal form. **Transaction Processing & Management:** Transaction concept &State, Concurrency Control: Lock Based Protocols, Multiple granularity, Deadlocks. **Recovery:** Recovery & Atomicity, Log based Recovery. **Concurrency control mechanisms:** concurrency control techniques: Locking techniques for concurrency control techniques, concurrency control based on Timestamp ordering, multiversion concurrency control techniques, validation (optimistic) concurrency for concurrency control in indexes, some other concurrency control issues. **File Storage,** Indexing & Hashing: File structures, RAID Level, Order indices, B+-Tree Indices File, B+-Tree extensions, Multiple Key Access, Static Hashing and Dynamic Hashing.

F. TEXT BOOKS

T1. Avi Silberschatz, Henry F. Korth, S. Sudarshan, “Database System Concepts”, TMH, New Delhi, 2006

T2. R. Elmasri, S. B. Navathe, “Fundamentals of Database Systems”, Addison & Weisely, New Delhi, 2008

G. REFERENCE BOOKS

R1. C. J. Date, “Database Systems”, Prentice Hall of India, New Delhi, 2012
R2. Raghu Ramakrishnan, “Database Management Systems (2nd Ed)”, McGraw Hill, 2000.
R3. Ivan Bayross, “Introduction to SQL”, Tata McGraw, 2010.

H. Lecture Plan: 54 Lectures

Lectures	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode Of Assessing CO
1.	Introduction to Data, data processing requirement, desirable characteristics of an	Classify, Compare & recall different file based system, Data Model.	PPT, Lecture, Class Notes	1402.1	N. A.

	ideal data processing system.				
2.	Traditional file based system, its drawback, File processing systems versus database management systems.	Compare file systems and DBMS	PPT, Lecture, Class Notes	1402.1	Mid Term I, Quiz & End Term
3.	Data Models, Schemas and Instances. Categories of Data Models.	Classify and Compare different Data Model.	PPT, Lecture, Class Notes	1402.1	Mid Term I, Quiz & End Term
4.	Three Schema Architecture, Data Independence (Logical & Physical).	Classify and Compare various architectures and data independence.	PPT, Lecture, Class Notes	1402.1	Mid Term I, Quiz & End Term
5.	Benefits of DBMS. Database system applications, Purpose of database systems, Different database users.	Classify, Compare & recall different file based system, Data Model.	PPT, Lecture, Class Notes	1402.1	Mid Term I, Quiz & End Term
6.	Conceptual data model, Conceptual data modelling using E-R data model.	Understand and design Entity Relationship Model and illustrate the concept of cardinality, mapping and various constraints.	PPT, Lecture, Class Notes	1402.1 & 1402.2	Mid Term I, Quiz & End Term
7.	Entity Types, Entity Sets, Attributes, Keys and Weak Entity type.	Understand and design Entity Relationship Model and illustrate the concept of cardinality, mapping and various constraints.	PPT, Lecture, Class Notes	1402.1 & 1402.2	Mid Term I, Quiz & End Term
8.	Relationship Types, Relationship Sets, Roles, and Structural Constraints.	Understand and design Entity Relationship Model and illustrate the concept of cardinality, mapping and various constraints.	PPT, Lecture, Class Notes	1402.1 & 1402.2	Mid Term I, Quiz & End Term
9.	Enhanced Entity-Relationship (EER) Model: Subclass, Super classes and Inheritance.	Understand and design Entity Relationship Model and illustrate the concept of cardinality, mapping and various constraints.	PPT, Lecture, Class Notes	1402.1 & 1402.2	Mid Term I, Quiz & End Term
10.	Specialization and Generalization, Constraints and characteristics of Specialization and Generalization Hierarchies.	Understand the concepts of generalization and specialization and various constraints associated.	PPT, Lecture, Class Notes	1402.1 & 1402.2	Mid Term I, Quiz & End Term
11.	Relational Model Concepts: Domain, Attributes, Tuples and Relations.	Understand the concepts of relational model	PPT, Lecture, Class Notes	1402.1 & 1402.2	Mid Term I, Quiz & End Term
12.	Relational Model Constraints and Relational Database Schema: Domain Constraints, Key Constraints and Constraints on NULL Values.	Understand and design Entity Relationship Model and illustrate the concept of NULL values.	PPT, Lecture, Class Notes	1402.1 & 1402.2	Mid Term I, Quiz & End Term
13.	Entity Integrity, Referential Integrity and Foreign Keys.	Understand various concepts of key constraints.	PPT, Lecture, Class Notes	1402.1 & 1402.2	Mid Term I, Quiz & End Term

14.	Relational database design using ER-to-Relational Mapping.	Understand mapping of ER models into relations	PPT, Lecture, Class Notes	1402.1 & 1402.2	Mid Term I, Quiz & End Term
15.	Mapping EER Model constructs to Relations.	Understand mapping of EER models into relations	PPT, Lecture, Class Notes	1402.1 & 1402.2	Mid Term I, Quiz & End Term
16.	Relational Algebra: Unary Relational Operations SELECT and PROJECT.	Understand unary relational operations like SELECT and PROJECT	PPT, Lecture, Class Notes	1402.3	Mid Term I, Quiz & End Term
17.	Sequences of Operations and the RENAME Operation.	Understand the sequences of operations and the RENAME Operation.	PPT, Lecture, Class Notes	1402.3	Mid Term I, Quiz & End Term
18.	Relational Algebra Operation from Set Theory: UNION, INTERSECTION, CARTESIAN PRODUCT (CROSS PRODUCT) Operations.	Interpret different Relational Algebra operations and apply the techniques and rules in different problems	PPT, Lecture, Class Notes	1402.3	Mid Term I, Quiz & End Term
19.	Binary Relational Operations: JOIN and DIVISION Operation	Interpret JOIN and DIVISON operations and apply the techniques and rules in different problems.	PPT, Lecture, Class Notes	1402.3	Mid Term I, Quiz & End Term
20.	Variations of JOIN: THETA JOIN, EQUI JOIN, NATURAL JOIN, INNER JOIN and OUTER JOIN	Interpret different types of JOIN operations and apply the techniques and rules in different problems	PPT, Lecture, Class Notes	1402.3	Mid Term I, Quiz & End Term
21.	Additional Relational Operations: Generalized Projection, Aggregate Functions and Grouping.	Interpret additional Relational Algebra operations and apply the techniques and rules in different problems	PPT, Lecture, Class Notes	1402.3	Mid Term II, Quiz & End Term
22.	Tuple Relational Calculus: Tuple Variable and Range Relations, Expressions and Formulas in tuple relational calculus.	Interpret different Relational Calculus operations and apply the techniques and rules in different problems	PPT, Lecture, Class Notes	1402.3	Mid Term II, Quiz & End Term
23.	The Existential and Universal Quantifiers, Safe Expressions.	Understand existential and universal and existential quantifiers.	PPT, Lecture, Class Notes	1402.3	Mid Term II, Quiz & End Term
24.	Domain Relational Calculus.	Understand concepts of domain relational calculus.	PPT, Lecture, Class Notes	1402.3	Mid Term II, Quiz & End Term
25.	SQL Data Definition and Data Types, Specifying Constraints in SQL, Schema change statements in SQL.	Understand fundamentals of SQL	PPT, Lecture, Class Notes	1402.3	Mid Term II, Quiz & End Term
26.	Basic queries in SQL, More complex SQL queries: Comparisons involving NULL and Three-Valued Logic, Nested Queries, Tuples, and Set/Multiset Comparisons.	Interpret SQL and apply the techniques and rules in different problems	PPT, Lecture, Class Notes	1402.3	Mid Term II, Quiz & End Term

27.	Correlated Nested Queries, EXISTS and UNIQUE functions in SQL.	Interpret SQL and apply the techniques and rules in different problems	PPT, Lecture, Class Notes	1402.3	Mid Term II, Quiz & End Term
28.	Joined tables in SQL and Outer Joins, Aggregate functions in SQL.	Interpret SQL and apply the techniques and rules in different problems	PPT, Lecture, Class Notes	1402.3	Mid Term II, Quiz & End Term
29.	GROUP BY, HAVING Clauses, INSERT, DELETE, AND UPDATE Statements in SQL.	Interpret SQL and apply the techniques and rules in different problems	PPT, Lecture, Class Notes	1402.3	Mid Term II, Quiz & End Term
30.	Views (Virtual tables) in SQL, Specifying General Constraints as assertion and Triggers, Additional features of SQL.	Interpret SQL and apply the techniques and rules in different problems	PPT, Lecture, Class Notes	1402.3	Mid Term II, Quiz & End Term
31.	Database Design: Redundant information in tuples and update anomalies, insertion anomalies, deletion anomalies and modification anomalies.	Understand the concepts of different anomalies and how they can be removed	PPT, Lecture, Class Notes	1402.4	Mid Term II, Quiz & End Term
32.	Properties of Relational Decompositions: Dependency preservation and Lossless join property of a decomposition.	Understand concepts of relational decompositions	PPT, Lecture, Class Notes	1402.4	Mid Term II, Quiz & End Term
33.	Functional Dependencies: Definition of functional dependencies, Inference rules for functional dependencies.	Understand concepts of functional dependencies	PPT, Lecture, Class Notes	1402.4	Mid Term II, Quiz & End Term
34.	Equivalence of sets of functional dependencies, Minimal sets of functional dependencies.	Understand the process of finding out equivalence among given sets of FDs and finding out minimal sets of functional dependencies	PPT, Lecture, Class Notes	1402.4	Mid Term II, Quiz & End Term
35.	Normal forms based on Primary keys, Normalization of relations, Definition of Super Key and Candidate Key. Definition of Prime and Non-Prime Attribute.	Understand different normalization techniques for optimizing database and analyse database design	PPT, Lecture, Class Notes	1402.4	Mid Term II, Quiz & End Term
36.	Normal Forms: First normal form, Second normal form.	Understand 1NF and 2NF	PPT, Lecture, Class Notes	1402.4	Mid Term II, Quiz & End Term
37.	Third normal form and Boyce-Codd normal form.	Understand 3NF and BCNF	PPT, Lecture, Class Notes	1402.4	Mid Term II, Quiz & End Term
38.	Multivalued dependencies and fourth normal form.	Understand concepts of multivalued dependencies	PPT, Lecture, Class Notes	1402.4	Mid Term II, Quiz & End Term

39.	Introduction to transaction processing, Desirable properties of transactions.	Understand and summarize transaction processing	PPT, Lecture, Class Notes	1402.5	Quiz & End Term
40.	Characterizing schedules based on recoverability.	Understand and summarize concepts of recoverability of schedules	PPT, Lecture, Class Notes	1402.5	Quiz & End Term
41.	Characterizing schedules based on Serializability: Serial, Nonserial and conflict serializable schedules.	Understand and summarize concepts of schedules	PPT, Lecture, Class Notes	1402.5	Quiz & End Term
42.	View equivalence and View Serializability.	Understand and summarize concepts of serializability	PPT, Lecture, Class Notes	1402.5	Quiz & End Term
43.	Concurrency control techniques: Two Phase locking Techniques (Binary Lock, Shared/Exclusive Lock).	Understand and summarize concurrency control techniques.	PPT, Lecture, Class Notes	1402.5	Quiz & End Term
44.	Basic 2PL, Strict 2PL, Rigorous 2PL.	Understand the concepts of locking for concurrency control	PPT, Lecture, Class Notes	1402.5	Quiz & End Term
45.	Deadlock prevention protocol (Wait-Die, Wound-Wait), Deadlock detection and starvation.	Understand different strategies of deadlock prevention and detection strategies	PPT, Lecture, Class Notes	1402.5	Quiz & End Term
46.	Concurrency control based on Timestamp Ordering (Basic TO, Strict TO and Thomas's Write Rule.	Understand concurrency control based on timestamp ordering.	PPT, Lecture, Class Notes	1402.5	Quiz & End Term
47.	Granularity of Data items and Multiple Granularity Locking.	Understand concepts of multiple granularity locking	PPT, Lecture, Class Notes	1402.5	Quiz & End Term
48.	Database Recovery Techniques: Recovery Concepts, Recovery Technique based on Deferred Update.	Understand and summarize recovery techniques.	PPT, Lecture, Class Notes	1402.5	Quiz & End Term
49.	Recovery Technique based on Immediate Update, Recovery Systems Check pointing and Shadow paging.	Understand and summarize recovery techniques.	PPT, Lecture, Class Notes	1402.5	Quiz & End Term
50.	File Storage: File structures (Fixed Length Record, Variable Length Record), Record Blocking and Spanned versus Un-spanned Records.	Explain different database storage structure and access technique	Lectures, Flipped Classroom	1402.6	Quiz & End Term
51.	RAID organization and Levels, Hashing Techniques (Internal and External Hashing).	Explain RAID organization and Hashing techniques	Lectures, Flipped Classroom	1402.6	Quiz & End Term
52.	Indexing Structure: Single Level ordered indexes (Primary,	Explain different indexing techniques	PPT, Lecture, Class Notes	1402.6	Quiz & End Term

	Clustering, and Secondary).				
53.	Multilevel Indexes, Dynamic multilevel indexes using B-Trees.	Explain different indexing techniques	PPT, Lecture, Class Notes	1402.6	Quiz & End Term
54.	Dynamic multilevel indexes using B+-Trees.	Explain different indexing techniques	PPT, Lecture, Class Notes	1402.6	Quiz & End Term

I. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
[CS1402.1]	Classify, Compare & recall different file based system, Data Model	**1**												**1**		
[CS1402.2]	Understand and design Entity Relationship Model and illustrate the concept of cardinality, mapping and various constraints	**2**	**2**	**2**	**2**	**2**					**2**			**2**	**2**	
[CS1402.3]	Interpret different query language SQL, Relation Algebra, calculus and apply the techniques and rules in different problems	**2**		**1**	**2**	**2**								**2**	**2**	
[CS1402.4]	Understand different normalization technique for optimizing database and analyse database design	**2**		**2**			**2**							**2**	**2**	
[CS1402.5]	Understand and summarize transaction processing, concurrency and recovery technique.	**2**	**2**	**1**		**2**	**1**							**2**	**2**	
[CS1402.6]	Explain different database storage structure and access technique	**1**		**1**		**1**								**2**		

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

SCHOOL OF COMPUTING & INFORMATION TECHNOLOGY

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
COURSE HAND-OUT

Relational Database Management Systems Lab| CS 1432 | 1 Credit | 0 0 2 1

Session: Jan '19 – May '19 | Faculty: Dr. Sandeep Joshi, Dr. V. P. S. Dhaka, Dr. Roheet Bhatnagar, Dr. Arvind Dhaka, Mr. Manu Srivastava, Mr. Shashank Sharma, Mr. Virender, Mr. Krishna Kumar, Mr. Saket Acharya, Mr. Satyabrata Roy | Class: B.Tech. 2nd Year IV Semester (Core Course)

A. Introduction:

To familiarize the students with the fundamental concepts, techniques and tools of Relational DBMS. Participation in this course will enable students to better use Database in many application areas and will prepare them to take advanced courses in more specific areas of Database.

B. Course Outcomes: At the end of the course, students will be able to

[CS1432.1] Demonstrate the concepts of ER, EER diagrams and introduction to SQL
[CS1432.2] Demonstrate the concepts and queries of DDL
[CS1432.3] Demonstrate the concepts and queries of DML
[CS1432.4] Demonstrate the concepts and queries of DCL
[CS1432.5] Demonstrate the concepts of triggers in database
[CS1432.6] Demonstrate the concepts of stored procedures and transaction to acquire efficient database management skill.

C PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

PO1. **Engineering knowledge**: Apply the knowledge of mathematics, computer science, and communication engineering fundamentals to the solution of complex engineering problems.

PO2. **Problem analysis**: The sophisticated curriculum would enable a graduate to identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using basic principles of mathematics, computing techniques and communication engineering principles.

PO3. **Design/development of solutions**: Upon analysing, the B Tech CCE graduate should be able to devise solutions for complex engineering problems and design system components or processes that meet the specified requirements with appropriate consideration for law, safety, cultural & societal obligations with environmental considerations.

PO4. **Conduct investigations of complex problems**: To imbibe the inquisitive practices to have thrust for innovation and excellence that leads to use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO6. **The engineer and society**: The engineers are called society builders and transformers. B. Tech CCE graduate should be able to apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. **Environment and sustainability**: The zero effect and zero defect is not just a slogan, it is to be practised in each action. Thus a B Tech CCE should understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. **Ethics**: Protection of IPR, staying away from plagiarism are important. Student should be able to apply ethical principles and commit to professional ethics, responsibilities and norms of the engineering practice.

PO9. **Individual and team work**: United we grow, divided we fall is a culture at MUJ. Thus an outgoing student should be able to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. **Communication**: Communicate effectively for all engineering processes & activities with the peer engineering team, community and with society at large. Clarity of thoughts, being able to comprehend and formulate effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in varied environments.

PO12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)

[PSO.1] Will be able to design, develop and implement efficient software for a given real life problem.
[PSO.2] Will be able to apply knowledge of AI, Machine Learning and Data Mining in analyzing big data for extracting useful information from it and for performing predictive analysis.
[PSO.3] Will be able to design, manage and secure wired/ wireless computer networks for transfer and sharing of information.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Continuous evaluation (Record + Execution + Viva)	60
	Lab project	10
End Term Exam (Summative)	End Term Exam (CLOSED BOOK)	30
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

E. SYLLABUS

DB application development with MS Access, Experiments on DDL and Basic SQL, Advanced SQL, ER diagrams using DIA tool, Data Integrity Constraints and Built-in Functions, Design and Implementing the data requirements of a simple DB application, Experiments on Basic PL/SQL, PL/SQL Exceptions and Transactions, PL/SQL Cursors, PL/SQL Procedures, Functions and Packages, DB application development with Java as front end

F. Text Books

T1. “Teach yourself SQL & PL/SQL using Oracle 8i & 9i with SQLJ”, Ivan Bayross, BPB Publications, 2010

G. Reference Books

R1. Avi Silberschatz, Henry F. Korth, S. Sudarshan, “Database System Concepts”, TMH, New Delhi, 2006

H . Lecture Plan

Lab No.	Topics	Session Outcome	Mode of Delivery	Correspon ding CO	Mode of Assessing the Outcome
1	• Introduction to basic DDL, DML and DCL commands and domain types in SQL. • DDL statements to create, drop, alter, view and rename the Database.	• Understand basic concepts of DDL, DML and DCL • Demonstrate working of various DDL statements	Lecture Demonstration at system	CS1432.1 CS1432.2	Continuous Evaluation End Term Examination
2	• Write DML statements to insert the values into the tables. Use variants to insert values such as insert multiple records and insert records resulting from a select query. • Write statements to add and delete a column in a table which is pre-existent. • Write DML statements to update a table for single and multiple field updation. • Write DML statements to delete single or multiple record(s) from a table.	• Demonstrate working of various DML statements	Lecture Demonstration at system	CS1432.2	Continuous Evaluation End Term Examination
3-4	• Add primary key constraint to a pre-existent table. • Add NOT NULL / UNIQUE constraint to a pre-existent column. • Define the foreign key constraint. Show the errors returned by Database when: • a) FK constraint is violated • b) A referenced item is deleted	• Understand use of different types of constraints	Lecture Demonstration at system	CS1432.1 CS1432.2	Continuous Evaluation End Term Examination

	• Define and demonstrate cascading effect in foreign key referenced tables. • Define, add and drop the check/default constraint. • Define auto increment arguments/attributes of a table.				
5-6	• Practice SELECT query with following options: Distinct, order by, between, top/max/min and other aggregation keywords, group by, having, wild card matching, exists • Nested subqueries	Demonstrate nested subqueries and different DML statements	Lecture Demonstration at system	CS1432.3	Continuous Evaluation Project End Term Examination
7-8	• Write a query to create INNER JOIN / LEFT JOIN / RIGHT JOIN / FULL JOIN in two tables.	Demonstrate different JOIN operations	Lecture Demonstration at system	CS1432.3	Continuous Evaluation Project End Term Examination
9	• Write a query to create/delete VIEW from two tables including some selection criteria. • Write a query to create and delete clustered/non-clustered index for a table.	Demonstrate the use of VIEW and indexing	Lecture Demonstration at system	CS1432.3	Continuous Evaluation Project End Term Examination
10-11	• To implement the concept of trigger in database: ▪ How to apply database triggers ▪ Types of database triggers ▪ Create/delete database triggers	Demonstrate use of TRIGGERS	Lecture Demonstration at system	CS1432.5	Continuous Evaluation Project End Term Examination

	▪ Create trigger to demonstrate magic tables (INSERTED and DELETED). ▪ Create a hypothetical situation to undo the changes in a table via Trigger (Max credit limit reached/ Balance insufficient etc.).				
12-13	• Write some stored procedures to cover the following problems: ▪ Demonstrate Control structures ▪ Swap two numbers ▪ Find the sum of digits ▪ Calculate grades etc. • Define Transaction, demonstrate the Commit and Rollback operations using hypothetical situations.	Demonstrate stored procedures and transaction	Lecture Demonstration at system	CS1432.4 CS1432.6	Continuous Evaluation Project End Term Examination

1 Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES			
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
[CS1432.1]:	Demonstrate the concepts of ER, EER diagrams and introduction to SQL	**1**	**1**	**2**	**2**	**1**	**1**		**1**	**1**		**1**		**1**	**1**		
[CS1432.2]:	Demonstrate the concepts and queries of DDL	**1**	**1**	**1**										**1**			
[CS1432.3]:	Demonstrate the concepts and queries of DML	**1**	**1**	**1**										**1**			
[CS1432.4]:	Demonstrate the concepts and queries of DCL	**1**		**1**					**1**	**1**	**1**	**1**		**1**			
[CS1432.5]:	Demonstrate the concepts of triggers in database	**1**	**1**	**2**	**1**	**1**				**1**		**1**		**1**		**1**	
[CS1432.6]:	Demonstrate the concepts of stored procedures and transaction to acquire efficient database management skill.	**1**	**1**	**2**	**1**	**1**						**1**		**1**			

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Computing and IT

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Course Hand-out

Operating Systems | CS 1401 | 4 Credits | 3 0 1 3

Session: Jan 20-May 20 | Faculty: Dr. Umashankar Rawat | Class: B. Tech. IV SEM

A. **Introduction:** This course is offered by Dept. of Computer Science and engineering as a department core subject. The course provides a comprehensive understanding of Operating System principles, techniques and approaches used for designing the software. The focus of the course is to make the students understand how various components of operating system interact and provides services for execution of application software. Student will be apprised of process management, deadlock, concurrency control, memory management, file management and I/O management in detail, which will be beneficial for software development.

B. **Course Outcomes:** At the end of the course, students will be able to:

[1401.1]. Describe the objectives, structure, functionality and types of operating systems.
[1401.2]. Build skills to develop system programs using file and process system calls and PThread API.
[1401.3]. Compare various algorithms used for process scheduling.
[1401.4]. Describe concepts related to concurrency and achieve the same for cooperating processes, Apply various deadlock handling strategies to solve resource allocation problems.
[1401.5]. Evaluate the performance of different memory management techniques and page replacement algorithms.
[1401.6]. Describe file concepts and analyse various disk scheduling and storage strategies.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1] **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2] **Problem analysis**: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3] **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4] **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5] **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6] **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7] **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8] **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices.

[PO.9] **Individual and teamwork**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10] **Communication**: Communicate effectively_on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11] Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

[PO.12] Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

[PSO.1] Will be able to design, develop and implement efficient software for a given real life problem.

[PSO.2] Will be able to apply knowledge of AI, Machine Learning and Data Mining in analyzing big data for extracting useful information from it and for performing predictive analysis.

[PSO.3] Will be able to design, manage and secure wired/ wireless computer networks for transfer and sharing of information.

D. ASSESSMENT PLAN:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Open Book)	15
	Sessional Exam II (Open Book)	15
	Quizzes and Assignments (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Open Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

Introduction: Operating system structure, Operating system operations, Process management, Memory management, Storage management, Protection and security, Special purpose systems. **System structure:** Operating system services, User operating system interfaces, System calls, Types of system calls, System programs, Operating system structure, Virtual machines, System boot. **Process:** Process Concept, Process scheduling, Operations on processes, Inter-process communication, Unix Pipes. **Multithreaded Programming:** Multithreaded models, Thread libraries, Programs using PThreads. **Process scheduling:** Basic concepts, scheduling criteria, Scheduling algorithms. **Process Synchronization:** Critical section problem, Peterson's solution, Synchronization Hardware, Semaphores, Classical problems of synchronization, Synchronization programs using PThreads. **Deadlocks:** System model, Deadlock Characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock. **Memory Management:** Background, Swapping, Contiguous Memory Allocation, Paging, Structure of Page Table, Segmentation, Demand Paging, Page Replacement Policies, Allocation of Frames, Thrashing**. File System Interface and Implementation:** File Concept, Access Methods, Directory and Disk Structure, File System Mounting, File System Structure, File System Implementation, Space Allocation Methods for Files, Free Space Management. **Disk Management:** Disk Scheduling Algorithms, Disk Management, Swap Space Management. **Protection and Security**: Goals of Protection, Domain of Protection, Access Matrix, Implementation of Access Matrix, Security Problem, User Authentication, Program Threats, System Threats, Intrusion Detection.

TEXTBOOKS

T1. A. Silberschatz, P. B. Galvin and G. Gagne, *"Operating System Concepts",* 9th Edition, Wiley, 2014.

REFERENCE BOOKS

R1. A.S. Tanenbaum, "*Modern Operating Systems*", 3rd Edition, Prentice Hall India.

R2. W. Stallings, "*Operating Systems*", 7th Edition, Pearson.

R3. W. R. Stevens and S. A. Rago, "*Advanced Programming in the UNIX Environment*", 3rd Edition, Addison-Wesley, 2013.

F. Lecture Plan:

Lecture No	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1	Introduction and Course Hand-out briefing	To acquaint and clear teachers' expectations and understand student expectations	Lecture	NA	NA
2,3	**Introduction:** Operating system structure, Operating system operations, Process management, Memory management Storage management, Protection and security, Special purpose systems.	Describe the objectives, functionality and different types of operating systems	Lecture	1401.1	Quiz MTE-1 End Term
4,5,6	**System structure:** Operating system services, User operating system interfaces System calls, Types of system calls, System programs Operating system structure, Virtual machines, System boot.	Explain dual mode CPU operation, execution of system calls, interrupts, various operating system structures and booting process	Lecture	1401.1	Quiz MTE-1 End Term
7,8,9,10,11	**Process:** Process Concept, Process scheduling Operations on processes Inter-process Communication, Unix Pipes	Describe process state transitions, process control block, and context switching and write system programs for process creation, execution, inter-process communication.	Lecture	1401.2	Quiz MTE-1 End Term Programming Assignment
12,13,14,15	**Multithreaded Programming:** Overview, multithreaded models Thread libraries Programs using Pthreads	Describe significance of threads, multithreaded models and write system programs using PThreads	Lecture	1401.2	Quiz MTE-1 End Term Programming Assignment
16,17, 18, 19, 20	**Process scheduling:** Basic concepts, scheduling criteria, Scheduling Algorithms.	Compare various algorithms used for process scheduling based on various scheduling criteria	Lecture Tutorial	1401.3	Quiz Mid Term I End Term
FIRST SESSIONAL EXAM					
21, 22, 23, 24, 25	**Process Synchronization:** Background, Critical section problem Peterson's solution Synchronization Hardware, Semaphores Classical problems of synchronization. Programs using PThreads	Apply concepts related to concurrency to achieve the same for cooperating processes	Lecture Tutorial	1401.4	Quiz MTE-2 End Term Tutorial
26, 27	Synchronization Programs using PThreads	Write programs for synchronization problems	Lecture	1401.4	Quiz MTE-2 End Term Project

28, 29, 30, 31	**Deadlocks:** System model, Deadlock Characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.	Apply various deadlock handling strategies to solve resource allocation problems	Lecture Tutorial	1401.4	Quiz MTE-2 End Term Tutorial
32, 33, 34, 35, 36	**Memory Management:** Background, Swapping, Contiguous Memory Allocation, Paging, Structure of Page Table, Segmentation,	Evaluate the performance of different memory management techniques	Lecture Tutorial	1401.5	Quiz MTE-2 End Term Tutorial
37, 38, 39, 40, 41	Demand Paging, Page Replacement Policies, Allocation of Frames, Thrashing**.**	Describe the concept of virtual memory, and compare various page replacement algorithms	Lecture Tutorial	1401.5	Quiz End Term Tutorial
SECOND SESSIONAL EXAM					
42, 43, 44, 46, 47, 48	**File System Interface and Implementation:** File Concept, Access Methods, Directory and Disk Structure, File System Mounting, File System Structure, File System Implementation, Space Allocation Methods for Files, Free Space Management.	Compare various file allocation methods and free space management techniques	Lecture Tutorial	1401.6	Quiz End Term
49, 50, 51	**Disk Management:** Disk Scheduling Algorithms, Disk Management, Swap Space Management.	Analyse various disk scheduling strategies	Lecture Tutorial	1401.6	Quiz End Term
52, 53, 54	**Protection and Security:** Goals of Protection, Domain of Protection, Access Matrix, Implementation of Access Matrix, Security Problem, User Authentication, Program Threats, System Threats, Intrusion Detection	Apply various techniques used for file security in operating systems	Lecture	1401.6	End Term
END TERM EXAM					

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CS 1401.1	Describe the objectives, structure, functionality and types of operating systems.	**2**	**1**	**1**		**1**							**2**	**1**	**1**	**1**
CS 1401.2	Build skills to develop system programs using file and process system calls and PThread API.	**2**	**2**	**3**		**1**					**1**	**1**	**2**	**1**		**2**
CS 1401.3	Compare various algorithms used for process scheduling.	**2**	**2**	**2**		**1**							**2**	**1**		**1**
CS 1401.4	Describe concepts related to concurrency and achieve the same for cooperating processes, apply various deadlock handling strategies to solve resource allocation problems.	**2**	**2**	**2**	**1**	**1**							**2**	**1**		**1**
CS 1401.5	Evaluate the performance of different memory management techniques and page replacement algorithms.	**2**	**2**	**2**	**1**	**1**					**1**	**1**	**2**	**1**		**1**
CS 1401.6	Describe file concepts and analyse various disk scheduling and storage strategies.	**2**	**2**	**2**	**1**	**1**					**1**	**1**	**2**	**1**		**1**

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Computing and IT

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Course Hand-out

Operating Systems Lab | CS 1431 | 1 Credit | 0 0 2 1

Session: Jan 20-May 20 | Faculty: Dr. Umashankar Rawat | Class: B. Tech. IV SEM

A. Introduction: The objective of this lab is to provide students practical knowledge of Unix Commands, various scheduling page replacement and deadlock handling algorithms and to familiarize the students with the fundamental concepts, techniques and implementation details of operating systems. Participation in this course will enable students to compare the working behaviour and functions of different operating systems.

B. Course Outcomes: At the end of the course, students will be able to:

[CS1431.1]: Explain basic Unix commands and write shell Scripts.
[CS1431.2]: Build Skills to develop system programs using file and process system calls and PThread API.
[CS1431.3]: Compare various algorithms used for process scheduling.
[CS1431.4]: Describe concepts related to concurrency and achieve the same for cooperating processes, apply various deadlock handling strategies to solve resource allocation problems.
[CS1431.5]: Evaluate the performance of different memory management techniques and page replacement algorithms.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. **Engineering knowledge**: Apply the knowledge of mathematics, computer science, and communication engineering fundamentals to the solution of complex engineering problems.

[PO.2]. **Problem analysis**: The sophisticated curriculum would enable a graduate to identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using basic principles of mathematics, computing techniques and communication engineering principles.

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[PO.4]. **Conduct investigations of complex problems**: To imbibe the inquisitive practices to have thrust for innovation and excellence that leads to use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

[PO.5]. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

[PO.6]. **The engineer and society**: The engineers are called society builders and transformers. B. Tech IT graduate should be able to apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

[PO.7]. Environment and sustainability: The zero effect and zero defect is not just a slogan, it is to be practised in each action. Thus, a B Tech IT should understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

[PO.8]. Ethics: Protection of IPR, staying away from plagiarism are important. Student should be able to apply ethical principles and commit to professional ethics, responsibilities and norms of the engineering practice.

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[PO.10]. Communication: Communicate effectively for all engineering processes & activities with the peer engineering team, community and with society at large. Clarity of thoughts, being able to comprehend and formulate effective reports and design documentation, make effective presentations, and give and receive clear instructions.

[PO.11]. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in varied environments.

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[PSO.3] Will be able to design, manage and secure wired/ wireless computer networks for transfer and sharing of information.

D. ASSESSMENT PLAN:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Continuous evaluation (Record + Execution + Viva)	60
	Lab project	10
End Term Exam (Summative)	End Term Exam (CLOSED BOOK)	30
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

E. SYLLABUS

Testing the use of UNIX commands, UNIX shell commands, Basics of Shell Programming, UNIX System Calls, CPU Scheduling Algorithms, Deadlock Detection Algorithms, Deadlock Avoidance Algorithms, Page Replacement Algorithms, Memory Allocation Algorithms, Disk Scheduling Algorithms, and UNIX Inter Process Communication

TEXT BOOKS

T1. S. Das, "*Unix Concepts and Applications*", 4th Edition, Tata McGraw-Hill, 2017.
T2. A. Silberschatz, P. B. Galvin and G. Gagne, *"Operating System Concepts",* 9th Edition, Wiley, 2014.

REFERENCE BOOKS

R1. R. Blum, and C. Bresnahan, *"Linux Command Line and Shell Scripting Bible",* 3rd Edition, Wiley, 2015.
R2. Maurice J. Bach, "*The Design of the UNIX Operating System*", Pearson Education.

F. Lecture Plan

Lab No.	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1-4	**Introduction- Linux Operating System, Unix Commands and Shell Scripts**	Define basic terminology related to OS.	Lecture Demonstration at system	CS1432.1	Continuous Evaluation End Term Examination
		List and demonstrate various basic Unix and shell script commands.			
		Illustrate use of Unix and Shell scripts commands in writing shell scripts.			
5,6	**System Calls**	Program writing using file system related system calls.	Lecture Demonstration at system	CS1432.2	Continuous Evaluation End Term Examination
7,8	**Process Control**	Illustrate process creation and its termination. (Using fork and kill)	Lecture Demonstration at system	CS1432.2	Continuous Evaluation End Term Examination
		Illustrate Inter-Process communication using pipes.			
		Illustrate Zombie and Orphan Process.			
9	**Process Scheduling**	Apply knowledge of CPU scheduling algorithms in Implementing various CPU Scheduling Algorithms viz. FCFS, SJF, Priority and Round Robin.	Lecture Demonstration at system	CS1432.3	Continuous Evaluation End Term Examination
10	**Thread**	Implementation of concept of Multi-Threading using PThread in Linux OS.	Lecture Demonstration at system	CS1432.2	Continuous Evaluation End Term Examination
11	**Deadlock**	Apply Bankers Algorithm for Deadlock Avoidance.	Lecture Demonstration at system	CS1432.4	Continuous Evaluation End Term Examination
12	**Process Synchronization**	Implementation of Producer-Consumer, Reader-Writer Synchronization Problems using Semaphores	Lecture Demonstration at system	CS1432.4	Continuous Evaluation End Term Examination
13	**Memory Management Policies**	Illustration of Page Replacement Algorithms: FIFO, Optimal and LRU	Lecture Demonstration at system	CS1432.5	Continuous Evaluation End Term Examination
		Illustration of memory allocation strategies: First Fit, Best Fit, Next Fit and Worst Fit			

G. Course Articulation Matrix: (Mapping of COs with POs):

CO	STATEMENT	Correlation with program outcomes												Correlation with program specific outcomes		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
[CS1431.1]:	Explain basic Unix commands and write shell Scripts.	**1**	**1**	**2**	**2**	**1**	**1**		**1**	**1**		**1**		**1**	**1**	**1**
[CS1431.2]:	Build skills to develop system programs using file and process system calls and PThread API.	**1**	**1**	**1**										**1**		
[CS1431.3]:	Compare various algorithms used for process scheduling.	**1**	**1**	**1**										**1**		
[CS1431.4]:	Describe concepts related to concurrency and achieve the same for cooperating processes, apply various deadlock handling strategies to solve resource allocation problems.	**1**		**1**					**1**	**1**	**1**	**1**		**1**	**1**	
[CS1431.5]:	Evaluate the performance of different memory management techniques and page replacement algorithms.	**1**	**1**	**2**	**1**	**1**				**1**		**1**		**1**		

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

DEPARTMENT OF COMPUTER SCIENCE ENGINEERING

Course Hand-out

Microprocessor and Microcontroller Lab | CS 1433 | 2 Credit | 0 1 2 2

Session: Jan '2020 – May '2020 | Faculty: Mr. Tarun Jain (Coordinator)

Class: B.Tech. IInd Year IV Semester

A. Introduction:

The aim of this laboratory is to have a basic understanding of microprocessor and explore a 16-bit one from a hardware and software point of view in implementation. The major stress would be on architectural aspects and the programmer's model with an intensive coaching on assembly programming. The design aspects of a micro-computer system comprising of various peripherals would be another major area of discourse.

B. Course Outcomes: At the end of the course, students will be able to

[CS1433.1]: Interpret and illustrate the basic architecture of 16-bit 8086 Microprocessors & its need.

[CS1433.2]: Understand & Apply basic instruction set of 8086 to write the assembly language programming.

[CS1433.3]: Analyze and Implement various instruction timing, delay loops, Procedures and Macros.

[CS1433.4]: Analyze and Implement various string instruction and Flag instructions.

[CS1433.5]: Understand the internal architecture and interfacing of different peripheral devices with 8086 microprocessor.

C PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

PO1. **Engineering knowledge**: Apply the knowledge of mathematics, computer science, and communication engineering fundamentals to the solution of complex engineering problems.

PO2. **Problem analysis**: The sophisticated curriculum would enable a graduate to identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using basic principles of mathematics, computing techniques and communication engineering principles.

PO3. **Design/development of solutions**: Upon analysing, the B Tech graduate should be able to devise solutions for complex engineering problems and design system components or processes that meet the specified requirements with appropriate consideration for law, safety, cultural & societal obligations with environmental considerations.

PO4. **Conduct investigations of complex problems**: To imbibe the inquisitive practices to have thrust for innovation and excellence that leads to use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO6. The engineer and society: The engineers are called society builders and transformers. B. Tech IT graduate should be able to apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. Environment and sustainability: The zero effect and zero defect is not just a slogan, it is to be practised in each action. Thus a B Tech should understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. Ethics: Protection of IPR, staying away from plagiarism are important. Student should be able to apply ethical principles and commit to professional ethics, responsibilities and norms of the engineering practice.

PO9. Individual and team work: United we grow, divided we fall is a culture at MUJ. Thus an outgoing student should be able to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. Communication: Communicate effectively for all engineering processes & activities with the peer engineering team, community and with society at large. Clarity of thoughts, being able to comprehend and formulate effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in varied environments.

PO12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)

The graduation from B.Tech. in Computer Science & Engineering will empowers the student:

PSO 1: Will be able to design, develop and implement efficient software for a given real life problem.

PSO 2: Will be able to apply knowledge of AI, Machine Learning and Data Mining in analyzing big data for extracting useful information from it and for performing predictive analysis.

PSO 3: Will be able to design, manage and secure wired/ wireless computer networks for transfer and sharing of information.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Continuous evaluation (Record + Execution + Viva)	70
End Term Exam (Summative)	End Term Practical Exam (CLOSED BOOK)	30
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

E. SYLLABUS

Data and Address transfer Instructions, Simple Arithmetic Instructions, Arithmetic Instructions, BIT Manipulation Instructions: Program execution transfer Instructions, Program execution Transfer Instructions, Array operations, String Operations.

F. TEXT BOOK

T1. Douglas. V. Hall, “Microprocessors and Interfacing”, TMH, Revised Second Edition 2006, ISBN-10: 0-07-060167-4. Reprint -2011.

T2. N. S. Kumar, M. Saravanan et. al. “Microprocessors and Microcontrollers”, Oxford Higher Education, 2015.

G. REFERENCES

R1. B. Brey, “The Intel Microprocessors”, Prentice Hall India, Seventh Edition, 2005.

R2. Clements, “Microprocessor system design 68000 Hardware”, Software and Interfacing, PWS Publishing Company, Third Edition, 1997.

G. Lab Plan

Lab No.	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1	Basic introduction of 8086 emulator.	Use of 8086 emulator for writing assembly programs.	Lecture Demonstration at system	CS1433.1	Continuous Evaluation End Term Examination
2	Implementation of data transfer instruction	Understand data transfer instructions with register and memory.	Lecture Demonstration at system	CS1433.1	Continuous Evaluation End Term Examination
3	Implementation of arithmetic addition and subtraction operation by different addressing modes.	Understand the use of addition and subtraction instructions.	Lecture Demonstration at system	CS1433.2	Continuous Evaluation End Term Examination
4	Implementation of arithmetic multiplication and division operation by different addressing modes.	Understand the use of multiplication and division instructions.	Lecture Demonstration at system	CS1433.2	Continuous Evaluation End Term Examination
5	Implementation of arithmetic multiplication and division operation by using repetitive addition and subtraction.	Understand the use of multiplication and division with repetitive addition and substation by applying LOOP instructions.	Lecture Demonstration at system	CS1433.2 CS1433.3	Continuous Evaluation End Term Examination
6	Implementation of complement (1's and 2's) and shift (Left and Right) operation by different addressing modes.	Understand the use of complement, shift and rotate instructions.	Lecture Demonstration at system	CS1433.2 CS1433.3	Continuous Evaluation End Term Examination
7	Branching instruction: Implementation of if- else instruction program.	Demonstrate the use of Branch control and Jump instructions in development of programs.	Lecture Demonstration at system	CS1433.3 CS1433.4	Continuous Evaluation End Term Examination
8	String instruction: Implementation Of data transfer by using string data.	Understand string data transfer instructions with register and memory.	Lecture Demonstration at system	CS1433.3	Continuous Evaluation End Term Examination

9	Bit Manipulation instruction: Implementation of NOT, AND & OR instruction program.	Demonstrate the use of logical instructions in development of programs.	Lecture Demonstration at system	CS1433.4	Continuous Evaluation End Term Examination
10	Iteration Control Instructions: Implementation of Loop instruction program.	Demonstrate the use of Iteration Control Instructions in development of programs.	Lecture Demonstration at system	CS1433.3 CS1433.4	Continuous Evaluation End Term Examination
11	Processor Control Instructions: Implementation of flag controlling instruction program.	Demonstrate the use of Processor Control Instructions in development of programs.	Lecture Demonstration at system	CS1433.3 CS1433.4	Continuous Evaluation End Term Examination
12	Sorting: Implementation of different comparison based sorting technique program.	Demonstrate the sorting in assembly program using instructions.	Lecture Demonstration at system	CS1433.4	Continuous Evaluation End Term Examination
13	Traffic control system: Illustration of traffic control system.	Understand how to develop a real life problem as traffic control using instructions of assembly programming.	Lecture Demonstration at system	CS1433.4 CS1433.5	Continuous Evaluation End Term Examination

I Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
[CS1433.1]:	Interpret and illustrate the basic architecture of 16-bit 8086 Microprocessors & its need.	1	1	2	2	1	1		1	1		1		1	1	
[CS1433.2]:	Understand & Apply basic instruction set of 8086 to write the assembly language programming.	1	1	1							1			1		
[CS1433.3]:	Analyse and Implement various instruction timing, delay loops, Procedures and Macros.	1	1	1		1								1		
[CS1433.4]:	Analyse and Implement various string instruction and Flag instructions.	1							1		1	1		1		
[CS1433.5]:	Understand the internal architecture and interfacing of different peripheral devices with 8086 microprocessor.	1	1	2	1	1		1				1		1	1	1

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Course Hand-out

Microprocessor and Microcontroller | CS 1403 | 3 Credit | 3 0 0 3

Session: Jan '2020 – May '2020 | Faculty: Mr. Tarun Jain (Course Coordinator)

Class: B.Tech. IInd Year IV Semester

A. Introduction:

The objective of this course is to have a basic understanding of microprocessor & microcontrollers and explore a 16-bit platform for hardware and software point of view. The major stress would be on architectural aspects and the programmer's model with an intensive coaching on assembly programming. The design aspects of a micro-computer system comprising of various peripherals would be another major area of discourse.

B. Course Outcomes: At the end of the course, students will be able to

[CS1403.1]: Understand the internal architecture and interfacing of different peripheral devices with 8086 microprocessor.

[CS1403.2]: Understand & Apply basic instruction set of 8086 to write the assembly language programming.

[CS1403.3]: Analyze and Implement various instruction timing, delay loops, Procedures and Macros.

[CS1403.4]: Understand the internal architecture and interfacing of different peripheral devices with 8086 microprocessor.

[CS1403.5]: Become proficient at working on 16-Bit microcontroller based systems.

C PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

PO1. **Engineering knowledge**: Apply the knowledge of mathematics, computer science, and communication engineering fundamentals to the solution of complex engineering problems.

PO2. **Problem analysis**: The sophisticated curriculum would enable a graduate to identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using basic principles of mathematics, computing techniques and communication engineering principles.

PO3. **Design/development of solutions**: Upon analysing, the B Tech graduate should be able to devise solutions for complex engineering problems and design system components or processes that meet the specified requirements with appropriate consideration for law, safety, cultural & societal obligations with environmental considerations.

PO4. **Conduct investigations of complex problems**: To imbibe the inquisitive practices to have thrust for innovation and excellence that leads to use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO6. **The engineer and society**: The engineers are called society builders and transformers. B. Tech IT graduate should be able to apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. **Environment and sustainability**: The zero effect and zero defect is not just a slogan, it is to be practised in each action. Thus a B Tech should understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. **Ethics**: Protection of IPR, staying away from plagiarism are important. Student should be able to apply ethical principles and commit to professional ethics, responsibilities and norms of the engineering practice.

PO9. **Individual and team work**: United we grow, divided we fall is a culture at MUJ. Thus an outgoing student should be able to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. **Communication**: Communicate effectively for all engineering processes & activities with the peer engineering team, community and with society at large. Clarity of thoughts, being able to comprehend and formulate effective reports and design documentation, make effective presentations, and give and receive clear instructions.

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PO12**. Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)

The graduation from B.Tech. in Computer Science & Engineering will empowers the student:

PSO 1: Will be able to design, develop and implement efficient software for a given real life problem.

PSO 2: Will be able to apply knowledge of AI, Machine Learning and Data Mining in analyzing big data for extracting useful information from it and for performing predictive analysis.

PSO 3: Will be able to design, manage and secure wired/ wireless computer networks for transfer and sharing of information.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	15
	Sessional Exam II (Closed Book)	15
	5 Quizzes and 2 Assignments (Accumulated and Averaged)	20+5+5
End Term Exam (Summative)	End Term Exam (Closed Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

8086: internal architecture, programming the 8086, Addressing modes, Flags; Instruction Set: assembler and Assembler directives, Simple sequence programs, Jumps and conditional jumps, Loop instructions, Instruction timing and delay loops; String instructions, Writing and Using Procedures and Macros, 8255: Programmable Parallel ports and Handshake Input/ Output; Interrupts and Interrupt Responses: 8259 Priority Interrupt Controller, 8254 Software-Programmable Timer/counter; Software interrupts, Intel 8096-16-bitMicrocontroller: Overview; Instruction Set and Programming; Hardware features, , iRMX, ARM processor, Real-Time Executive: iRTX.

F. TEXT BOOK

T1. Douglas. V. Hall, "*Microprocessors and Interfacing*", TMH, Revised Second Edition 2006, ISBN-10: 0-07-060167-4. Reprint -2011.

T2. N. S. Kumar, M. Saravanan et. al. "Microprocessors and Microcontrollers", Oxford Higher Education, 2015.

G. REFERENCES

R1. B. B. Brey, "*The Intel Microprocessors*", Prentice Hall India, Seventh Edition, 2005.

R2. A. Clements, "*Microprocessor system design 68000 Hardware*", Software and Interfacing, PWS Publishing Company, Third Edition, 1997.

H. Lecture Plan

Lecture No.	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1	Introduction-Microprocessor and Microcontroller	Basic understanding of the course, practicality of the microprocessor and microcontroller	Lecture	1403.1 1403.5	NA
2	Segmentation, Physical Address Calculation	Understanding the memory organization of 8086	Lecture	1403.1	In Class Quiz Mid Term I End Term
3-4	Detailed System Architecture	Identifying the building blocks of system architecture and their functions	Lecture	1403.1	In Class Quiz Mid Term I End Term
5-6	Addressing modes	Understanding the structure of instructions	Lecture, Practice questions	1403.1 1403.2	Home Assignment Mid Term I End Term
7	Introduction to Programming-Data Transfer Instructions	Understanding the assembly language programming and 8086 instruction set	Lecture, Practice questions	1403.2	In Class Quiz Home Assignment Mid Term I End Term
8	Stack Instructions and I/O	Understanding the working of stack instructions	Lecture, Practice questions	1403.2	In Class Quiz Home Assignment Mid Term I End Term
9	Arithmetic Instructions	Understanding the working of arithmetic instructions	Lecture, Practice questions	1403.2	In Class Quiz Home Assignment Mid Term I End Term
10	BCD Arithmetic Instructions	Understanding the working of BCD arithmetic instructions	Lecture, Practice questions	1403.2	In Class Quiz Home Assignment Mid Term I End Term
11	Logical Instructions	Understanding the working of logical instructions	Lecture, Practice questions	1403.2	In Class Quiz Home Assignment Mid Term I End Term

12	Flag Controlling Instructions and Branching Instructions	Understanding the working of flag and branching instructions	Lecture, Practice questions	1403.2	In Class Quiz Home Assignment Mid Term I End Term
13	Loop Instructions	Understanding the working of loop instructions	Lecture, Practice questions	1403.2	In Class Quiz Home Assignment Mid Term I End Term
14	Instruction timing and delay loops	Understanding the working of delay loops and timing of instructions	Lecture, Practice questions	1403.2	In Class Quiz Home Assignment Mid Term I End Term
15	Assembler Directives	Use of assembler directives	Lecture, Practice questions	1403.2	In Class Quiz Home Assignment Mid Term I End Term
16	String Instructions	Working of string instructions	Lecture, Practice questions	1403.2	In Class Quiz Home Assignment Mid Term I End Term
17	Writing and Using Procedures	Implementing procedures in 8086 assembly programs	Lecture, Practice questions	1403.3	In Class Quiz Home Assignment Mid Term II End Term
18	Macros	Implementing macros in 8086 assembly programs and difference between procedure and macros	Lecture, Practice questions	1403.3	In Class Quiz Home Assignment Mid Term II End Term
19-22	8255: Programmable Parallel ports and Handshake Input/ Output	Understand the internal architecture and interfacing of 8255 with 8086	Lecture	1403.4	In Class Quiz Home Assignment Mid Term II End Term
23	Interrupts and Interrupt Responses	Understanding the concept of interrupts and interrupt responses	Lecture	1403.4	In Class Quiz Home Assignment Mid Term II End Term
24-27	8259 Priority Interrupt Controller	Understand the internal architecture and interfacing of 8259 with 8086	Lecture	1403.4	In Class Quiz Home Assignment Mid Term II

					End Term
28-31	8254 Software-Programmable Timer/counter; Software interrupts	Understand the internal architecture and interfacing of 8254 with 8086	Lecture	1403.4	In Class Quiz Home Assignment Mid Term II End Term
32-36	Intel 8096-16-bit Microcontroller: Overview; Instruction Set and Programming; Hardware features	Understand the basic architecture of 16-bit microcontroller & its need.	Lecture	1403.5	In Class Quiz Home Assignment End Term
37	ARM processor, Real-Time Executive: iRTX	Understand the basic architecture of ARM processor & its need.	Lecture, Hands on session	1403.5	In Class Quiz Home Assignment End Term

I Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
[CS1403.1]:	Interpret and illustrate the basic architecture of 16-bit 8086 Microprocessors & its need.	2	2	1		1	1		1	1		1	1	1		
[CS1403.2]:	Understand & Apply basic instruction set of 8086 to write the assembly language programming.	3	2	1	2						1		1	3		
[CS1403.3]:	Analyse and Implement various instruction timing, delay loops, Procedures and Macros.		3		2	1							1	2		
[CS1403.4]:	Understand the internal architecture and interfacing of different peripheral devices with 8086 microprocessor.	2	2						1		1	1	1	1		
[CS1403.5]:	Become proficient at working on 16-Bit microcontroller based systems.			1	2	1		1				1	1	1	1	1

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Computing and IT

DEPARTMENT OF CCE

Course Hand-out

Web Technologies | CC1551| 3 Credits | 3 0 0 3

Session: July 19-Nov 19 | Faculty: Dr V S Dhaka | Class: B Tech V SEM

A. **Introduction:** This course is offered by the Department of Computer and Communication Engineering as Department Elective. The main objective of this course is to familiarize students with the basics of Web, Web clients and servers with working of HTTP. It also gives the insight of developing static and dynamic Web pages to serve as front-end to client/server applications, and effective server side programming while introducing event -driven system programming. The course also covers basics of XML and recent trends in the area of web technology. The course also covers application areas of Introduction of web technology in Electronic Commerce.

B. **Course Outcomes:** At the end of the course, students will be able to:

[CC 1551.1] Recognize fundamentals and working principles of web technology and web programming.

[CC 1551.2] Design and implement client-side web programming using HTML, Java Script and CSS.

[CC 1551.3] Implement server-side programming using PHP and JSP and Database interactions.

[CC 1551.4] Implement and deployment of Web based applications on web server and debugging.

[CC 1551.5] Developing skills for designing websites leads to entrepreneurship opportunities.

C. **PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES**

[PO.1] Engineering knowledge: <u>Apply the knowledge of mathematics, computer science, and communication engineering fundamentals</u> to the solution of complex engineering problems.

[PO.2] Problem analysis: The sophisticated curriculum would enable a graduate to <u>identify, formulate, review research literature, and analyses complex engineering problems</u> reaching substantiated conclusions using basic principles of mathematics, computing techniques and communication engineering principles.

[PO.3] Design/development of solutions: Upon analyzing, the B Tech CCE, CSE, IT graduate will be able to devise <u>solutions for complex engineering problems and design system components or processes</u> that meet the specified requirements with appropriate consideration for law, safety, cultural & societal obligations with environmental considerations.

[PO.4] Conduct investigations of complex problems: To imbibe the inquisitive practices to have thrust for innovation and excellence that leads to use research-based knowledge and research methods including <u>design of experiments, analysis and interpretation of data, and synthesis of the information</u> to provide valid conclusions.

[PO.5] Modern tool usage: Create, select, and apply appropriate techniques, resources, and <u>modern engineering and IT tools</u> including prediction and modelling to complex engineering activities with an understanding of the limitations.

[PO.6] The engineer and society: The engineers are called society builders and transformers. B. Tech CCE, CSE and IT graduate will be able to apply reasoning informed by the <u>contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities</u> relevant to the professional engineering practice.

[PO.7] Environment and sustainability: The zero effect and zero defect is not just a slogan, it is to be practiced in each action. Thus a B Tech CCE, CSE and IT will understand the <u>impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.</u>

[PO.8] Ethics: Protection of IPR, staying away from plagiarism are important. Student will be able to apply ethical principles and commit to <u>professional ethics, responsibilities and norms of the engineering practice</u>.

[PO.9] Individual and team work: United we grow, divided we fall is a culture at MUJ. Thus an outgoing student will be able to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

[PO.10] Communication: Communicate effectively for all engineering processes & activities with the peer engineering team, community and with society at large. Clarity of thoughts, being able to comprehend and formulate effective reports and design documentation, make effective presentations, and give and receive clear instructions.

[PO.11] Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in varied environments.

[PO.12] Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)

At the end of the B Tech CCE program, the student:

[PSO.1] Will be able to clearly understand the basic principles, concepts and applications in the field of computer based Communication/networking, information sharing, signal processing, web based systems, smart devices and communication technology.

[PSO.2] Will be able to nail down the issues prevalent in the field of Computer and Communication Engineering.

[PSO.3] Will be able to identify and devise solutions for the existing open problems in the field of computing and propose the best possible solutions.

[PSO.4] Will be able to apply the contextual knowledge in the field of computing and communication to assess social, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional engineering practice.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Open Book)	15
	Sessional Exam II (Open Book)	15
	In class course Project, , MOOC (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Open Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work at home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

Introduction: Overview of Internet and the sub network "the Web", History, and Other sub networks, Web System Architecture, Web Clients and Web Servers, Application Servers. HTTP– Basics of HTTP Request and Response, HTTP Methods, headers, content transport (PUSH and PULL), Drawbacks HTTP1.0, Introduction to HTTP1.1, HTTPS, SSL, and Generation of Dynamic Web pages, Extension Mechanisms;

Client side programming: Web application Design Life-cycle, Web Markup Languages – What is markup, why markup, Intro to HTML and Deficiencies of HTML, Using XHTML – Basic syntax and semantics, fundamental elements, URLs – Inter-page and Intra-Page Linking, Lists, Tables, Frames and Forms., HTML Document Object Model (DOM), Styling with CSS, Introduction to HTML5 and CSS3;

Scripting: Client side dynamic programming with JavaScript – Basics, Primitives, Loops, Decision Statements, Screen Output and Keyboard Input, Arrays and Functions, Event Handling, Pattern Matching and Form Validation with Regular Expressions;

Server side Programming: Three Tier Model, PHP –Basics, Form Validation, Sessions and Session Tracking techniques, ASP, JSP;

Advanced technologies*:* XML– Syntax and Semantics, Document Structure, DTDs, Need for Namespaces-e Commerce Basics, Models and Architecture; ecommerce - WAP and Mobile Agents.

F. REFERENCE BOOKS

R1. J. C. Jackson, "*Web Technologies: A Computer Science Perspective*", Pearson Education, 2007.

R2. H. Chan, R. Lee, T. Dillon, E. Chang, "*E-commerce, Fundamentals and Applications*", John Wiley & Sons, 2007.

R3. DT Editorial Services, "HTML 5 Black Book", 2nd Edition, Wiley India, 2016.

R4. Treese, G. Winfield, L. C. Stewart, "*Designing Systems for Internet Commerce*", 2nd Edition, Addison-Wesley Professional, 2003.

R5. X. Bai, M. Ekedahl, *"The Web Warrior Guide to Web Programming",* 1st Edition, Course Technology Inc, 2003.

G. Lecture Plan:

Class Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1	Overview of Internet and the sub network	To acquaint and clear teachers' expectations and understand student expectations.	Lecture	1551.1	Class Quiz and Mid Term-I
2	Web System Architecture	To understand physical structure of Web system	Lecture	1551.1	Class Quiz and Mid Term-I
3,4	Web Clients and Web Servers	Identify various methods to store, process and deliver web pages to the clients from server.	Lecture	1551.1	Class Quiz and Mid Term-I Class Quiz and Mid Term-I Class Quiz and Mid Term-I
5,6	Application Servers	To describe the application servers	Lecture	1551.1	
7,8,9	HTTP– Basics of HTTP Request and Response, HTTP Methods, headers, content transport (PUSH and PULL), Drawbacks HTTP1.0	Illustrate the basics of HTTP, methods, with Drawbacks	Lecture	1551.1	
10	Introduction to HTTP1.1, HTTPS, SSL	To analyse security aspects of HTTP and SSL	Lecture	1551.1	Class Quiz Mid Term I End Term Continuous Evaluation Class Quiz Mid Term I End term
11	Discussion of Project and Assignment	Understand the case study on the project	Group Discussion	1551.4/5	
12,13	Generation of Dynamic Web pages, Extension Mechanisms	To understand Basics of Web development.	Lecture	1551.2	
14,15	Web application Design Life-cycle, Web Markup Languages	To apply website enhancement methods.	Lecture	1551.2	Home Assignment Class Quiz Mid Term I End Term Continuous Evaluation Class Quiz Mid Term I End Term
16	Project Study presentation by students	To provide early project feedbacks	Flip Class	1551.4/5	
17,18	Intro to HTML and Deficiencies of HTML	To design static web pages and define approach of development	Lecture	1551.2	
19	XHTML– Basic syntax and semantics, fundamental elements,	To understand XHTML	Lecture	1551.2	Class Quiz Mid Term I End Term Class Quiz Mid Term I End Term Class Quiz and Mid Term-I
20	URLs – Inter-page and Intra-page Linking, Lists, Tables, Frames and Forms	To design HTML frames, lists, tables.	Lecture	1551.2	
FIRST SESSIONAL EXAM From 05-09-2019 to 09-09-2019					
21,22	HTML Document Object Model (DOM), Styling with CSS	To understand Web development	Lecture	1551. 2	Class Quiz Mid-Term II and End Term Class Quiz Mid-Term II and End Term Class Quiz Mid-Term II
23,24	Introduction to HTML5 and CSS3	To illustrate web design and development using HTML, CSS	Lecture	1551.2/4	
25,26	Client side dynamic programming with JavaScript-Basics	To understand Advance web designing and development with Javascript	Lecture	1551.2/4	

					and End Term
27,28	Primitives, Loops, Decision Statements, Screen Output and Keyboard Input .	To understand loops and decision statement in Javascript.	Lecture	1551.2/4	Class Quiz Mid-Term II and End Term
29,30	Arrays and Functions, Event Handling, Pattern Matching and Form Validation with Regular Expressions	To apply verification and validation of web development using regular expressions.	Lecture	1551.2/4	Class Quiz Mid-Term II and End Term Continuous Evaluation
31	Midterm Project Presentation by the students and discussion	To get feedback on project status.	Flip Class	1551.4/5	
32	Three Tier Model	To analyse of Tier system	Lecture	1551.2/4	Class Quiz Mid-Term II and End Term Class Quiz Mid-Term II and End Term Class Quiz Mid-Term II and End Term
33	PHP –Basics, Form Validation	To understand dynamic programing – through PHP	Lecture	1551.3/4	
34,35	Sessions and Session Tracking techniques	To understand and apply session handling methodology of PHP using cookies and session	Lecture	1551.3/4	
36,37	ASP, JSP	To explain basics of dynamic programming using ASP, JSP	Lecture	1551.3/4	Class Quiz Mid-Term II and End Term Class Quiz Mid-Term II and End Term Class Quiz Mid-Term II and End Term
SECOND SESSIONAL EXAM From 04-11-2019 to 06-11-2019					
38-39	XML – Syntax and Semantics	To understand basics of XML and its application	Lecture	1551.3/4	Class Quiz and End term Class Quiz and End term Class Quiz and End term
40	Document Structure, DTDs, Need for Namespaces	To explain needs of DTD and namespaces in XML	Lecture	1551.4/5	
41	eCommerce Basics	To understand business web development in ecommerce domain	Lecture	1551.5	
42	Models and Architecture of eCommerce	To illustrate physical structure of eCommerce	Lecture	1551.4/5	Class Quiz and End term Class Quiz and End term Continuous Evaluation Class Quiz and End term
43	Ecommerce - WAP and Mobile Agents.	To analyze agent applications	Lecture	1551.4/5	
44	End Term Project Evaluation presentation	To provide project feedback and evaluation	Flip Class	1551.4/5	

END TERM EXAM From 29-11-2019 to 13-12-2019

H. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	Correlation with Program Outcomes **(POs)**												Correlation with Program Specific Outcomes (PSOs)			
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO4
[CC 551.1]	Recognize fundamentals and working principles of web technology and web programming.	2				3		2	2			3		3	2		
[CC 1515.2]	Design and implement client-side web programming using HTML, Java Script and CSS.			3	3	1							3		2	2	2
[CC 1515.3]	Implement server-side programming using PHP and JSP and Database interactions.		2	3	2	1	1			2	2					3	
[CC 1515.4]	Implement and deployment of Web based applications on web server and debugging.					3			1	1				3		2	2
[CC 1515.5]	Developing skills for designing websites leads to entrepreneurship opportunities.			3	2						1	3	1	2		2	2

1- **Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation**

MANIPAL UNIVERSITY JAIPUR

SCHOOL OF COMPUTING & INFORMATION TECHNOLOGY

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
COURSE HAND-OUT

Design & Analysis of Algorithm Lab | CS 1530 | 1 Credit 3 1 0 4

Session: July 19 – Nov 19 | Faculty: Ms. Anita Shrotriya & Mr. Tarun Jain | Class: B.Tech. 3rd Year V Semester (Core Course)

A. Introduction: This course is offered by the Department of Computer Science & Engineering with the aim to discuss techniques for designing efficient algorithms and also to measure their complexity and performance. The course is intended to provide experience to the students in programming, algorithm design and to emphasize both the practical as well as the mathematical aspects of different problems.

B. Course Outcomes: At the end of the course, students will be able to:

[CS 1501.1] Analyse worst-case running times of algorithms using asymptotic analysis.
[CS 1501.2] Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm.
[CS 1501.3] Design dynamic-programming algorithms, and analyse them to enhance entrepreneurship skills.
[CS 1501.4] Synthesize efficient greedy algorithms in common engineering design situations to enhance employment skills.
[CS 1501.5] Synthesize new graph algorithms and algorithms that employ graph computations as key components, and analyse them to improve employment skills.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1] **Problem analysis**: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.2] **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes_that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.3] **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.4] **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools_including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.5] **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues_and the consequent responsibilities relevant to the professional engineering practice

[PO.6] **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.7] **Ethics**: Apply ethical principles and commit to professional ethics_and responsibilities and norms of the engineering practices

[PO.8] **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.9] **Communication**: Communicate effectively_on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.10] **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.11] **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

[PSO.1] Will be able to design, develop and implement efficient software for a given real life problem.

[PSO.2] Will be able to apply knowledge of AI, Machine Learning and Data Mining in analysing big data for extracting useful information from it and for performing predictive analysis.

[PSO.3] Will be able to design, manage and secure wired/ wireless computer networks for transfer and sharing of information.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	15
	Sessional Exam II (Closed Book)	15
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Closed Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work at home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

Algorithm Analysis: A priori and a posteriori Analysis, Time Space Tradeoff, Asymptotic Notations, Properties of asymptotic notations, Recurrence equations, Solving recurrence equations using Substitution method and Master's method; Trees: B-Tree Red Black Tree; Divide and Conquer: Binary Search, Finding Maximum and Minimum, Merge Sort, Quick Sort, Matrix Multiplication; Greedy Algorithms: Knapsack Problem, Job Sequencing with deadline, Optimal Merge Pattern, Single Source Shortest Path, Minimum Cost Spanning tree; Dynamic Programming: Multistage Graphs, Matrix Chain Multiplication, All-Pair shortest paths, Optimal binary search trees, 0/1 Knapsack, Travelling salesperson problem, Graph Traversals, Connected Components, Spanning Trees, Bi-connected components; Complexity Classes: Introduction to NP-Hard and NP-Completeness; Approximation Algorithm, Randomized Algorithm.

F. TEXTBOOKS

T1. E. Horowitz, S. Sahni and S. Rajasekaran, *"Computer Algorithms"*, 2nd Edition, University Press, 2007.
T2. T. H. Cormen, C. E. Leiserson, R.L.Rivest, and C. Stein, "*Introduction to Algorithms*", 3rd Edition, MIT press, 2009.

G. REFERENCE BOOKS

R1. V. Aho, J. E. Hopcroft and J. D. Ullman, "*The Design and Analysis of Computer Algorithms*", 1st Edition, Pearson Education, 1999.

F. Lecture Plan:

Class Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1	Introduction to Algorithms, Specification of Algorithm, Complexity	Idea of computer algorithm and its performance	Lecture	1501.1	NA
2	Asymptotic Notation- Analysis of Algorithm,	Use of asymptotic notations in algorithm analysis	Lecture	1501.1	Class Quiz 1st Sessional ET Exam Home Assignment
3	Time & Space Complexity – Hands-on	Calculate time complexity of some typical algorithms	Lecture, Practice questions	1501.1	1st Sessional ET Exam Home Assignment
4	Insertion Sort and Analysis, QA-Discussions	Insertion sort analysis	Lecture & Lab	1501.1	
5	Selection Sort and Bubble Sort Analysis, QA-Discussions	Analysis of commonly used sorting methods	Lecture & Lab	1501.1	
6	Divide and Conquer: Merge Sort and Analysis, QA-Discussions	Familiarity with divide and conquer and use it for different sort	Lecture, Practice questions & Lab	1501.2	1st Sessional ET Exam Home Assignment
7	Quick Sort and Analysis,	divide and conquer using quicksort	Lecture, Practice questions & Lab	1501.2	
8	Randomized Quick sort Analysis	Quicksort case analysis and dealing with worst case using randomization	Lecture, Practice questions & Lab	1501.2	
9	Master Theorem and its cases	Apply Masters theorem on recurrence relations	Lecture, Practice questions	1501.2	1st Sessional ET Exam Home Assignment
10	Heap Sort - Insertion, Deletion – Analysis	Understand Heap as a data structure And use of heap to sort elements	Lecture, Practice questions & Lab	1501.2	
11	Heap Sort- Priority Queue	Using Heap as priority queue	Lecture, Practice questions & Lab	1501.2	
12	Heap - Insertion, Deletion – Analysis	Analysis of insertion and deletion costs	Lecture, Practice questions & Lab	1501.2	1st Sessional ET Exam Home Assignment
13	Strassen's Matrix Multiplication	Matrix multiplication using divide and conquer	Lecture, Practice questions	1501.2	
14	Greedy Paradigm - Introduction, Coin Change Problem	Understanding greedy method using coin change problem	Lecture	1501.4	
15	Job Sequencing with deadline, Interval Scheduling Problem (Given as Assignment)	Job sequencing using greedy method	Lecture, Practice questions	1501.4	1st Sessional

16	Knapsack-problem,	Fractional knapsack and its solution using greedy method	Lecture, Practice questions	1501.4	ET Exam Home Assignment
17	Optimal Merge tape, Huffman Encoding	Solution using Huffman Encoding	Lecture, Practice questions & Lab	1501.4	
FIRST SESSIONAL EXAM					
18	Spanning Trees - MST	Basic idea about Spanning Trees	Lecture, Practice questions & Lab	1501.4	2nd Sessional ET Exam Home Assignment
19	Prim's, Algorithm	Classical algorithms to find minimum spanning tree using greedy approach	Lecture, Practice questions & Lab	1501.4	
20	Kruskal's Algorithm		Lecture, Practice questions & Lab	1501.4	
21	Dijkstra's Algorithm-SSSP	Solving single source shortest path problem using Dijkstra's algorithm	Lecture, Practice questions & Lab	1501.4	2nd Sessional ET Exam Home Assignment
22	Graph Search Algorithm - BFS/ DFS	Basic graph traversal algorithms and their applications	Lecture, Practice questions & Lab	1501.4	
23	Topological Sort,		Lecture, Practice questions	1501.4	
24	Bellman Ford Algorithm	Shortest path finding in the presence of negative edge weights	Lecture, Practice questions & Lab	1501.4	2ndSession al ET Exam Home Assignment
25	Connected Components, Bi-connected Components	Understanding of connected components and their application	Lecture, Practice questions	1501.4	
26	Introduction to Dynamic Programming-	Understanding dynamic programming and its characteristics	Lecture	1501.3	
27	Top Down Fibonacci, Binomial Coefficient	Classical problems of finding binomial and Fibonacci coefficient and 0-1 knapsack problem as for understanding dynamic programming	Lecture, Practice questions	1501.3	2nd Sessional ET Exam Home Assignment
28	Bottom up Binomial Coefficient, Dynamic Knapsack,		Lecture, Practice questions	1501.3	
29	Longest Integer Sequence, Longest Common Subsequence	Solving LCS using dynamic programming	Lecture, Practice questions	1501.3	
30	Multi-Stage Graph	Better understanding of dynamic problem solving technique using classical problems.	Lecture, Practice questions & Lab	1501.3	2ndSession al ET Exam Home Assignment
31	Floyd Warshal Algorithm – All pair of shortest path		Lecture, Practice questions	1501.3	
32	Matrix Chain Multiplication	Identify different approach of Matrix Chain Multiplication	Lecture, Practice questions	1501.3	

33	TSP- DP method	Understanding of calculate shortest path using TSP & OBST	Lecture, Practice questions	1501.3	2nd Sessional ET Exam Home Assignment
34	OBST-Optimal Binary Search Tree		Lecture, Practice questions & Lab	1501.3	
SECOND SESSIONAL EXAM					
35	Backtracking Intro – Problems	Introduction of backtracking	Lecture	1501.3	ET Exam Home Assignment
36	Graph Coloring, M-Graph Coloring	Use of backtracking to solve graph problems	Lecture, Practice questions & Lab	1501.5	
37	Sum of Subset Problem	Use of backtracking to solve some classical problems. Limitations of backtracking	Lecture, Practice questions	1501.5	
38	N-Queen Problem		Lecture, Practice questions	1501.5	
39	Sudoku Game - Design & Implementation (Given as an assignment)	Game development using backtracking	Lecture, Practice questions	1501.5	ET Exam Home Assignment
40	Branch & Bound – Knapsack	Use of branch and bound to solve a problems	Lecture, Practice questions	1501.5	
41	Branch & Bound - Job Assignment	Use of branch and bound to solve some classical problems. Limitations of backtracking.	Lecture, Practice questions	1501.5	
42	15 Puzzle Problem (Given as an assignment)	Use of branch and bound to solve some classical problems. Limitations of backtracking.	Lecture, Practice questions	1501.5	ET Exam Home Assignment
43	Branch & Bound – TSP		Lecture, Practice questions	1501.5	
44	String Matching – Meaning and Application	To understand importance of string matching in practical applications	Lecture, Practice questions	1501.5	
45	Naïve String Matching, Rabin Karp Algorithm	Classical string matching algorithms and their limitations	Lecture, Practice questions	1501.5	ET Exam Home Assignment
46	Knuth-Morris-Pratt (KMP) Algorithm		Lecture, Practice questions & Lab	1501.5	
47	Randomization & Approximation Algorithm	Finding better solutions to intractable problems	Lecture, Practice questions & Lab	1501.5	
48	Introduction to NP Hard and NP Completeness	Concept of intractability and significance of intractability proof	Lecture, Practice questions & Lab	1501.5	
END TERM EXAM					

G. Course Articulation Matrix: (Mapping of COs with POs & PSOs)

Course Out-Comes	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
[CS1501.1]	Analyze worst-case running times of algorithms using asymptotic analysis.		3		2				2				3		
[CS1501.2]	Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm.		2	2				1				2		2	1
[CS1501.3]	Design dynamic-programming algorithms, and analyse them to enhance entrepreneurship skills.				2	2							2	1	3
[CS1501.4]	Synthesize efficient greedy algorithms in common engineering design situations to enhance employment skills.						2		2	3			3	2	
[CS1501.5]	Synthesize new graph algorithms and algorithms that employ graph computations as key components, and analyse them to			2						1	2		1		2

	improve employment skills.														

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Department of Computer Science & Engineering
Course Hand-out

Automata & Compiler Design | CS 1505 | 4 Credits | 3 1 0 4

Session: July '19 – December '19 | Faculty: Dr. Prakash Chandra Sharma, Mr. Virender Dehru, Mr. Manu Srivastava, Mr. Rohit Kumar Gupta, Ms. Anubha Parashar, Mr. Satyabrata Roy | Class: V semester Department Core Course

A. Introduction: The objective of this course is to make the students familiar with the fundamental area of computer science which will enable the students to focus on abstract models of computation. The course exposes students to the computability theory, as well as to the complexity theory. The goal is to allow them to answer fundamental questions about problems, such as whether they can or cannot be computed. The objective is also to make the students familiar with the language processors as well as various phases of compilation process of any source code. Throughout the semester they will learn about lexical analysis, different types of parsing techniques, code generation and optimization. The goal is to allow them to answer in detail about how a compiler works and how it reports to its users various types of errors.

B. Course Outcomes: At the end of the course, students will be able to

[1505.1]. Understand alphabet, strings, language and build regular expression and applying these concepts to construct finite automata.

[1505.2]. Compare the characteristics of different types of formal languages and grammars as mentioned in Chomsky Hierarchy and to build push down automata.

[1505.3]. Determine the type of computational problems and examine the decidability of them by constructing Turing machines and propose an optimal abstract model that can be applied to a suitable real life problem.

[1505.4]. Inspect the performance of each phase of a compiler and compare the working principles of different types of parsers.

[1505.5]. Construct optimized compiler using various type checking rules and concepts of storage organizations, thus developing optimized compiler construction skill.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

[PO.2]. **Problem analysis:** Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4]. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

[PO.5]. **Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

[PO.6]. **The Engineers and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. **Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

[PO.8]. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices.

[PO.9]. **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

[PO.10]. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

[PO.11]. **Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

[PO.12]. **Life-long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

[PSO.1] Will be able to design, develop and implement efficient software for a given real life problem.

[PSO.2] Will be able to apply knowledge of AI, Machine Learning and Data Mining in analyzing big data for extracting useful information from it and for performing predictive analysis.

[PSO.3] Will be able to design, manage and secure wired/ wireless computer networks for transfer and sharing of information.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	15
	Sessional Exam II (Closed Book)	15
	Quiz (Open Book)	15
	Assignments	10
	Relevant MOOC	05
End Term Exam (Summative)	End Term Exam (Closed Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

Introduction: Automata Theory: Mathematical Preliminaries and Notation :Review of set theory, function, relation; Finite Automata: Deterministic and Non Deterministic Finite Automata (FA), Regular languages, Mealy and Moore machine; Regular Sets and Regular Grammars: Chomsky Hierarchy, Regular Expressions, Regular Grammar and FA, Pumping Lemma for Regular Languages; Context Free Languages (CFL) and Grammars: Ambiguity, Methods for Transforming Grammars; Push Down Automata: Nondeterministic Pushdown Automata (NPDA), Design of NPDA, PDA and CFLs; Introduction to Turing machine; Introduction to Compiler Design: Structure of a Compiler; Lexical Analysis, Recognition of Tokens; Introduction to LR Parsing: Simple LR, More Powerful LR Parsers Generators; Syntax Directed Translations; Type Checking: Rules for Type Checking, Storage Organization.

F. Text Books

T1. An Intorduction to Formal Languages and Automata – Peter Linz, Jones and Bartlett Student Edition, Fifth Edition, 2010.

T2. Compilers : Principles, Techniques and Tools – A. Aho, J. Ullman, M. S. Lam, R. Sethi, Pearson Education, 2nd Edition, 2007.

G. Reference Books

R1. Introduction to the Theory of Computation – Michael Sipser, Cengage Learning, Third Edition, 2012.

R2. Introduction to Languages and the Theory of Computation – John Martin, Tata McGraw Hill, Fourth Edition, 2010.

R3. Introduction to Automata Theory, Languages and Computations – J. E. Hopcroft, R. Motwani, J. Ullman, Pearson Education, 3rd Edition, 2006.

H. Lecture Plan:

Lec No	**Topics**	**Session Outcome**	**Mode of Delivery**	**Corresponding CO**	**Mode of Assessing the Outcome**
1	Mathematical Preliminaries and Notation, Review of set theory	Understand basics of set theory, groups, relations, functions.	Lecture	NA	NA
2	Function, relation, Three Basic Concepts i.e. string, sentence and languages	Understand basics of set theory, groups, relations, functions.	Lecture	NA	In Class Quiz (Not Accounted)
3-8	Design of Deterministic Finite Automata (DFA), Minimization of DFA	Introduction to automata theory and finite state machines	Lecture, Practice questions	1505.1	Home Assignment Mid Term I End Term
9-10	Design of FA with output: Mealy and Moore machine and their equivalence	Understand the design principles of Mealy and Moore machines	Lecture, Practice questions	1505.1	In Class Quiz Home Assignment Mid Term I End Term
11-12	Equivalence of DFA and NDFA, Removal of null moves from FA	Understanding the basic difference between DFA and NDFA and realising the importance of NDFA	Lecture, Practice questions	1505.1	In Class Quiz Home Assignment Mid Term I End Term
13	Chomsky Hierarchy of Grammar and Formal Languages	Understand the notations and properties of formal languages and grammar, compare different types of languages and their grammars according to Chomsky Hierarchy	Lecture, Practice questions	1505.2	In Class Quiz Home Assignment Mid Term I End Term
14-21	Regular Languages: Construction of Regular Expressions, equivalence of Regular Expressions and Finite Automata, equivalence of regular grammar and finite automata, Identifying non-regular languages and Pumping Lemma for regular languages	Understand the properties of regular languages and equivalence between FA and RE, FA and regular grammar. Apply pumping lemma to identify non-regular languages.	Lecture, Practice questions	1505.2	In Class Quiz Home Assignment Mid Term I End Term
22-25	Ambiguity in CFGs, Derivation trees, Simplification of CFGs, CNF and GNF, Pumping Lemma for CFGs	Understand the properties of CFLs, normal forms of CFGs. Apply pumping lemma to identify non-CFLs.	Lecture, Practice questions	1505.2	In Class Quiz Home Assignment Mid Term I End Term
26-31	Design of PDA, Types of PDA, Equivalence of PDA: NPDA and DPDA, Conversion of PDA and CFGs.	Design pushdown automata and understanding the properties of it variants. Equivalence between PDA and CFGs.	Lecture, Practice questions	1505.1 1505.2	In Class Quiz Home Assignment Mid Term II End Term

32-35	Introduction to Turing machines, design of Turing machines, properties of recursive and recursively enumerable languages, decidability.	Design of Turing machines, application of Turing machines and understanding the properties of recursive and recursively enumerable languages. Understanding whether a given problem is decidable	Lecture, Practice questions	1505.2 1505.3	In Class Quiz Home Assignment Mid Term II End Term
36-38	Introduction to compilers, structure and phases of a compiler, lexical analysis phase of a compiler	Summarize the structure and roles of each phase of a compiler. Illustrate the role of a lexical analyser.	Flipped Classroom	1505.4	In Class Quiz Home Assignment Mid Term II End Term
39-46	Introduction to syntax analysis and parsing, computing FIRST and FOLLOW, LR(0), SLR(1), CLR(1) and LALR(1) parsing	Develop and compare the working principles of different types of parsers.	Lecture, Practice questions	1505.4	In Class Quiz Home Assignment Mid Term II End Term
47-50	Introduction to Syntax directed translations, S-attributes, I-attributes and L-attributes, Building annotated trees	Understand and develop syntax directed translation scheme and annotated trees	Lecture, Practice questions	1505.4 1505.5	In Class Quiz Home Assignment End Term
51-52	Type Checking: Rules for Type Checking, Storage Organization.	Understanding concepts of type checking and its various rules. Summarize the storage organization.	Flipped Classroom	1505.4 1505.5	In Class Quiz Home Assignment End Term

I. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
[CS1505.1]	Understand alphabet, strings, language and build regular expression and applying these concepts to construct finite automata.	3	3	3	3		1		1				1	3		
[CS1505.2]	Compare the characteristics of different types of formal languages and grammars as mentioned in Chomsky Hierarchy and to build push down automata.	3	3	2	3		1		1				1	2		
[CS1505.3]	Determine the type of computational problems and examine the decidability of them by constructing Turing machines and propose an optimal abstract model that can be applied to a suitable real life problem.	3	3	3	3		2		1	1		1	1	3		
[CS1505.4]	Inspect the performance of each phase of a compiler and compare the working principles of different types of parsers.	2	2	2					1			1	1	2		
[CS1505.5]	Construct optimized compiler using various type checking rules and concepts of storage organizations, thus developing optimized compiler construction skill.	3	3	3	3	2	1		1			1	1	3		

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

SCHOOL OF COMPUTING & INFORMATION TECHNOLOGY

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
COURSE HAND-OUT

Design & Analysis of Algorithm Lab | CS 1530 | 1 Credit | 0 0 2 1

Session: July 19 – Nov 19 | Faculty: Ms. Anita Shrotriya & Mr. Tarun Jain | Class: B.Tech. 3rd Year V Semester (Core Course)

A. Introduction: This course is offered by Computer Science and Engg. Dept., targeting students who wish to learn new technologies, idea and research in industries or higher studies in field of Computer Science, IT and Communication Engineering. This course is designed to develop analytical skills to enable students design algorithms for various applications, and to analyze the algorithms. The mathematical analysis of algorithms is also discussed.

B. Course Outcomes: At the end of the course, students will be able to

[CS1530.1]:	Explain basic concepts of various Algorithm and Complexity.
[CS1530.2]:	Select and/or apply appropriate algorithm to solve problems and assess the trade-offs involved in the design choices also calculate the running time complexity.
[CS1530.3]:	Describe and analyze various Notations, Recurrences and DAC approach to enhance their skills , also used in sorting algorithms like merge sort, heap sort and quick sort etc and analyses of different cases.
[CS1530.4]:	Demonstrating Greedy, Dynamic, Backtracking and Graph based techniques to enhance entrepreneurship skills.
[CS1530.5]:	Developing employability skills to solve various application based on different designing approach.

C PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

PO1. **Engineering knowledge**: Apply the knowledge of mathematics, computer science, and communication engineering fundamentals to the solution of complex engineering problems.

PO2. **Problem analysis**: The sophisticated curriculum would enable a graduate to identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using basic principles of mathematics, computing techniques and communication engineering principles.

PO3. **Design/development of solutions**: Upon analysing, the B Tech CCE graduate should be able to devise solutions for complex engineering problems and design system components or processes that meet the specified requirements with appropriate consideration for law, safety, cultural & societal obligations with environmental considerations.

PO4. **Conduct investigations of complex problems**: To imbibe the inquisitive practices to have thrust for innovation and excellence that leads to use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO6. **The engineer and society**: The engineers are called society builders and transformers. B. Tech CCE graduate should be able to apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. **Environment and sustainability**: The zero effect and zero defect is not just a slogan, it is to be practised in each action. Thus a B Tech CCE should understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. **Ethics**: Protection of IPR, staying away from plagiarism are important. Student should be able to apply ethical principles and commit to professional ethics, responsibilities and norms of the engineering practice.

PO9. **Individual and team work**: United we grow, divided we fall is a culture at MUJ. Thus an outgoing student should be able to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. **Communication**: Communicate effectively for all engineering processes & activities with the peer engineering team, community and with society at large. Clarity of thoughts, being able to comprehend and formulate effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in varied environments.

PO12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)

At the end of the B Tech CSE program, the student:

PSO1. Will be able to identify the existing open problems in the field of computing Science and propose the best possible solutions.

PSO2. Will be able to apply knowledge of AI, Machine Learning and Data Mining in analyzing big data for extracting useful information from it and for performing predictive analysis.

PSO3. Will be able to design, manage and secure wired/ wireless computer networks for transfer and sharing of information.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Continuous evaluation (Record + Execution + Viva)	50
	Lab project	20
End Term Exam (Summative)	End Term Exam (CLOSED BOOK)	30
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

E. SYLLABUS

Review of Algorithm and write a programs on Sorting Method, Greedy approach, Dynamic programming, Trees, Graphs, Branch & Bound using C language.

F. Text Books

T1. E. Horowitz, S. Sahni and S. Rajasekaran, *"Computer Algorithms"*, 2nd Edition, University Press, 2007.
T2. T. H. Cormen, C. E. Leiserson, R.L.Rivest, and C. Stein, "*Introduction to Algorithms*", 3rd Edition, MIT press, 2009.

G. Reference Books

R1. V. Aho, J. E. Hopcroft and J. D. Ullman, "*The Design and Analysis of Computer Algorithms*", 1st Edition, Pearson Education, 1999.

H . Lecture Plan

Lab No.	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1	**Searching**	• Programs based on Iterative Binary Search & Recursive Binary Search.	Lab	CS1530.1 CS1530.3	Internal Evaluation Home Assignments External Evaluation
2	**Sorting**	• Programs to implement Insertion Sort & Selection Sort.	Lab	CS1530.1 CS1530.3	Internal Evaluation Home Assignments External Evaluation
3	**DAC Sorting**	• Programs to implement Merge Sort & Quick Sort.	Lab	CS1530.1 CS1530.3	Internal Evaluation Home Assignments External Evaluation
4	**Heap & Priority Queue**	Programs to implement sorting a given list of elements in ascending order using the following sorting methods. HeapSort – MAX Heap and MIN Heap & programs based on Priority Queue.	Lab	CS1530.1 CS1530.3	Internal Evaluation Home Assignments External Evaluation
5	**Greedy method**	Programs to implement knapsack problem using greedy method.	Lab	CS1530.4	Internal Evaluation Home Assignments External Evaluation
6	**Greedy method-Graph**	Programs to implement the single source shortest path problem using greedy method. (Dijkstra's).	Lab	CS1530.4	Internal Evaluation Home Assignments External Evaluation
7	**Greedy method-Spanning Trees**	Programs to implement Prim's & Kruskal's algorithms.	Lab	CS1530.4 CS1530.2	Internal Evaluation Home Assignments External Evaluation
8	**Graph Traversal**	Programs to implement Breadth first search & Depth first search traversal algorithms.	Lab	CS1530.4 CS1530.2	Internal Evaluation Home Assignments External Evaluation
9	**Dynamic Programming**	Write a program to implement Fibonacci series dynamic programming using top-down & bottom up approach algorithms.	Lab	CS1530.4	Internal Evaluation Home Assignments External Evaluation
10	**Dynamic Programming**	Write a program to implement longest integer sequence LIS & longest common subsequence.	Lab	CS1530.4	Internal Evaluation Home Assignments External Evaluation

11	**Dynamic Programming**	Write a program to implement Binomial Coefficient & travelling sales person problem using Dynamic Programming.	Lab	CS1530.4 CS1530.5	Internal Evaluation Home Assignments External Evaluation
12	**Backtracking**	Consider the problem of eight queens on a chess board. Two queens are said to attack each other if they are on the same row, column or diagonal. Write a program that implements back tracking algorithm to solve the problem i.e., place eight non-attacking queens on the board.	Lab	CS1530.2 CS1530.5	Internal Evaluation Home Assignments External Evaluation
13	**Randomization**	Write a program to implement Randomized Quick sort & Graph Coloring Problem.	Lab	CS1530.5 CS1530.4	Internal Evaluation Home Assignments External Evaluation

I Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
[CS1530.1]:	Explain basic concepts of various Algorithm and Complexity.	3	1										2	1		
[CS1530.2]:	Select and/or apply appropriate algorithm to solve problems and assess the trade-offs involved in the design choices also calculate the running time complexity.		1	2									2	3		
[CS1530.3]:	Describe and analyze various Notations, Recurrences and DAC approach to enhance their skills , also used in sorting algorithms like merge sort, heap sort and quick sort etc and analyses of different cases..		1	2									2	2		
[CS1530.4]:	Demonstrating Greedy, Dynamic, Backtracking and Graph based techniques to enhance entrepreneurship skills.		1	2									2	3		
[CS1530.5]:	Developing employability skills to solve various application based on different designing approach.		1	2									2	3		

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

SCHOOL OF COMPUTING & INFORMATION TECHNOLOGY

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
COURSE HAND-OUT

AUTOMATA AND COMPILER DESIGN LAB || CS1535|| 1 Credits|| [0 0 2 1]
Session: JULY-NOV-2019 | Faculty Name: Mr. Satyabrata Roy, Mr. Manu Srivastava, Ms. Anubha Parashar||
class: V semester core

A. Introduction:

This course is meant to provide an understanding of design of abstract models of computation, the language translation peculiarities by designing complete translator for mini language. Students would learn to use two language processing tools LEX and YACC.

B. Course Outcomes: At the end of the course, students will be able to

[CS1535.1]: Design finite automata, Mealy machine and Moore machines.

[CS1535.2]: Understand language processing system.

[CS1535.3]: Implement different phases of a compiler.

[CS1535.4]: Develop parser designing skill for any given language.

[CS1535.5]: Make use of the LEX and YACC tools.

C PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

PO1. **Engineering knowledge**: Apply the knowledge of mathematics, computer science, and communication engineering fundamentals to the solution of complex engineering problems.

PO2. **Problem analysis**: The sophisticated curriculum would enable a graduate to identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using basic principles of mathematics, computing techniques and communication engineering principles.

PO3. **Design/development of solutions**: Upon analysing, the B Tech CCE graduate should be able to devise solutions for complex engineering problems and design system components or processes that meet the specified requirements with appropriate consideration for law, safety, cultural & societal obligations with environmental considerations.

PO4. **Conduct investigations of complex problems**: To imbibe the inquisitive practices to have thrust for innovation and excellence that leads to use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO6. **The engineer and society**: The engineers are called society builders and transformers. B. Tech CCE graduate should be able to apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. Environment and sustainability: The zero effect and zero defect is not just a slogan, it is to be practised in each action. Thus a B Tech CCE should understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. Ethics: Protection of IPR, staying away from plagiarism are important. Student should be able to apply ethical principles and commit to professional ethics, responsibilities and norms of the engineering practice.

PO9. Individual and team work: United we grow, divided we fall is a culture at MUJ. Thus an outgoing student should be able to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. Communication: Communicate effectively for all engineering processes & activities with the peer engineering team, community and with society at large. Clarity of thoughts, being able to comprehend and formulate effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in varied environments.

PO12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)

At the end of the B Tech CSE program, the student:

[PSO.1] Will be able to design, develop and implement efficient software for a given real life problem.
[PSO.2] Will be able to apply knowledge of AI, Machine Learning and Data Mining in analyzing big data for extracting useful information from it and for performing predictive analysis.
[PSO.3] Will be able to design, manage and secure wired/ wireless computer networks for transfer and sharing of information.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Continuous evaluation (Record + Execution + Viva)	50
	Mid – Term Lab Evaluation	20
End Term Exam (Summative)	End Term Exam	30
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

E. SYLLABUS

Implementation of finite automata systems in gcc compiler/eclipse platform; Implementation of lexical analyser in gcc compiler/eclipse platform; Computation of FIRST and FOLLOW for different types of parsing techniques; Demonstration and use of LEX and YACC tools for compiler design; Mini-Projects & Case Studies.

F. Text Books

T1. An Intorduction to Formal Languages and Automata – Peter Linz, Jones and Bartlett Student Edition, Fifth Edition, 2010.

T2. Compilers : Principles, Techniques and Tools – A. Aho, J. Ullman, M. S. Lam, R. Sethi, Pearson Education, 2nd Edition, 2007.

G. Reference Books

R1. J. R Levine, T. Mason and D. Brown, “lex & yacc”, 2 nd Edition, O’ Reilly Publishing, 1992.

H . Lecture Plan

Lec No	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1-2	Introduction and simulation of the behaviours of some sample DFA, Mealy machines and Moore machines	• To acquaint and clear teachers expectations and understand student expectations • Implementing the behaviour of DFA	Lecture Demonstration at system	CS1535.1	Continuous Evaluation End Term Examination
3-4	• Context Free Grammars and Push Down Automata • Introduction to lexical analyser	• Understand normalization of CFGs • Design PDA • Construct lexical analyser.	Lecture Demonstration at system	CS1535.1 CS1535.2	Continuous Evaluation End Term Examination
5-6	• Computing FIRST and FOLLOW for CFGs. • Symbol table implementation	• Understand parsers. • Design symbol table.	Lecture Demonstration at system	CS1535.1 CS1535.2 CS1535.3	Continuous Evaluation End Term Examination
7-14	Demonstrate the use of LEX and YACC	Demonstrate lexical analysis and syntax analysis using tools.	Lecture Demonstration at system	CS1535.1 CS1535.2 CS1535.3	Continuous Evaluation Project End Term Examination

I Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES			
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
[CS1535.1]	Design finite automata, Mealy machine and Moore machines.	3		3	1									2			
[CS1535.2]	Understand language processing system.	3	3	3	1	2								3			
[CS1535.3]	Implement different phases of a compiler.	1	1		1	2								3			
[CS1535.4]	Develop parser designing skill for any given language.	3	3	3	2	2								2			
[CS1535.5]	Make use of the LEX and YACC tools.	3		1										3			

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Department of Computer Science Engineering

Data Communications | IT 1504 | 4 Credits | 3 1 0 4

Session: July, 2019 – Dec, 2019 | Faculty: Mr. Saket Acharya, Mr. Amit Kumar & Dr. Anshumann Kalla | Class: V Semester

A. Introduction:

This course is to provide students with the fundamental concepts and techniques used for communicating data in efficient and reliable manner. The student will be able to understand and describe various encoding techniques, flow & error control mechanisms and multiplexing & multiple-access techniques used for enabling data communication. The course lays down the foundation for Computer Networks, Wireless & Mobile Communication and Network security.

B. Course Outcomes: At the end of the course, students will be able to

[1504.1]: Define the significance of relevant terminologies, explain the transmission of digital & analog signals over different types of transmission media and outline the effects of various transmission impairments on analog & digital transmission.

[1504.2]: Describe the principles of signal encoding techniques used for digital data to digital signal conversion and analog data to digital signal conversion and compare them.

[1504.3]: Develop skills pertaining to error detection and correction techniques in order to find and overcome error encountered during transmission and discuss flow control and error control techniques.

[1504.4]: Discuss and distinguish between different types of multiplexing techniques and spread spectrum techniques.

[1504.5]: Identify and compare various generations of wireless cellular networks.

C. Program Outcomes and Program Specific Outcomes

PO1. **Engineering knowledge**: Apply the knowledge of mathematics, computer science, and communication engineering fundamentals to the solution of complex engineering problems.

PO2. **Problem analysis**: the sophisticated curriculum would enable a graduate to identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using basic principles of mathematics, computing techniques and communication engineering principles.

PO3. **Design/development of solutions**: Upon analyzing the B Tech CCE graduate should be able to devise solutions for complex engineering problems and design system components or processes that meet the specified requirements with appropriate consideration for law, safety, cultural & societal obligations with environmental considerations.

PO4. **Conduct investigations of complex problems**: To imbibe the inquisitive practices to have thrust for innovation and excellence that leads to use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO6. The engineer and society: The engineers are terms society builders and transformers. B. Tech CCE graduate should be able to apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. Environment and sustainability: The zero effect and zero defect is not just a slogan, it is to be practised in each action. Thus a B Tech CCE should understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. Ethics: Protection of IPR, staying away from plagiarism are important. Student should be able to apply ethical principles and commit to professional ethics, responsibilities and norms of the engineering practice.

PO9. Individual and team work: United we grow, divided we fall is a culture at MUJ that an outgoing student should be able to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. Communication: Communicate effectively for all engineering processes & activities with the peer engineering team, community and with society at large. Clarity of thoughts, being able to comprehend and formulate effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

Program Specific Outcomes (PSOs)

[PSO.1] Will be able to design, develop and implement efficient software for a given real life problem.
[PSO.2] Will be able to apply knowledge of AI, Machine Learning and Data Mining in analyzing big data for extracting useful information from it and for performing predictive analysis.
[PSO.3] Will be able to design, manage and secure wired/ wireless computer networks for transfer and sharing of information.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Close Book)	15
	Sessional Exam II (Close Book)	15
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Close Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for	

	absence. These assignments are limited to a maximum of 5 throughout the entire semester.

E. Syllabus

Data Transmission: Concepts and Terminology, Analog and Digital Data Transmission, Transmission Impairments, Channel Capacity.

Transmission Media: Guided Transmission Media, Wireless Transmission, Wireless Propagation, Line-of-Sight Transmission.

Signal Encoding Techniques: Analog and Digital Signals, Digital-To-Digital Conversion: Line Coding Schemes, Block Coding, Scrambling, Analog-To-Digital Conversion: Pulse Code Modulation, Delta Modulation.

Digital Data Communication Techniques: Asynchronous and Synchronous Transmission, Types of Errors, Error Detection, Error Correction, Line Configurations.

Data Link Control Protocols: Flow Control, Error Control, High-Level Data Link Control (HDLC).

Multiplexing: Frequency-Division Multiplexing (FDM), Time-Division Multiplexing (TDM), Code-Division Multiple Access (CDMA); Space Division Multiplexing.

Spread Spectrum: The Concept of Spread Spectrum, Frequency Hopping Spread Spectrum (FHSS), Direct Sequence Spread Spectrum (DSSS).

Cellular Wireless Communication Techniques: Introduction, Generations: 1G, 2G, 3G, 4G, and 5G.

F. Text Books

1. W. Stallings, "Data and Computer Communications", 9th Edition, Pearson Education, 2010

G. Reference Books

1. B. Forouzan, "Data communication & networking" Fifth Edition. TMH, 2012.
2. L. Peterson and T. Davie "*Computer Networks: A Systems Approach*" Fifth Edition, Morgan Kaufmann Publishers, 2012.
3. R. Stevens, *"TCP/IP Illustrated*", Addison-Wesley Publication, 2011.

H. Lecture Plan

Lecture No.	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1.	Data, Data Communication, Data Network, Internet	Define the significance of relevant terminologies, Layered Architecture and	Lecture	NA	NA
2.	Need of Layered Protocol Architecture (OSI &TCP/IP)		Lecture	NA	NA
3.	TCPIP - Layers and its Functioning		Lecture & Activity	NA	NA
4.	Concepts and Terminology – Simplex, Half-Duplex, Full-Duplex, Frequency, Bandwidth		Lecture	[1504.1]	Class Quiz Mid Term - I End Term
5.	Time Domain and Frequency Domain Concepts, Data Rate		Lecture & Problem Solving Practice	[1504.1]	Class Quiz Mid Term - I End Term
6.	Analog and Digital Data and Signals	Explain the transmission of digital & analog signals over different types of transmission media and characteristics of Analog and Digital Transmission	Lecture	[1504.1]	Class Quiz Mid Term - I End Term
7.	Analog and Digital Transmission		Lecture	[1504.1]	Class Quiz Mid Term - I End Term
8.	Attenuation, Delay Distortion, Noise	Identify and comprehend various transmission impairments and its effects	Lecture & Problem Solving Practice	[1504.1]	Class Quiz Mid Term - I End Term

9.	Data Rate and Nyquist Bandwidth	Define and understand significance of Channel Capacity	Lecture	[1504.2]	Class Quiz Mid Term - I End Term
10.	Shannon Capacity Formula		Lecture & Problem Solving Practice	[1504.2]	Class Quiz Mid Term - I End Term
11.	Twisted Pair & CAT Types	Identify and distinguish various Transmission Media: Guided Transmission Media	Lecture & Activity	[1504.2]	Class Quiz Mid Term - I End Term
12.	Coaxial Cable, Optical Fiber		Lecture	[1504.2]	Class Quiz Mid Term - I End Term
13.	Antennas , Terrestrial Microwave	Explain the principles of Wireless Transmission	Lecture	[1504.2]	Class Quiz Mid Term - I End Term
14.	Satellite Microwave, Broadcast Radio, Infrared		Lecture & Problem Solving Practice	[1504.2]	Class Quiz Mid Term - I End Term
15.	Ground Wave Propagation, Sky Wave Propagation	Identify and explain wireless propagation modes	Lecture & Activity	[1504.2]	Class Quiz Mid Term - I End Term
16.	Line-of-Sight Propagation		Lecture & Problem Solving Practice	[1504.2]	Class Quiz Mid Term - I End Term

17.	Free Space Loss	Explain the principles of Line-of-sight Propagation	Lecture & Problem Solving Practice	[1504.2]	Class Quiz Mid Term - I End Term
18.	Atmospheric Absorption, Multipath, Refraction		Lecture	[1504.2]	Class Quiz Mid Term - I End Term
19.	Analog and Digital Signals, Line Coding Schemes: Unipolar, Polar	Identify and distinguish various Signal Encoding Techniques: Digital-To-Digital Conversion	Lecture & Problem Solving Practice	[1504.2]	Class Quiz Mid Term - I End Term
20.	NRZ & Bipolar – AMI		Lecture & Problem Solving Practice	[1504.2]	Class Quiz Mid Term - I End Term
21.	Biphase – Manchester & Differential Manchester		Lecture & Problem Solving Practice	[1504.2]	Class Quiz Mid Term - I End Term
22.	Modulation Rate and Scrambling Techniques		Lecture & Problem Solving Practice	[1504.2]	Class Quiz Mid Term - I End Term
23.	ASK & FSK	Explain the principles of Digital Data – Analog Signal and draw the respective waveforms	Lecture	[1504.2]	Class Quiz Mid Term - I End Term
24.	PSK – BPSK		Lecture	[1504.2]	Class Quiz Mid Term - I End Term
25.	MFSK		Lecture	[1504.2]	Class Quiz Mid Term - I End Term
26.	QAM		Lecture	[1504.2]	Class Quiz Mid Term - I End Term

27.	Pulse Code Modulation	Explain the principles of Analog Data – Digital Signal and draw the respective waveforms	Lecture & Problem Solving Practice	[1504.2]	Class Quiz Mid Term - I End Term
28.	Delta Modulation		Lecture	[1504.2]	Class Quiz Mid Term - I End Term
29.	Asynchronous and Synchronous Transmission	Apply the knowledge of various error detection and correction techniques in order to find and overcome error encountered during transmission	Lecture	[1504.3]	Class Quiz Mid Term - I End Term
30.	Type of Error, Redundancy, Detection Vs Correction		Lecture	[1504.3]	Class Quiz Mid Term - II End Term
31.	Cyclic Redundancy Check		Lecture	[1504.3]	Class Quiz Mid Term - II End Term
32.	Polynomials & CRC Architecture		Lecture & Problem Solving Practice	[1504.3]	Class Quiz Mid Term - II End Term
33.	Error Correction and Block Code Principle		Lecture & Problem Solving Practice	[1504.3]	Class Quiz Mid Term - II End Term
34.	Line Configurations		Lecture	[1504.3]	Class Quiz Mid Term - II End Term

35.	Framing	Data Link Control Protocols: Discuss flow control and error control techniques.	Lecture	[1504.3]	Class Quiz Mid Term - II End Term
36.	Flow Control - Stop-and-Wait Protocol		Lecture & Problem Solving Practice	[1504.3]	Class Quiz Mid Term - II End Term
37.	Sliding Window		Lecture & Problem Solving Practice	[1504.3]	Class Quiz Mid Term - II End Term
38.	Error Control: Stop-and-Wait ARQ		Lecture & Problem Solving Practice	[1504.3]	Class Quiz Mid Term - II End Term
39.	Go-Back-N ARQ		Lecture & Problem Solving Practice	[1504.3]	Class Quiz Mid Term - II End Term
40.	Selective Repeat ARQ		Lecture & Problem Solving Practice	[1504.3]	Class Quiz Mid Term - II End Term
41.	High-Level Data Link Control (HDLC)		Lecture	[1504.3]	Class Quiz Mid Term - II End Term

42.	Introduction to Multiplexing	Discuss and distinguish between different types of multiplexing techniques	Lecture	[1504.4]	Class Quiz Mid Term - II End Term
43.	Frequency Division Multiplexing (FDM)		Lecture	[1504.4]	Class Quiz Mid Term - II End Term
44.	Time-Division Multiplexing (TDM)		Lecture & Activity	[1504.4]	Class Quiz Mid Term - II End Term
45.	The Concept of Spread Spectrum	Principles of spread spectrum techniques and in particular CDMA technique	Lecture	[1504.4]	Class Quiz Mid Term - II End Term
46.	Frequency Hopping Spread Spectrum (FHSS)		Lecture	[1504.4]	Class Quiz Mid Term - II End Term
47.	Slow and Fast FHSS		Lecture & Problem Solving Practice	[1504.4]	Class Quiz Mid Term - II End Term
48.	Direct Sequence Spread Spectrum (DSSS)		Lecture & Problem Solving Practice	[1504.4]	Class Quiz Mid Term - II End Term
49.	Performance Consideration – FHSS and DSSS		Lecture	[1504.4]	End Term
50.	Code Division Multiple Access (CDMA)		Lecture & Problem Solving Practice	[1504.4]	End Term

51.	Introduction, Generations: 1G, 2G, 3G,	Identify and compare various generations of wireless cellular networks.	Lecture	[1504.5]	End Term
52.	4G, and 5G		Lecture	[1504.5]	End Term

I. Course Articulation Matrix (Mapping of COs with POs and PSOs) for Data Communications:

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1504.1	Define the significance of relevant terminologies, explain the transmission of digital & analog signals over different types of transmission media and outline the effects of various transmission impairments on analog & digital transmission.	1	1							1	2		1	1	2	

1504.2	Describe the principles of signal encoding techniques used for digital data to digital signal conversion and analog data to digital signal conversion and compare them.	2	2	1							1			3	2	
1504.3	Develop skills pertaining to error detection and correction techniques in order to find and overcome error encountered during transmission and discuss flow control and error control techniques.	3	2	1							1			2	2	1
1504.4	Distinguish between different types of multiplexing techniques and spread spectrum techniques.	2								1	2			2	2	
1504.5	Identify and compare various generations of wireless cellular networks.	2						1					1	1	2	

1- Low Correlation : 2- Moderate Correlation; 3-Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Computing and IT

Department of Computer Science and Engineering
Course Hand-out

Linux System and Shell Programming | CS 1551 | 3 Credits | 3 0 0 3

Session: July - Nov 2019 | Faculty: Ms. Bali Devi | Class: V Semester DE-1

A. **Introduction:** This course explains the structure of the Unix/Linux operating system and how to write system and network programs. The course covers the details of the file system, terminal and device input/output, multi-tasking, interprocess communication, and network programming. Theory is presented in the context of how Unix/Linux implements the ideas.

B. **Course Outcomes:** At the end of the course, students will be able to:

[1551.1]. Figure out how most Linux commands work and write system programs for implementing general file system utilities, process trees, internal data structures of operating systems, input/output redirection & for handling signals.

[1551.2]. Design, write and test programs to improve skills on inter-process communication that uses pipe, socket API and Remote procedure calls.

[1551.3]. Apply employability based concepts related to concurrency to achieve the same for cooperating processes.

[1551.4]. Include their own driver in kernel code, recompile it and boot from their kernel.

[1551.5]. Write advanced shell scripts.

[1551.6]. Develop minor projects like Shell, Network File System, File Transfer Protocol and other network applications for entrepreneurship and employability.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1] . **Engineering Knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

[PO.2] . **Problem Analysis**: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

[PO.3] . **Design/Development of Solutions**: Design solutions for complex engineering problems and design system components or processes_that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

[PO.4] . **Conduct Investigations of Complex Problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

[PO.5] . **Modern Tool Usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools_including prediction and modeling to complex engineering activities with an understanding of the limitations.

[PO.6] . **The Engineer and Society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues_and the consequent responsibilities relevant to the professional engineering practice.

[PO.7] . **Environment and Sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

[PO.8] . <u>Ethics</u>: Apply ethical principles and commit to professional ethics_and responsibilities and norms of the engineering practices.

[PO.9] . <u>Individual and Teamwork</u>: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

[PO.10] <u>Communication</u>: Communicate effectively_on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

[PO.11] <u>Project Management and Finance:</u> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

[PO.12] <u>Life-long Learning</u>: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

[PSO.1] <u>Analysis</u> to design, develop and implement efficient software for a given real life problem.

[PSO.2] <u>Develop</u> through practice apply knowledge of AI, Machine Learning and Data Mining in analyzing big data for extracting useful information from it and for performing predictive analysis.

[PSO.3] <u>Implement</u> to design, manage and secure wired/ wireless computer networks for transfer and sharing of information.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	15
	Sessional Exam II (Closed Book)	15
	Quizzes and Assignments (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Close Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

Fundamentals: Processes in Linux, Process system calls, Background processes and daemons, Linux I/O, Device terminology, I/O system calls, select and poll Functions, Filters and redirection, Linux File system navigation, Directory access, File system implementation, Hard links and symbolic links; **Asynchronous events:** Basic signal concepts, Generating signals, Manipulating signal masks and signal sets, Catching and ignoring signals, Waiting for signals, Handling signals, Programming with asynchronous I/O, POSIX times, Sleep functions; **Inter-process communication:** Named and unnamed pipes, Sockets, Remote procedure calls, Network file system; **Concurrency:** POSIX thread attributes, Synchronization functions, Mutex locks, Condition variables, Signal handling and threads; **Character device driver development:** Driver concepts, Writing character drivers, Interrupt handling, Interfacing with hardware; **Shell scripting:** Shell scripts with the help of variables, Loops, Conditional statements, Command line arguments, test command, expr command, Interactive scripts with read, Functions & file manipulations, Regular expression & filters; **Advanced scripting techniques:** Providing command line options to scripts, Exporting variables, Arrays, Remote shell execution, Connecting to MySQL using shell, Essential System Administration jobs, Debugging using GDB, make utility, Customizing the environment.

F. TEXT BOOKS

T1. W. R. Stevens and S. A. Rago, "*Advanced Programming in the UNIX Environment*", 3rd Edition, Addison-Wesley, 2013.

T2. S. Das, "*Unix Concepts and Applications*", 4th Edition, McGraw Hill, 2006.

G. REFERENCE BOOKS

R1. W. R. Stevens and B. Fenner, *"UNIX Network Programming, Volume 1: The Sockets Networking API*", 3rd Edition, Pearson Education, 2003.

R2. W. R. Stevens, *"UNIX Network Programming, Volume 2: Interprocess Communications*", 2nd Edition, Pearson Education, 1998.

R3. K. A. Robbins and S. Robbins, "*Unix Systems Programming: Communication, Concurrency, and Threads*", 2nd Edition, Prentice Hall, 2004.

R4. M. Bach, "*Design of Unix Operating System*", PHI.

H. Lecture Plan:

Lec No	**Topics**	**Session Outcome**	**Mode of Delivery**	**Corresponding CO**	**Mode of Assessing the Outcome**
1	Introduction and Course Hand-out briefing	To acquaint and clear teachers expectations and understand student expectations	Lecture	NA	NA
2,3	Processes in Linux, Process system calls, Background processes and daemons	Describe kernel data structures for process, syntax of process system calls, write system programs for creating different process trees	Lecture	1551.1	Quiz MTE-1 End Term Programming Assignment
4,5	Linux I/O, Device terminology, I/O system calls, select and poll Functions	Describe I/O system calls routines, device independence, Identify in-memory data structures after execution of system calls	Lecture	1551.1	Quiz MTE-1 End Term Programming Assignment
6,7,8	Filters and redirection, Linux File system navigation, Directory access, File system implementation, Hard links and symbolic links	Figure out how linux commands work and able to write system programs for the same	Lecture	1551.1	Quiz MTE-1 End Term
9,10	Basic signal concepts, Generating signals, Manipulating signal masks	Identify the effect of signals related to process group and	Lecture	1551.1	Quiz MTE-1 End Term

	and signal sets, Catching and ignoring signals, Waiting for signals, Handling signals, Programming with asynchronous I/O, POSIX times, Sleep functions	write system programs for catching signals			Programming Assignment
11,12,13	Inter-process communication: Named and unnamed pipes	Identify the kernel data structures on execution of pipe and mkfifo system calls and write IPC programs using them	Lecture	1551.2 1551.6	Quiz Mid Term I End Term Programming Assignment Project
14,15,16,17,18	UDP Sockets, Iterative TCP Sockets, Concurrent TCP Sockets, Remote procedure calls, SUN RPC	Design, write and test programs that use the POSIX socket API and Remote procedure calls.	Lecture	1551.2 1551.6	In Class Quiz MTE-1 End Term Project
19, 20, 21	Network file system	Configure NFS, describe its implementation, develop their own NFS code	Lecture	1551.6	In Class Quiz MTE-2 End Term Project
22,23,24,25,26	POSIX thread attributes, Synchronization functions, Mutex locks, Condition variables Signal handling and threads	Apply concepts related to concurrency to achieve the same for cooperating processes	Lecture	1551.3	Class Quiz Mid Term 2 End Term Programming Assignment
27,28,29,30	Character device driver development: Driver concepts, Writing character drivers, Interrupt handling, Interfacing with hardware	Include their own driver in kernel code, recompile it and boot from their kernel	Lecture Self-Study	1551.4 1551.6	Class Quiz End Term Project
31,32,33,34	Shell scripts with the help of variables, Loops, Conditional statements, Commandline arguments, test command, expr command, Interactive scripts with read, Functions & file manipulations, Regular expression & filters	Recall Shell Scripts	Lecture Self-Study	1551.5	Class Quiz End Term Programming Assignment
35,36,37	Advanced scripting techniques: Providing command line options to scripts, Exporting variables, Arrays, Remote shell execution	Write advanced shell scripts	Lecture	1551.5	End Term Project
38,39,40	Connecting to MySQL using shell, Essential System Administration jobs, Debugging using GDB, make utility, Customizing the environment.	Write scripts for system administration and customizing the environment, know how to use debugger and make utility	Lecture	1551.5	End Term Project

I. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CS 1551.1	Figure out how most Linux commands work and write system programs for implementing general file system utilities, process trees, internal data structures of operating systems, input/output redirection & for handling signals.	2		1									1	1	1	1
CS 1551.2	Design, write and test programs for inter-process communication that uses pipe, socket API and Remote procedure calls.	3		2	1								2	1		1
CS 1551.3	Describe concepts related to concurrency and achieve the same for cooperating processes.	2	1	1									1	1	1	1
CS 1551.4	Include their own driver in kernel code, recompile it and boot from their kernel.	3				2					1	1	1	1		1
CS 1551.5	Write advanced shell scripts.	2											2	1	1	1
CS 1551.6	Develop minor projects like Shell, Network File System, File Transfer Protocol and other network applications.	3		3	1					1	1		2	2		2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

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MANIPAL UNIVERSITY JAIPUR

School of Computing & Information Technology

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Course Hand-out

Software Engineering Lab | CS1532 | 1 Credits | 0 0 2 1

Session: July 19- Dec 19 | Faculty: Dr. Ashish Kumar| Class: B.Tech. - CSE V SEM

A. **Introduction:** This course is offered by the Department of Computer Science & Engineering as of Software Engineering Lab is to impart state-of-the-art knowledge on Software Engineering and UML. The subject will introduce the concept of Software development life cycle. Student will learn Rational Rose Software, Load Runner and Selenium tool.

B. **Course Outcomes:** At the end of the course, students will be able to:

[CS 1532.1] Apply concepts of UML to design Use Case Diagrams.

[CS 1532.2] Do requirement analysis, develop SRS and detail design

[CS 1532.3] Develop Project based on requirements.

[CS 1532.4] Design of test cases based on requirement and design.

[CS 1532.5] Do estimation of project parameters.

C. **PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES**

[PO.1]. **Engineering knowledge:** Apply the knowledge of basic science and fundamental computing in solving complex engineering problems.

[PO.2]. **Problem analysis:** Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

[PO.3]. **Design/development of Computing solutions:** Design solutions for complex IT engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the Information oriented public health and safety, and the cultural, societal, and environmental considerations

[PO.4]. **Conduct investigations of complex problems**: Use IT domain research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations

[PO.6]. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse IT teams, and in multidisciplinary settings.

[PO.10]. **Communication:** Communicate effectively on complex computing engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

[PSO.1]. Will be able to design, develop and implement efficient software for a given real life problem.

[PSO.2]. Will be able to apply knowledge of AI, Machine Learning and Data Mining in analysis big data for extracting useful information from it and for performing predictive analysis.

[PSO.3]. Will be able to design, manage and secure wired/ wireless computer networks for transfer and sharing of information.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Weekly evaluation (record + execution + viva)	50
	Mini project	20
End Term Exam (Summative)	End Term Exam	30
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work at home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

Introduction to Unified Modeling Language (UML 2.0), Use case diagrams, Class diagram, Object diagram, Activity diagram, sequence diagram, component diagram, deployment diagram, state chart diagram, ER Diagrams and DFD Designing Test Cases, Mini-Projects & Case Studies.

TEXTBOOKS

T1. R. S. Pressman: Software Engineering: A Practitioners Approach, 7th Edition, TMH, 2016.

REFERENCE BOOKS

R1. W. Boggs and M. Boggs : Mastering UML with Rational Rose with CDROM, SYBEX Inc., USA, 1999.

F. Lecture Plan:

Class Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1-2	Identifying the Requirements from Problem Statements	Identify functional and non-functional requirements from a given problem statement	Lecture/ Demonstration	[CS1532.1]	Continuous Evaluation, Project
3	Estimation of Project Metrics	Estimate cost, effort and duration for a software project	Lecture Demonstration	[CS1532.5]	Continuous Evaluation, Project

5-6	Modeling UML Use Case Diagrams and Capturing Use Case Scenarios, Modeling UML Class Diagrams and Sequence diagrams	Develop Use Case Diagrams & Sequence diagrams	Demonstration	[CS1532.2]	Continuous Evaluation, Project
7	E-R Modeling and Statechart and Activity Modeling from the Problem Statements	Construct E-R Modeling, Statechart and Activity Modeling	Lecture Demonstration	[CS1532.2]	Continuous Evaluation, project, End Term
8-9	Coding & Development	Develop project based on requirements and detail design	Lecture Demonstration	[CS1532.3]	Continuous Evaluation, project, End Term
10	Estimation of Test Coverage Metrics and Structural Complexity	Estimation of Test Coverage Metrics and Structural Complexity	Lecture Demonstration	[CS1532.4] [CS1532.5]	Continuous Evaluation, project, End Term
11-12	Designing Test Suites	hands-on experience on Load Runner and Selenium testing tool.	Lecture Demonstration	[CS1532.4]	Continuous Evaluation, project, End Term

G. Course Articulation Matrix: (Mapping of COs with POs & PSOs)

CO	STATEMENT	Correlation with Program Outcomes **(POs)**												Correlation with Program Specific Outcomes (**PSOs**)		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
[CS1532.1]	Apply concepts of UML to design Use Case Diagrams	**1**	**2**	**3**	**1**	**2**	**1**	**2**						**3**		
[CS1532.2]	Do requirement analysis, develop SRS and detail design.	**1**	**2**	**3**	**1**	**1**	**1**	**2**						**3**		
[CS1532.3]	Develop Project based on requirements.	**1**	**3**	**3**	**1**	**1**	**1**	**3**						**3**		
[CS1532.4]	Design of test cases based on requirement and design with the help of testing tools	**1**	**2**	**2**		**3**	**1**	**2**						**3**		
[CS1532.5]	Do estimation of project parameters.	**1**	**2**	**2**	**1**	**1**	**1**	**2**						**3**		

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Department of Computer Science & Engineering
Course Hand-out

Software Engineering| CS 1502 | 4 Credits | 3 1 0 4

Session: July 19 – Nov 19 | Faculty: Dr. Neha Chaudhary | V Sem

A. Introduction: The aim of this course is to enable a clear understanding and knowledge of the foundations, techniques, tools and processes in the area of software engineering and its practices followed in software industry. The course will prepare students to apply engineering methods and processes on software projects.

B. Course Outcomes: At the end of the course, students will be able to

[CS 1502.1] Describe basic concept related to software engineering Methods, tool, Process Model and use them in software project.

[CS 1502.2] Apply different Estimation Techniques based on project Metrics, Measures and indicators

[CS 1502.3] Design software and architecture at different detail levels based on requirements for software projects

[CS 1502.4] Demonstrate the Testing methods and their procedures to implement in any project

[CS 1502.5] Improve entrepreneurship skills by Assess quality of software projects based on software quality assurance techniques.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. **Engineering knowledge**: : Apply the knowledge of basic science and fundamental computing in solving complex engineering problems

[PO.2]. **Problem analysis**: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

[PO.3]. **Design/development of Computing solutions**: Design solutions for complex IT engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the Information oriented public health and safety, and the cultural, societal, and environmental considerations

[PO.4]. **Conduct investigations of complex problems**: Use IT domain research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6]. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse IT teams, and in multidisciplinary settings.

[PO.10]. **Communication**: Communicate effectively on complex computing engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

[PSO.1] Will be able to design, develop and implement efficient software for a given real life problem.

[PSO.2] Will be able to apply knowledge of AI, Machine Learning and Data Mining in analysing big data for extracting useful information from it and for performing predictive analysis.

[PSO.3] Will be able to design, manage and secure wired/ wireless computer networks for transfer and sharing of information.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	15
	Sessional Exam II (Closed Book)	15
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Closed Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

Introduction: The Evolving Role of Software, The changing nature of software, Legacy software, Software Myths, Software Engineering: A Layered Technology, A Process Framework, umbrella activities, measures, metrics, indicators, The Capability Maturity Model Integration (CMMI), Specialized Process Models, The Unified Process; Agile development: Agile Process Models Software Engineering Practice, Communication Practice, Planning Practices, Modeling Practices, Construction Practice, Deployment Computer–Based Systems, The System Engineering Hierarchy, Business Process Engineering: An Overview; Product Engineering: An Overview, Data Modeling Concepts, Object Oriented Analysis, Flow-Oriented Modeling, Taxonomy of Quality Attributes, Perspectives of Quality, Quality System, Software Quality Assurance, Capability Maturity Model Observation on Estimation, The Project Planning Process, Software Scope and Feasibility, Human Resources, Empirical Estimation Model

F. TEXT BOOKS

T1. Pressman R, Software Engg. Practioner Approach (MGH), 2006

T2. Jalote Pankaj, An integrated approach to Software Engineering (Narosa)

T3. Rajib Mall, Introduction to Software Engineering, TMH

G. REFERENCE BOOKS

R1. Sommerville, Software Engineering 10e, Pearson

Lecture Plan:

S.NO	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
	Introduction to software engineering	To explain teachers expectations and understand student expectations	**Lecture**	NA	NA
1.	Software, Emergence of software engineering, evolving role of software, The changing nature of software.	Define role and nature of software	**Lecture**	[1502.1]	Class Quiz Mid Term - I End Term
2.	Legacy software, Software Myths, Software crisis.	Analyze types of software and myths associated with them.	**Lecture**	[1502.1]	Class Quiz Mid Term - I End Term
3.	Introduction to software engineering: Layered Approach, Generic approach, Process Framework.	Recall software engineering layered approach and process framework	**Lecture**	[1502.1]	Class Quiz Mid Term - I End Term
4.	The process, software products, Software Characteristics, Applications.	Recall software products, Software Characteristics, Applications.	**Lecture**	[1502.1]	Class Quiz Mid Term - I End Term
5.	Software development life cycle, Assessment Model-CMMI	**Appraise s**oftware development life cycle, Assessment Model-CMMI	**Lecture**	[1502.1]	Class Quiz-1 Mid Term - I End Term
6.	Process Models- Conventional Process Model (Traditional Waterfall Model, prototype, RAD)	**Choose between** process Models	**Lecture**	[1502.1]	Class Quiz Mid Term - I End Term
7.	Evolutionary Process Model (Incremental Model, Spiral models, Component based process model, unified process model), Comparison of various models	**Compare** Evolutionary Process Model	**Lecture**	[1502.1]	Class Quiz Mid Term - I End Term

8.	An Agile view of process, Human Factors	Define agile view of process	**Lecture**	[1502.1]	Class Quiz Mid Term - I End Term
9.	Agile Process Models (Extreme programming, Adaptive Software Development, Dynamic System Development method)	Apprise Agile process models and its adaptive software development using Extreme programming	**Lecture**	[1502.1]	Class Quiz Mid Term - I End Term
10.	Agile process Models (Scrum, Crystal, Feature Driven Development, Agile Modeling)	Assess agile process Models (Scrum, Crystal, Feature Driven Development, Agile Modeling)	**Lecture**	[1502.1]	Class Quiz Mid Term - I End Term
11.	Case study Based on Agile Model	Build systems based on Agile Model	**Lecture/Lab**	[1502.1]	Class Quiz Mid Term - I End Term
12.	Requirement Engineering, Type of requirements, Software requirements specifications	Illustrate methods of Requirement Engineering, Type of requirements, Software requirements specifications	**Lecture/Lab**	[1502.3]	Class Quiz Mid Term - I End Term
13.	Software Engineering Practice (elicitation, analysis, documentation, validation, Management)	Explain Software Engineering Practice (elicitation, analysis, documentation, validation, Management)	**Lecture/Lab**	[1502.3]	Class Quiz Mid Term - I End Term
14.	Size estimation- LOC Estimation	Evaluate the size of project and estimation- size of project using LOC Estimation	**Lecture/Lab**	[1502.2]	Class Quiz Mid Term - II End Term
15.	Function Count Method	Apply Function Count method	**Lecture/Lab**	[1502.2]	Class Quiz Mid Term - II End Term
16.	Cost Estimation	Apply Cost Estimation techniques in software projects	**Lecture/Lab**	[1502.2]	Class Quiz Mid Term - II End Term

17.	Halstead Size Estimation	Evaluate software project using Halstead Size Estimation	**Lecture/Lab**	[1502.2]	Class Quiz Mid Term - II End Term
18.	Effort Estimation-COCOMO Model	Effort Estimation- using COCOMO Model	**Lecture/Lab**	[1502.1]	Class Quiz Mid Term - II End Term
21.	Risk Analysis and Risk Estimation	Determine Risk associated with software projects	**Lecture/Lab**	[1502.1]	Class Quiz Mid Term - II End Term
22.	Analysis Modeling: Data Modeling, Functional modeling and information flow, Data flow diagrams	Apply Analysis Modeling: Data Modeling, Functional modeling and information flow, Data flow diagrams	**Lecture/Lab**	[1502.3]	Class Quiz Mid Term - II End Term
23.	Behavioral Modeling; The mechanics of structured analysis: Creating entity/ relationship diagram	Apply Behavioral Modeling; The mechanics of structured analysis: Creating entity/ relationship diagram	**Lecture/Lab**	[1502.3]	Class Quiz Mid Term - II End Term
24.	Data flow model, control flow model, the control and process specification; The data dictionary	Design Data flow model, control flow model, the control and process specification; The data dictionary	**Lecture/Lab**	[1502.3]	Class Quiz Mid Term - II End Term
25.	Unified modeling language – an introduction, Discussion on Class diagrams, Object diagrams, Sequence diagrams, use case diagram.	Apply Unified modeling language and develop UML Diagrams	**Lecture/Lab**	[1502.3]	Class Quiz Mid Term - II End Term
26.	Case Study Based on Software Design	Develop Case Study Based on Software Design	**Flipped Classroom**	[1502.3]	Class Quiz Mid Term - II End Term
27.	Design concepts and principles, the design process	Design concepts and principles and show design process	**Lecture/Lab**	[1502.3]	Class Quiz Mid Term - II End Term
28.	Design and software quality, design principles	Relate design and software quality, design principles	**Lecture/Lab**	[1502.3]	Class Quiz Mid Term - II End Term

	Design concepts: Abstraction, refinement, modularity	Recall concept of Abstraction, refinement and modularity	**Lecture/Lab**	[1502.3]	Class Quiz Mid Term - II End Term
29.	software architecture, control hierarchy, structural partitioning, data structure, software procedure, information hiding	Develop software architecture, control hierarchy, structural partitioning, data structure, software procedure, information hiding	**Lecture/Lab**	[1502.3]	Class Quiz Mid Term - II End Term
30.	Effective modular design: Functional independence, Cohesion, Coupling	Appraise effective modular design: Functional independence, Cohesion, Coupling	**Lecture/Lab**	[1502.3]	Class Quiz Mid Term - II End Term
31.	Software architecture: Data Design: Data modeling, data structures, databases and the data warehouse.	Develop Software architecture: Data Design: Data modeling, data structures, databases and the data warehouse.	**Lecture/Lab**	[1502.3]	Class Quiz Mid Term - II End Term
32.	Analyzing alternative Architectural Designs ,architectural complexity;	Analyzing alternative Architectural Designs ,architectural complexity;	**Lecture/Lab**	[1502.3]	Class Quiz Mid Term - II End Term
33.	Mapping requirements into a software architecture;	Translate requirements into a software architecture;	**Lecture/Lab**	[1502.3]	Class Quiz Mid Term - II End Term
	Transform flow, Transaction flow	Recall Transform flow, Transaction flow	**Lecture/Lab**	[1502.3]	Class Quiz Mid Term - II End Term
34.	Transform mapping: Refining the architectural design.	Apply transform mapping: Refining the architectural design.	**Lecture/Lab**	[1502.3]	Class Quiz Mid Term - II End Term
35.	Software Testing Techniques, software testing fundamentals	Analyze Software Testing Techniques, software testing fundamentals	**Lecture/Lab**	[1502.4]	Class Quiz Mid Term - II End Term

36.	Functional Testing(black Box): Boundary value analysis	Experiment with functional Testing(black Box): Boundary value analysis	**Lecture/Lab**	[1502.4]	Class Quiz Mid Term - II End Term
37.	Equivalence class Testing,	Apply Equivalence class Testing,	**Lecture/Lab**	[1502.4]	Class Quiz Mid Term - II End Term
38.	Decision table based testing	Make use of Decision table based testing	**Lecture/Lab**	[1502.4]	Class Quiz Mid Term - II End Term
39.	Structural Testing (White box) : Path testing	Experiment with Structural Testing (White box) : Path testing	**Lecture/Lab**	[1502.4]	Class Quiz Mid Term - II End Term
40.	Cyclomatic Complexity	Evaluate Cyclomatic Complexity	**Lecture/Lab**	[1502.4]	Class Quiz Mid Term - II End Term
41.	Graph Matrices	Examine Graph Matrices for testing	**Lecture/Lab**	[1502.4]	Class Quiz Mid Term - II End Term
42.	Data Flow Testing	Make use of Data Flow Testing	**Lecture/Lab**	[1502.4]	Class Quiz Mid Term - II End Term
43.	Unit testing, Integration Testing, System Testing, Validation Testing, Testing Tools (Static Testing tools, Dynamic Testing tools, characteristics of Modern tools).	Develop test cases using different methods	**Lecture/Lab**	[1502.4]	Class Quiz Mid Term - II End Term
44.	Debugging: Debugging techniques, Debugging Approaches, Debugging Tools.	Choose Debugging tools and techniques	**Lecture/Lab**	[1502.4]	Class Quiz End Term
45.	Software re-engineering, reverse engineering, restructuring, forward engineering.	Apply concepts of Software re-engineering, reverse engineering, restructuring, forward engineering.	**Lecture/Lab**	[1502.4]	Class Quiz End Term

46.	Case Study based on Software Testing	Take part in Case Study based on Software Testing	**Flipped Classroom**	[1502.4]	Class Quiz End Term
47.	Quality concepts, Software quality assurance , SQA activities, Software reviews	Apply Quality concepts, Software quality assurance , SQA activities, Software reviews	**Lecture**	[1502.5]	Class Quiz End Term
48.	Formal technical reviews: The review meeting, review reporting and record keeping, review guidelines, Formal approaches to SQA.	Recall Formal technical reviews and Formal approaches to SQA.	**Lecture**	[1502.5]	Class Quiz End Term
49.	Statistical software quality assurance; software reliability: Measures of reliability and availability, The ISO 9000 Quality standards: The ISO approach to quality assurance systems, The ISO 9001 standard	Explain Statistical software quality assurance and ISO 9000 Quality standards	**Lecture**	[1502.5]	Class Quiz End Term
50.	Characteristics of software maintenance, Software maintenance processes model	Identify characteristics of software maintenance, Software maintenance processes model	**Lecture**	[1502.5]	Class Quiz End Term
51.	Case Study based on Software Quality Assurance and Software Maintenance	Take part in Case Study based on Software Quality Assurance and Software Maintenance	**Flipped Classroom**	[1502.5]	Class Quiz End Term

H. Course Articulation Matrix: (Mapping of COs with POs and PSOs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1502.1	[1502.1]. Describe basic concept related to software engineering Methods, tools , Process Model and use them in software project.	1	2	1	1	1				2	3	1	3	3		
1502.2	[1502.2]. Apply different Estimation Techniques based on project Metrics, Measures and indicators	2	3	2	2	3					3	3		3		
1502.3	[1502.3]. Design software and archictecture at different detail levels based on requirements for software projects	1	3	3	3	3				3	3	3	3	3		
1502.4	[1502.4]. Demonstrate the Testing methods and their procedures to implement in any project	1	2	1	3	3					3	1		3		
1502.5	[1502.5]. Assess quality of software projects based on software quality assurance techniques.	1	1	2	2	2					3	2		3		

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Department of Computer Science and Engineering
Course Hand-out

ARTIFICIAL INTELLIGENCE | IT1653 | 3 Credits | 3 0 0 3

Session: Jan 20 – May 20| Faculty: Neha Chaudhary| Class: VI semester Elective

A. Introduction: This course introduces artificial intelligence techniques and soft computing techniques to the students. The course will teach you about Autonomous Agents, Problem solving, Search, Heuristic methods, State space Learning, Game Playing, Knowledge Representation, Uncertainty, Propositional Logic, Predicate Logic, Logic-based Agents, Basics of Natural Language Processing, Neural Networks, Evolutionary Computation.

B. Course Outcomes: At the end of the course, students will be able to

[IT1653.1] Discuss basics of Artificial intelligence and some representative applications of artificial intelligence.
[IT1653.2] Formalise a given AI problem and analyse it along different dimensions.
[IT1653.3] Identify and implement appropriate A.I. search technique to solve the problem.
[IT1653.4] Illustrate knowledge representation using propositional, first order predicate logic and semantic network and apply reasoning process to draw conclusions.
[IT1653.5] Apply different models performing common machine learning tasks such as classification and clustering.
[IT1653.6] Understand the role of soft computing and NLP techniques to solve problems and Improve entrepreneurship skills.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4]. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations

[PO.6]. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

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[PO.10]. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

[PSO.1] Will be able to design, develop and implement efficient software for a given real life problem.
[PSO.2] Will be able to apply knowledge of AI, Machine Learning and Data Mining in analysing big data for extracting useful information from it and for performing predictive analysis.
[PSO.3] Will be able to design, manage and secure wired/ wireless computer networks for transfer and sharing of information.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	15
	Sessional Exam II (Open Book)	15
	In class Quizzes, Assignments and Class Performance (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Closed Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

Pre-requisite(s): Programming in C, Data Structures, Engineering Mathematical - III, Design and Analysis of Algorithms

Introduction: What is Artificial Intelligence, Current Trends in AI; **Intelligent Agents**, Agent v/s Software Program, Classification of Agents, Working of an Agent, Single and Multi-Agent System, Performance Evaluation of Agents, Architecture of Intelligent Agents**; AI Problems- Problem Space**: Problem analysis; **Problem Solving Techniques**: Heuristic search Techniques; **Knowledge Representation**: Semantic Networks, Propositional and Predicate Logic: Propositional and Predicate calculus, semantics for predicate calculus, theorem prover, inference rules, unification, Resolution, Refutation in predicate logic; **Learning -** Supervised, unsupervised, Symbolic learning: Rote Learning, learning by taking, learning by example, explanation based learning, learning by parameter adjustment; **Soft Computing**: Neural Networks: Perceptron, Back Propagation, Hop-field Networks; **Introduction to Genetic Algorithms** -a simple GA algorithm, Application to GA - robot path Planning, optimization; **Introduction to Natural Language Processing** - Introduction, Parsing using CFG, Chomsky, case grammar.

F. TEXT BOOKS

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1. Lecture Plan:

Lec No	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1- 2	Fundamental Concepts	Intelligent Systems, Foundation and Application of AI Current Trends in AI	Lecture	**IT1653.1**	In Class Quiz Sessional I End Term
3– 5	Problems, Problem Spaces	Defining a Problem Characteristics of a Problem A brief introduction to problem solving techniques.	Lecture	**IT1653.2**	In Class Quiz Sessional I End Term
6-7	Intelligent Agents	Agent v/s Software Program Rational Agent and PEAS Description Classification of Agents, Working of an Agent Single and Multi-Agent System Performance Evaluation of Agents, Architecture of Agent, Intelligent Agents;	Lecture Tutorial	**IT1653.2**	In Class Quiz End Term
8-12	Heuristic Search Techniques	Heuristic search technique: Generate and Test, Hill Climbing, Best-first search, Problem reduction, Constraint satisfaction, Means-ends analysis	Lecture Tutorial	**IT1653.3**	Sessional I End Term
13-14	Game Playing	Min-Max Search Procedure Alpha-Beta Pruning Two – player perfect information games	Lecture Tutorial	**IT1653.3**	In Class Quiz End Term
15	Knowledge Representation	Knowledge Representation Issues	Lecture	**IT1653.4**	Class Quiz Sessional II End term
16-19	Propositional and Predicate Logic	Propositional and Logic operators , Simplification laws Predicate Calculus: Limitations of Propositional Logic Quantifiers: Existential and Universal Domain Constraints Nested Quantifiers Semantics for predicate calculus Inference rules, Resolution principle	Lecture	**IT1653.4**	Class Quiz Sessional II End term
20-23	Knowledge Representation	Knowledge Representation using predicate logic Semantic nets	Tutorial	**IT1653.4**	Class Quiz Sessional II End term

24 – 28	Learning in AI	Learning, different types of learning, learning by example-induction (Find-s, Version Space, Decision Trees), Naïve Bayes Classifier	Lecture	**IT1653.5**	Class Quiz Sessional II End term
29 – 32	Neural Networks	Introduction, Neuron, Model, Perceptron, Formulation , Perceptron, Back propagation	Lecture	**IT1653.6**	Class Quiz Sessional II End term
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36 – 39	Natural Language Processing:	Introduction Parsing using context free grammar Chomsky hierarchy Case grammar	Lecture	**IT1653.6**	Home Assignment Class Quiz End Term
40	Conclusion and Course Summarization	NA	Lecture	**NA**	NA

2. Course Outcome Attainment Level Matrix:

CO	STATEMENT	ATTAINMENT OF PROGRAM OUTCOMES **THRESHOLD VALUE: 40%**												ATTAINMENT OF PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
IT1653.1	Discuss basics of Artificial intelligence and some representative applications of artificial intelligence.			2											3	
IT1653.2	Formalise a given problem and analyse it along different dimensions		3	2										2	3	
IT1653.3	Identify and implement appropriate A.I. search technique to solve the problem.	2	3											2	3	
IT1653.4	Illustrate knowledge representation using propositional, first order predicate logic and semantic network and apply reasoning process to draw conclusions.	2		2										2	3	
IT1653.5	Apply different models performing common machine learning tasks such as classification and clustering.					2								2	3	
IT1653.6	Understand the role of soft computing and NLP techniques to solve problems.	2											2	3	3	

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MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Department of Computer Science and Engineering

Course Hand-out

Cloud Computing and Infrastructure Services | CS 1653 | 3 Credits | 3 0 0 3

Session Jan 20 - April 20 | Dr. Sunita Singhal| Class: B. Tech. (CSE) VI SEM | DE

A. Introduction: This course goals to discuss computing and service model of cloud. The course is envisioned to offer the experience in data canter and to highlight both the practical and programmatically scenario. This course also support with the design, implementation and inference of advanced technologies in cloud computing and Infrastructure.

B. Course Outcomes: At the end of the course, students will be able to

[CS 1653.1]. Analyse the phases of transition from classic data center to virtual data center and then to the cloud.
[CS 1653.2]. Describe virtualization technology at compute, storage, network, desktop, and application layers of IT infrastructure.
[CS 1653.3]. Implement the key characteristics, services, and deployment models of cloud.
[CS 1653.4]. Elaborated the cloud infrastructure components and service management processes.
[CS 1653.5]. Illustrate the cloud security concerns and solutions.
[CS 1653.6]. Demonstrate the entrepreneurship skill by key considerations for migration to the cloud and Implement business continuity solutions in a VDC environment and hence improve employability skills.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

[PO.2]. Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

[PO.4]. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
[PO.5]. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
[PO.6]. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice
[PO.7]. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
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[PO.12]. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

[PSO.1]. Will be able to design, develop and implement efficient software for a given real life problem.

[PSO.2]. Will be able to apply knowledge of AI, Machine Learning and Data Mining in analysing big data for extracting useful information from it and for performing predictive analysis.

[PSO.3]. Will be able to design, manage and secure wired/ wireless computer networks for transfer and sharing of information.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Open Book)	15
	Sessional Exam II (Open Book)	15
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Open Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

Clouds and Cloud Computing: Basic Concepts, Cloud Classifications, and Types of Services, deployment models; **Classic Data Center (CDC):** DBMS concepts, CDC drawbacks and need of Cloud Resources, CDC Management and case studies; **Virtualized Data Center (VDC):** Compute and Storage, Compute virtualization overview, Compute virtualization techniques, Virtual Machines, VM Resource management techniques, Physical to virtual conversion, Hypervisor Management Software, Virtual Infrastructure Requirements; **Storage**: Storage virtualization overview, Virtual Machine Storage, Block level and File level virtualization, Virtual provisioning and automated storage tiering; **Networking:** VDC networking overview, VDC networking components , VLAN and VSAN technologies, Network traffic management, Exercise – VDC networking; **Desktop and Application:** Desktop virtualization, Application virtualization, Business Continuity in VDC, Fault tolerance mechanism in VDC, Backup in VDC, Replication and migration in VDC, Cloud infrastructure and service creation, Cloud service management; Cloud **Security:** Security basics, Cloud security concerns and threats, Cloud security mechanisms, Access control and identity management in Cloud, Governance, risk, and compliance, Security best practices for Cloud, Cloud Migration; **Issues in Cloud Considerations:** Migration Considerations, Security issues at different phases to adopt the Cloud.

TEXT BOOKS

T.1 Course materials from EMC^2 Education Services

T.2 Miller M, "*Cloud Computing*", 8th Edition, Que Publishers 2008.

T.3 Buyya R K, "*Cloud Computing: Principles and Paradigms*", Wiley Press, 2011.

REFERENCE BOOKS

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F. **Lecture Plan:**

Lectures	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode Of Assessing CO
1	Introduction of Cloud	Understand need of Cloud computing	Lecture	1653.1	Mid Term I, Quiz & End Term
2	Cloud Classifications	Learn different cloud types	Flipped Class	1653.1	Mid Term I, Quiz & End Term
3	Types of Services	Analaysis of type of services	Lecture	1653.1	Mid Term I, Quiz & End Term
4	Deployment Models	Learn different models	Activity	1653.1	Mid Term I, Quiz & End Term
5	Classic Data Center (CDC)DBMS concepts, CDC drawbacks and need of Cloud Resources	Learn different type of CDC and DBMS concepts	Lecture	1653.1	Mid Term I, Quiz & End Term
6	CDC Management	Understand the CDC Management	Lecture	1653.1	Mid Term I, Quiz & End Term
7	Case Study- Azure	Analysis Azure Management	Lecture	1653.1 & 1653.2	Mid Term I, Quiz & End Term
8	Case Study-IBM	Analysis IBM Management	Lecture	1653.1 & 1653.2	Mid Term I, Quiz & End Term
9	Case Study-Google	Compare with other cloud management with Google	Lecture	1653.1 & 1653.2	Mid Term I, Quiz & End Term
10	Virtualized Data Center (VDC): Compute	Understand Virtualized Data Center management	Lecture	1653.2	Mid Term I, Quiz & End Term
11	Storage, Compute virtualization overview	Analysis the Storage management of different cloud	Lecture	1653.2	Mid Term I, Quiz & End Term
12	Compute virtualization techniques	Study the different Compute virtualization techniques	Lecture	1653.2	Mid Term I, Quiz & End Term
13	Introduction of Virtual Machines	Learn Virtual Machines	Lecture	1653.2	Mid Term I, Quiz & End Term
14	VM Resource management techniques	Learn different VM Resource management techniques	Lecture	1653.2	Mid Term II, Quiz & End Term
15	VM Resource management techniques	Learn different VM Resource management techniques	Lecture	1653.2	Mid Term II, Quiz & End Term
16	Physical to virtual conversion	Develop the Physical to virtual machine	Flipped Class	1653.2	Mid Term II, Quiz & End Term
17	Hypervisor Management Software	Learn Hypervisor Management Software	Flipped Class	1653.2	Mid Term II, Quiz & End Term
18	Virtual Infrastructure Requirements.	Identify Virtual Infrastructure Requirements.	Lecture	1653.2 & 1653.3	Mid Term II, Quiz & End Term

19	Storage: Storage virtualization overview	Learn Storage virtualization	Lecture	1653.2 & 1653.4	Mid Term II, Quiz & End Term
20	Virtual Machine Storage	Application of Virtual Machine Storage	Lecture	1653.2 & 1653.5	Mid Term II, Quiz & End Term
21	Block level and File level virtualization	Understand the Block level and File level virtualization	Lecture	1653.2 & 1653.6	Mid Term II, Quiz & End Term
22	Virtual provisioning and automated storage tiering	Understand Virtual provisioning and automated storage tiering	Lecture	1653.2 & 1653.7	Mid Term II, Quiz & End Term
23	VDC networking overview	Learn VDC networking	Lecture	1653.4	Mid Term II, Quiz & End Term
24	VDC networking components	Learn VDC networking components	Lecture	1653.4	Mid Term II, Quiz & End Term
25	VLAN and VSAN technologies	Learn VLAN and VSAN technologies	Lecture	1653.4	Mid Term II, Quiz & End Term
26	VLAN and VSAN technologies, Network traffic management	Learn VLAN and VSAN technologies, Network traffic management	Lecture	1653.4	Mid Term II, Quiz & End Term
27	VDC networking, Desktop and Application	VDC networking, Desktop and Application	Lecture	1653.4	Mid Term II, Quiz & End Term
28	Desktop virtualization	Learn Desktop virtualization	Lecture	1653.4	Mid Term II, Quiz & End Term
29	Application virtualization	Learn Application virtualization	Lecture	1653.4	Mid Term II, Quiz & End Term
30	Business Continuity in VDC	Understand Business Continuity in VDC	Lecture	1653.6	Mid Term II, Quiz & End Term
31	Fault tolerance mechanism in VDC	Understand Fault tolerance mechanism in VDC	Lecture	1653.6	Quiz & End Term
32	Backup in VDC	Learn Backup in VDC	Lecture	1653.6	Quiz & End Term
33	Replication and migration	Learn Replication and migration	Lecture	1653.6	Quiz & End Term
34	Cloud service management; Cloud Security	Learn requirment Cloud service management	Lecture	1653.6	Quiz & End Term
35	Security basics	Understand Security Requirement of cloud	Lecture	1653.5	Quiz & End Term
36	Cloud security concerns and threats	Understand Cloud security concerns and threats	Lecture	1653.5	Quiz & End Term
37	Cloud security mechanisms, Access control and identity management in Cloud	Identify the Cloud security mechanisms	Lecture	1653.5	Quiz & End Term
38	Governance, risk, and compliance, Security best practices for Cloud, Cloud Migration	Learn risk and issue in cloud	Lecture	1653.5	Quiz & End Term
39	Issues in Cloud Considerations: Migration Considerations	Learn Issues of cloud migration	Lecture	1653.5	Quiz & End Term

40	Security issues at different phases to adopt the Cloud	Discuss Security issues in cloud	Lecture	1653.5	Quiz & End Term

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CS1653.1	Analyse the phases of transition from classic data center to virtual data center and then to the cloud.	3			1									3		
CS1653.2	Describe virtualization technology at compute, storage, network, desktop, and application layers of IT infrastructure.		3	3											1	1
CS1653.3	Implement the key characteristics, services, and deployment models of cloud.				1	3								2	1	1
CS1653.4	Elaborated the cloud infrastructure components and service management processes.									1				3	1	
CS1653.5	Illustrate the cloud security concerns and solutions.			2						1	1			1		1
CS1653.6	Demonstrate the entrepreneurship skill by key considerations for migration to the cloud and Implement business continuity solutions in a VDC environment hence improve employability skills.	2											3	3		1

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Department of Computer Science and Engineering

Course Hand-out

Cloud Computing and Infrastructure Services | CS 1653 | 3 Credits | 3 0 0 3

Session Jan 20 - April 20 | Dr. Sunita Singhal| Class: B. Tech. (CSE) VI SEM | DE

A. Introduction: This course goals to discuss computing and service model of cloud. The course is envisioned to offer the experience in data canter and to highlight both the practical and programmatically scenario. This course also support with the design, implementation and inference of advanced technologies in cloud computing and Infrastructure.

B. Course Outcomes: At the end of the course, students will be able to

[CS 1653.1]. Analyse the phases of transition from classic data center to virtual data center and then to the cloud.
[CS 1653.2]. Describe virtualization technology at compute, storage, network, desktop, and application layers of IT infrastructure.
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16	Physical to virtual conversion	Develop the Physical to virtual machine	Flipped Class	1653.2	Mid Term II, Quiz & End Term
17	Hypervisor Management Software	Learn Hypervisor Management Software	Flipped Class	1653.2	Mid Term II, Quiz & End Term
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CS1653.2	Describe virtualization technology at compute, storage, network, desktop, and application layers of IT infrastructure.		3	3											1	1
CS1653.3	Implement the key characteristics, services, and deployment models of cloud.				1	3								2	1	1
CS1653.4	Elaborated the cloud infrastructure components and service management processes.									1				3	1	
CS1653.5	Illustrate the cloud security concerns and solutions.			2						1	1			1		1
CS1653.6	Demonstrate the entrepreneurship skill by key considerations for migration to the cloud and Implement business continuity solutions in a VDC environment hence improve employability skills.	2											3	3		1

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Department of Computer Science and Engineering
Course Hand-out

Computer Graphics and Multimedia | CS 1604 | 4 Credits | 3 0 1 4

Session: Jan 20 – May 20 | Faculty: Ms. Shikha Mundra / Mr. Nitesh Pradhan / Mr. Saket Acharya / Ms. Bali Devi | Class: CSE 6th Sem | Class: Compulsory

A. Introduction: This course is offered by Dept. of Computer Science and engineering as a compulsory subject, targeting students who wish to pure research & development in industries or higher studies in field of Computer graphics and multimedia. This course aims to make the students aware of components of automated visual technology and related concepts that include display devices, and visual display units, geometric, mathematical and algorithmic concepts necessary for programming computer graphics, windows, clipping and view-ports object representation in relation to images displayed on screen, the models of lighting and shading. After learning through this course, students will be able to understand how a visual device displays components over display unit such as monitor, TV etc. Also, the students will have an overview of multimedia technology wherein they would come across various media formats, their characteristics, and animation basics. Prerequisite for the course is knowledge of fundamental mathematics including Coordinate Geometry and Programming Concepts.

B. Course Outcomes: At the end of the course, students will be able to

[CS1604.1]. Describe graphical display systems along with their skills and applications

[CS1604.2]. Analyse the underlying algorithms for the scan conversion of graphic primitives as per the needs of raster and random scan displays.

[CS1604.3]. Design and implement the model for spatial manipulation of graphic primitives using 2D and 3D transformations

[CS1604.4]. Comprehend the models for illumination and shading.

[CS1604.5]. Overview the core multimedia concepts, compression techniques and basics of animation.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

PO2: Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAM SPECIFIC OUTCOMES

PSO1: Will be able to design, develop and implement efficient algorithm for a given real life problem.
PSO2: Will be able to apply knowledge of Rendering, Texturing, Lighting, Projection to analyse and pre-process any real life image processing problems and also to develop good gaming environment.
PSO3: Will be able to implement multimedia compression algorithm and some animation techniques.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I	15
	Sessional Exam II	15
	In class Quizzes and Assignments, Activity feedbacks (Accumulated and Averaged)	30
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Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
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Basics Of Computer Graphics: Pixel, Frame buffer, Application of computer graphics, Raster Graphics fundamentals; Graphic Displays: Cathode Ray Tube, Random and Raster Scan displays; Scan Conversion: Line Generation- Digital Differential Analyzer (DDA), Bresenham's Algorithm, Algorithms for Circle Generation - Mid Point and Bresenham's Algorithm, Polygon generation and filling algorithms, Anti-aliasing; **Two Dimensional Transformations:** Introduction, Homogeneous representation of points, Basic transformation -Translation, Rotation, Scaling, Reflection, Shear; Clipping and Windowing: Point and Line Clipping, Cohen – Sutherland Algorithm, Sutherland - Hodgman Algorithm; **Three Dimensional transformation:** Translation, Rotation and Scaling; Parallel & Perspective Projection: Types of Parallel & Perspective Projection; Hidden Surface elimination: Depth comparison, Back face detection algorithm, Painter's Algorithm, Z-Buffer Algorithm; Basic Illumination Model: Diffuse reflection, Specular reflection, Phong and Gouraud shading; **Introduction to Multimedia:** Concepts and uses, hypertext and hypermedia; Image, video and audio standards; Audio: digital audio, MIDI, processing sound, sampling, compression; Video: MPEG compression standards, inter-frame and intra-frame compression; **Animation:** types, techniques, key frame animation, utility, morphing.

F. TEXT BOOKS

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G. REFERENCE BOOKS

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R2. "Procedural elements for computer graphics", David F. Rogers, Tata McGraw Hill 2nd Edition.

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H. Lecture Plan:

Class Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1	Introduction to Computer graphics	Gain the knowledge of real time requirement of graphical technology	Lecture	CO 1	1st Sessional ET Exam Class Quiz
2	Display technologies	Advancement in graphical technology	Lecture and Discussion	CO 1	1st Sessional ET Exam Class Quiz
3	CRT and its component	Learning of Foundation Of graphical technology	Lecture	CO 1	1st Sessional ET Exam Class Quiz
4	Raster scan system, Random Scan	Background knowledge to develop any algorithm	Lecture	CO 1	1st Sessional ET Exam Class Quiz
5	Frame buffers and Color CRT	How the data of every pixel get stored	Discussion & Question Answer Session	CO 1	1st Sessional ET Exam Class Quiz Home Assignment
6	Scan converting lines-DDA algorithm & problems	Learn to draw a line using pixels	Lecture	CO 2	1st Sessional ET Exam Class Quiz
7,8	Scan converting lines – Bresenham's algorithm & problems along with example	Learn to draw a line using pixels	Discussion & Question Answer Session	CO 2	1st Sessional ET Exam Class Quiz
9	Scan converting Circle – polar coordinate method, Midpoint algorithm	Learn to draw a circle using pixels	Lecture	CO 2	1st Sessional ET Exam Class Quiz

10,11	Scan converting Circle – Bresenham's algorithm along with example	Learn to draw a circle using pixels	Lecture	CO 2	1st Sessional ET Exam Class Quiz
12,13	Scan converting Ellipse – Midpoint algorithm along with example	Learn to draw a ellipse using pixels	Lecture	CO 2	1st Sessional ET Exam Class Quiz,
14	Polygon Filling – Scan fill algorithm	Explore the methods to fill any polygon	Lecture	CO 2	1st Sessional ET Exam Class Quiz
15	Polygon Filling – Boundary fill Algo	Explore the methods to fill any polygon	Lecture	CO 2	1st Sessional ET Exam Class Quiz
16	Polygon Filling – Flood fill Algo	Explore the methods to fill any polygon	Lecture	CO 2	1st Sessional ET Exam Class Quiz
17	Windowing concepts, Clipping algorithms	Learn to extract only region of interest from complete scenario	Lecture	CO 2	1st Sessional ET Exam Class Quiz
18,19	Line Clipping- 1	Learn to extract only region of interest from complete scenario	Lecture & Question Answer Session	CO 2	1st Sessional ET Exam Class Quiz
20, 21	Line Clipping-2	Learn to extract only region of interest from complete scenario	Lecture & Question Answer Session	CO 2	1st Sessional ET Exam Class Quiz
22	Polygon clipping	Learn to extract only region of interest from complete scenario	Lecture	CO 2	1st Sessional ET Exam Class Quiz, Home assignment
FIRST SESSIONAL EXAM					
23	Matrix representation and Homogeneous coordinates	Learn to manipulate a geometry	Lecture	CO 3	2nd Sessional ET Exam Class Quiz
24	Inverse Transformation	Learn to manipulate a geometry using matrix	Lecture	CO 3	2nd Sessional ET Exam Class Quiz
25,26,27	2D transformations – Translation, Scaling, Rotation	Learn to manipulate a geometry using matrix	Lecture	CO 3	2nd Sessional ET Exam

					Class Quiz
28,29	2D composition transformations	Learn to manipulate a geometry using matrix	Discussion & Question Answer Session	CO 3	2nd Sessional ET Exam Class Quiz
30	3D transformations – Translation, Scaling	Learn to manipulate a 3D geometry using matrix	Lecture with visualization	CO 3	2nd Sessional ET Exam Class Quiz
31	3D transformations – Rotation	Learn to manipulate a 3D geometry using matrix	Lecture with visualization	CO 3	2nd Sessional ET Exam Class Quiz
32,33	3D composition transformations	Learn to manipulate a 3D geometry using matrix	Lecture	CO 3	2nd Sessional ET Exam Class Quiz Home assignment
34,35	Hidden surface elimination	To show multiple overlapping object onto a 2D screen	Lecture	CO 4	2nd Sessional ET Exam Class Quiz
36	Basic illumination model, Light Source	Contribution of light to create a natural scene onto 2D screen	Lecture	CO 4	2nd Sessional ET Exam Class Quiz
37	Ambient light, Diffuse Reflection	Contribution of light to create a natural scene onto 2D screen	Lecture with visualization	CO 4	2nd Sessional ET Exam Class Quiz
38,39	Specular reflection, Phong model	Contribution of light to create a natural scene onto 2D screen	Lecture with visualization	CO 4	2nd Sessional ET Exam Class Quiz
40,41,42	Constant shading, Gouraud shading, Phong shading	Contribution of light to create a natural scene onto 2D screen to visualize metallic property of any object	Lecture with visualization	CO 4	2nd Sessional ET Exam Class Quiz Home assignment
43	Multimedia techniques	About multimedia and its real time application	Discussion	CO 5	2nd Sessional ET Exam Class Quiz
SECOND SESSIONAL EXAM					
44	Raster method for computer animation	Usage of already learnt method for animation	Lecture	CO 5	ET Exam Class Quiz

45	hypertext and hypermedia	Learn essential component of a multimedia system	Lecture	CO 5	ET Exam Class Quiz
46	Image, video and audio standards	Reference of multiple standards	Lecture	CO 5	ET Exam Class Quiz
47	Sampling and compression algorithm	How to reduce the size of data for easy transmission	Lecture	CO 5	ET Exam Class Quiz
48	Animation : types, techniques,	Various types of animation	Lecture	CO 5	ET Exam Class Quiz
49,50	key frame animation, Morphing	How to corelate frames to create a real animation	Lecture	CO 5	ET Exam Class Quiz
51,52	Revision/Doubt Class		Discussion & Question Answer Session		
END TERM EXAM					

I. Course Articulation Matrix: (Mapping of COs with POs and PSOs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CS 1604.1	Describe graphical display systems along with their skills and applications	3				2						2		3		
CS 1604.2	Analyse the underlying algorithms for the scan conversion of graphic primitives as per the needs of raster and random scan displays.		3		2				3			2	2	3		
CS 1604.3	Design and implement the model for spatial manipulation of graphic primitives using 2D and 3D transformations		2			3							3		3	
CS 1604.4	Comprehend the models for illumination and shading	1			2								2			3
CS 1604.5	Overview the core multimedia concepts and basics of animation	2				5							1			3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

J. Course Outcome Attainment Level Matrix:

CO	STATEMENT	ATTAINMENT OF PROGRAM OUTCOMES **THRESHOLD VALUE: 40%**												ATTAINMENT OF PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
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CS 1604.4	Comprehend the models for illumination and shading															
CS 1604.5	Overview the core multimedia concepts and basics of animation															

0-No Attainment; 1- Low Attainment; 2- Moderate Attainment; 3- Substantial Attainment

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Department of Computer Science and Engineering
Course Hand-out

Computer Graphics and Multimedia | CS 1604 | 4 Credits | 3 0 1 4

Session: Jan 20 – May 20 | Faculty: Ms. Shikha Mundra / Mr. Nitesh Pradhan / Mr. Saket Acharya / Ms. Bali Devi | Class: CSE 6th Sem | Class: Compulsory

A. **Introduction:** This course is offered by Dept. of Computer Science and engineering as a compulsory subject, targeting students who wish to pure research & development in industries or higher studies in field of Computer graphics and multimedia. This course aims to make the students aware of components of automated visual technology and related concepts that include display devices, and visual display units, geometric, mathematical and algorithmic concepts necessary for programming computer graphics, windows, clipping and view-ports object representation in relation to images displayed on screen, the models of lighting and shading. After learning through this course, students will be able to understand how a visual device displays components over display unit such as monitor, TV etc. Also, the students will have an overview of multimedia technology wherein they would come across various media formats, their characteristics, and animation basics. Prerequisite for the course is knowledge of fundamental mathematics including Coordinate Geometry and Programming Concepts.

B. **Course Outcomes:** At the end of the course, students will be able to

[CS1604.1]. Describe graphical display systems along with their skills and applications

[CS1604.2]. Analyse the underlying algorithms for the scan conversion of graphic primitives as per the needs of raster and random scan displays.

[CS1604.3]. Design and implement the model for spatial manipulation of graphic primitives using 2D and 3D transformations

[CS1604.4]. Comprehend the models for illumination and shading.

[CS1604.5]. Overview the core multimedia concepts, compression techniques and basics of animation.

C. **PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES**

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

PO2: Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAM SPECIFIC OUTCOMES

PSO1: Will be able to design, develop and implement efficient algorithm for a given real life problem.
PSO2: Will be able to apply knowledge of Rendering, Texturing, Lighting, Projection to analyse and pre-process any real life image processing problems and also to develop good gaming environment.
PSO3: Will be able to implement multimedia compression algorithm and some animation techniques.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I	15
	Sessional Exam II	15
	In class Quizzes and Assignments, Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
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3	CRT and its component	Learning of Foundation Of graphical technology	Lecture	CO 1	1st Sessional ET Exam Class Quiz
4	Raster scan system, Random Scan	Background knowledge to develop any algorithm	Lecture	CO 1	1st Sessional ET Exam Class Quiz
5	Frame buffers and Color CRT	How the data of every pixel get stored	Discussion & Question Answer Session	CO 1	1st Sessional ET Exam Class Quiz Home Assignment
6	Scan converting lines-DDA algorithm & problems	Learn to draw a line using pixels	Lecture	CO 2	1st Sessional ET Exam Class Quiz
7,8	Scan converting lines – Bresenham's algorithm & problems along with example	Learn to draw a line using pixels	Discussion & Question Answer Session	CO 2	1st Sessional ET Exam Class Quiz
9	Scan converting Circle – polar coordinate method, Midpoint algorithm	Learn to draw a circle using pixels	Lecture	CO 2	1st Sessional ET Exam Class Quiz

10,11	Scan converting Circle – Bresenham's algorithm along with example	Learn to draw a circle using pixels	Lecture	CO 2	1st Sessional ET Exam Class Quiz
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22	Polygon clipping	Learn to extract only region of interest from complete scenario	Lecture	CO 2	1st Sessional ET Exam Class Quiz, Home assignment
FIRST SESSIONAL EXAM					
23	Matrix representation and Homogeneous coordinates	Learn to manipulate a geometry	Lecture	CO 3	2nd Sessional ET Exam Class Quiz
24	Inverse Transformation	Learn to manipulate a geometry using matrix	Lecture	CO 3	2nd Sessional ET Exam Class Quiz
25,26,27	2D transformations – Translation, Scaling, Rotation	Learn to manipulate a geometry using matrix	Lecture	CO 3	2nd Sessional ET Exam

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28,29	2D composition transformations	Learn to manipulate a geometry using matrix	Discussion & Question Answer Session	CO 3	2nd Sessional ET Exam Class Quiz
30	3D transformations – Translation, Scaling	Learn to manipulate a 3D geometry using matrix	Lecture with visualization	CO 3	2nd Sessional ET Exam Class Quiz
31	3D transformations – Rotation	Learn to manipulate a 3D geometry using matrix	Lecture with visualization	CO 3	2nd Sessional ET Exam Class Quiz
32,33	3D composition transformations	Learn to manipulate a 3D geometry using matrix	Lecture	CO 3	2nd Sessional ET Exam Class Quiz Home assignment
34,35	Hidden surface elimination	To show multiple overlapping object onto a 2D screen	Lecture	CO 4	2nd Sessional ET Exam Class Quiz
36	Basic illumination model, Light Source	Contribution of light to create a natural scene onto 2D screen	Lecture	CO 4	2nd Sessional ET Exam Class Quiz
37	Ambient light, Diffuse Reflection	Contribution of light to create a natural scene onto 2D screen	Lecture with visualization	CO 4	2nd Sessional ET Exam Class Quiz
38,39	Specular reflection, Phong model	Contribution of light to create a natural scene onto 2D screen	Lecture with visualization	CO 4	2nd Sessional ET Exam Class Quiz
40,41,42	Constant shading, Gouraud shading, Phong shading	Contribution of light to create a natural scene onto 2D screen to visualize metallic property of any object	Lecture with visualization	CO 4	2nd Sessional ET Exam Class Quiz Home assignment
43	Multimedia techniques	About multimedia and its real time application	Discussion	CO 5	2nd Sessional ET Exam Class Quiz
SECOND SESSIONAL EXAM					
44	Raster method for computer animation	Usage of already learnt method for animation	Lecture	CO 5	ET Exam Class Quiz

45	hypertext and hypermedia	Learn essential component of a multimedia system	Lecture	CO 5	ET Exam Class Quiz
46	Image, video and audio standards	Reference of multiple standards	Lecture	CO 5	ET Exam Class Quiz
47	Sampling and compression algorithm	How to reduce the size of data for easy transmission	Lecture	CO 5	ET Exam Class Quiz
48	Animation : types, techniques,	Various types of animation	Lecture	CO 5	ET Exam Class Quiz
49,50	key frame animation, Morphing	How to corelate frames to create a real animation	Lecture	CO 5	ET Exam Class Quiz
51,52	Revision/Doubt Class		Discussion & Question Answer Session		
END TERM EXAM					

I. Course Articulation Matrix: (Mapping of COs with POs and PSOs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CS 1604.1	Describe graphical display systems along with their skills and applications	3				2						2		3		
CS 1604.2	Analyse the underlying algorithms for the scan conversion of graphic primitives as per the needs of raster and random scan displays.		3		2				3			2	2	3		
CS 1604.3	Design and implement the model for spatial manipulation of graphic primitives using 2D and 3D transformations		2			3							3		3	
CS 1604.4	Comprehend the models for illumination and shading	1			2								2			3
CS 1604.5	Overview the core multimedia concepts and basics of animation	2				5							1			3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

J. Course Outcome Attainment Level Matrix:

CO	STATEMENT	ATTAINMENT OF PROGRAM OUTCOMES **THRESHOLD VALUE: 40%**												ATTAINMENT OF PROGRAM SPECIFIC OUTCOMES		
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MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

DEPARTMENT OF COMPUTER SCIENCE AND TECHNOLOGY

Course Hand-out

Data Science | IT1654 | 3 Credits | 3 0 0 3

Session: Jan 20-May 20 | Faculty: Dr. Dilbag Singh, Dr. D. P. Sharma, and Dr. Mutthukumaran | Class: Department Elective SEM VI

A. **Introduction:** This department elective course is offered by Department of Information and Technology mainly targeting students who wish to pursue career in Data Science or higher studies in Engineering discipline with data science specialization. This course objectives to discuss techniques to explain how advanced Data Analytics can be leveraged to create Data with Statistical environment and how the data scientist role and skills differ from those of a traditional business intelligence analyst. This course also supports with the design, implementation and inference of advanced technologies in Data Science.

B. **Course Outcomes:** At the end of the course, students will be able to:

[IT1654.1] Deploy a structured lifecycle approach to data science and its statistical approaches.

[IT1654.2] Reframe a business challenge as a data science challenge.

[IT1654.3] Apply Data Science analytic techniques and tools to analyse data, create statistical models, and identify insights that can lead to statistical results.

[IT1654.4] Select optimal visualization techniques to clearly communicate data analytic insights to business sponsors and others.

[IT1654.5] Compare between different algorithms and accordingly use tools such as R, RStudio, Pycharm, Python libraries in Data Science.

[IT1654.6] Observe and illustrate the fundamental aspect of Data Science and their statistical analytics with their applications in industry and research.

C. **PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES**

[PO.1]. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

[PO.2]. **Problem analysis**: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

[PO.3]. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

[PO.4]. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

[PO.5]. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

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[PO.9]. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

[PO.10]. <u>Communication</u>: Communicate effectively_on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

[PO.11]. <u>Project management and finance:</u> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

[PO.12]. <u>Life-long learning</u>: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

[PSO.1]. To apply creativity in support of the design, simulation, implementation and inference of existing and advanced technologies.

[PSO.2]. To participate & succeed in IT oriented jobs/competitive examinations that offer inspiring & gratifying careers.

[PSO.3]. To recognize the importance of professional developments by pursuing postgraduate studies and positions.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	15
	Sessional Exam II (Closed Book)	15
	In class Quizzes and Assignments, Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Closed Book)	40
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Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work at home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

Descriptive Statistics: Introduction, Descriptive Statistics, Probability Distribution; **Inferential Statistics:** Inferential Statistics through Hypothesis Testing, Permutation and Randomization Test; **Regression and ANOVA:** regression analysis, analysis of variance; **Machine Learning:** Differentiating algorithmic and model based framework, OLS, RIDGE & LASSO regression,
KNN & classification; **Supervised Learning with regression and Classification technique:** Bias-Variance Dichotomy, Logistic Regression, LDA, QDA, Regression and Classification Trees, SVM, Ensemble Methods, random Forest; **Prescriptive Analysis:** Creating Data through Designed Experiments, Active learning, Reinforcement Learning.

TEXTBOOKS

T1. H. Trevor et al., "the elements of statistical learning", Vol. 2. No.1.New York, Springer, 2009.

REFERENCE BOOKS

R1. C. Douglas and C. George, "Applied Statistics and Probability for Engineers", John Wiley and Sons, 2010.

F. Lecture Plan:

Class Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1	Data, Information Context, Knowledge	To understand the Data, Information Context, and Knowledge	Lecture	IT1654.1, IT1654.1 & IT1654.5	Mid Term I, Quiz-1 & End Term
2	Continuous Interval, Discrete Interval	Identify the continuous Interval and discrete Interval	Lecture	IT1654.1 & IT1654.2	Mid Term I, Quiz-1 & End Term
3	Data Collection, Primary Data, Secondary Data, Numerical Data, Grouped Data.	Describe data collection, Primary Data, Secondary Data, Numerical Data, and Grouped Data.	Lecture and Flipped Class	IT1654.1 & IT1654.5	Mid Term I, Quiz-1 & End Term
4	Descriptive Statistics, Descriptive Vs. Inferential Statistics	Illustrate descriptive Statistics, Descriptive Vs. Inferential Statistics	Lecture	IT1654.2 & IT1654.4	Mid Term I Quiz-2 & End Term
5	Basic Blocks of Descriptive Statistics	Understand the basic Blocks of Descriptive Statistics	Lecture and Flipped Class	IT1654.2 & IT1702.4	Mid Term I, Quiz-2 & End Term
6	Central Tendency (Mean, Median, Mode for Grouped Data and Numerical Data)	Recall the Central Tendency (Mean, Median, Mode for Grouped Data and Numerical Data)	Flipped Class	IT1654.2 & IT1654.4	Mid Term I, Quiz-2 & End Term
7-8	Dispersion (Range, Variance, Standard Deviation, Quartile)	Understand the significance of Dispersion	Activity	IT1654.2 & IT1654.3	Mid Term I, Quiz-2 & End Term
9-10	Distribution and Visualization (Conditional Probability, Bayes' Theorem, Random Variables and Introduction to Probability Distribution)	Explain the issues of Conditional Probability, Bayes' Theorem, Random Variables and Introduction to Probability Distribution	Lecture	IT1654.3& IT1654.4	Mid Term I, Quiz-2 & End Term
11-12	Distribution and Visualization (The Frequency Distribution, Commutative Distribution, Relative and Cumulative Frequency Distributions Ogive Curve)	Understand the significance of Distribution and Visualization (The Frequency Distribution, Commutative Distribution, Relative and Cumulative	Lecture	IT1654.2 & IT1654.5	Mid Term I, Quiz-2 & End Term

		Frequency Distributions Ogive Curve)			
13	Stem-and Leaf display	Explain the issues of Stem-and Leaf display	Lecture	IT1654.2 & IT1654.3	Mid Term I Quiz-3 & End Term
14-15	Distribution and Visualization (Normal Distribution, Empirical Rule, Chebyshev's Theorem)	Understand the significance of Rule, Chebyshev's Theorem)	Activity	IT1654.2 & IT1654.5	Mid Term II, Quiz-3 & End
16-17	Distribution and Visualization (Pie Charts, Bar Graphs, Pareto Charts, Histograms, Box and Whisker Plots, Scattered Plot, Dot Plot, Error plot)	Recall the Pie Charts, Bar Graphs, Pareto Charts, Histograms, Box and Whisker Plots, Scattered Plot, Dot Plot, Error plot	Lecture	IT1654.3 & IT1654.5	Mid Term II, Quiz-3 & End
18	Populations and Samples, Population and Sample Variance, Population and Sample Standard Deviation	Illustrate the concept of Populations and Samples, Population and Sample Variance, Population and Sample Standard Deviation	Lecture	IT1654.3 & IT1654.4	Mid Term II, Quiz-3 & End
19	Inferential Statistics, Hypothesis, Null and Alternate Hypothesis,	Understand the significance of Inferential Statistics, Hypothesis, Null and Alternate Hypothesis,	Lecture	IT1654.3 & IT1654.5	Mid Term II, Quiz-3 & End
20	ANOVA	Understand the significance of ANOVA	Activity	IT1654.2 & IT1654.5	Mid Term II, Quiz-3 & End
21	Z statistics, T statistics	Explain the issues of Z statistics, T statistics	Lecture	IT1654.5 & IT1654.6	Mid Term II, Quiz-3 & End
22	F statistics, chi square statistics	Explain the issues of F statistics, chi square statistics	Lecture	IT1654.5 & IT1654.6	Mid Term II, Quiz-3 & End
23	Binomial statistics, Parametric test and non-Parametric test	Understand the significance of Binomial statistics, Parametric test and non-Parametric test	Lecture	IT1654.5 & IT1654.6	Mid Term II, Quiz-3 & End
24	Central Limit Theorem & Confidence Intervals.	Illustrate the concept of Central Limit Theorem & Confidence Intervals.	Lecture	IT1654.3 & IT1654.4	Mid Term II, Quiz-3 & End
25	Regression analysis, Type of Regression	Understand the significance of	Lecture	IT1654.5 & IT1654.6	Mid Term II, Quiz-4 & End

		Regression analysis, Type of Regression			
26	OLS, Linear, Logistic, Multiple	Explain the issues of OLS, Linear, Logistic, Multiple	Lecture	IT1654.4 & IT1654.5	Mid Term II, Quiz-4 & End Term
27	RIDGE & LASSO regression	Illustrate the concept of RIDGE & LASSO Regression	Lecture	IT1654.2 & IT1654.3	Quiz-4 & End Term
28	Regression and Classification Trees using	Explain the issues of Regression and Classification Trees using	Lecture	IT1654.3 & IT1654.6	Quiz-4 & End Term
29-30	Decision Tree, Random Forest Tree	Understand the significance of Decision Tree, Random Forest Tree	Flipped Class	IT1654.3 & IT1654.6	Quiz-4 & End Term
31-32	KNN and Classification, SVM, Ensemble Methods,	Explain the issues of KNN and Classification, SVM, Ensemble Methods,	Flipped Class	IT1654.3 & IT1654.6	Quiz-4 & End Term
33-34	LDA, QDA, Bias-Variance Dichotomy	Explain the issues of LDA, QDA, Bias-Variance Dichotomy	Lecture	IT1654.3 & IT1654.4	Quiz-4 & End Term
35	Assessment Metrics and Evaluations	Explain the issues of Assessment Metrics and Evaluations	Lecture	IT1654.2 & IT1654.3	Quiz-4 & End Term
36	Prescriptive Analysis	Illustrate the concept of Prescriptive Analysis	Activity	IT1654.5 & IT1654.6	Quiz-5 & End Term
37	Creating Data through Designed Experiments	Explain the issues of Creating Data through Designed Experiments	Lecture	IT1654.4 & IT1654.5	Quiz-5 & End Term
38-39	Reinforcement Learning.	Understand the significance of Reinforcement Learning.	Lecture	IT1654.5 & IT1654.6	Quiz-5 & End Term
40	Active learning	Explain the issues of Active learning	Lecture	IT1654.3 & IT1654.4	Quiz-5 & End Term

G. Course Articulation Matrix: (Mapping of COs with POs & PSOs)

CO	STATEMENT	Correlation with Program Outcomes **(POs)**												Correlation with Program Specific Outcomes (**PSOs**)		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
[IT1654.1]	Deploy a structured lifecycle approach to data science and its statistical approaches	1	2	3	2		2		2		1			1	1	2
[IT1654.2]	Reframe a business challenge as a data science challenge	3	2	3	3	1		2					2	2	3	1
[IT1654.3]	Apply Data Science analytic techniques and tools to analyse data, create statistical models, and identify insights that can lead to statistical results	3	3	3	2				2	1	1		2	2		1
[IT1654.4]	Select optimal visualization techniques to clearly communicate data analytic insights to business sponsors and others	3	2	3	2	2			2	1	1		1	2	2	3
[IT1654.5]	Compare between different algorithms and accordingly use tools such as R, RStudio, Pycharm, Python libraries in Data Science	2	3	3	2	2	1	2	3	2	1	2	2	3	1	2
[IT1654.6]	Observe and illustrate the fundamental aspect of Data Science and their statistical analytics with their applications in industry and research	1	2	3	2		1		2		1			1	1	2

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Computing & Information Technology

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Course Hand-out

Distributed Database | CS 1653| 3 Credits | 3 0 0 3

Session: Jan 20-May 20 | Faculty: Prof. (Dr.) Sandeep joshi| Class: CSE/IT/CC VI SEM

A. **Introduction:** This course is offered by the Department of Computer Science & Engineering as a program elective. Course is a combination of Database as well as computer network. It gives a new dimension to database subject. Students will learn that database is spread on different locations, will be accessed.

B. **Course Outcomes:** At the end of the course, students will be able to:

[CS 1653.1] Get familiar with the currently available models, technologies for and approaches to building distributed database systems and services

[CS 1653.2] **I**ntroduce architecture and design of distributed database systems

[CS 1653.3] Expose about query processing, concurrency control and reliability

[CS 1653.4] Apply parallel database and database interoperability

[CS 1653.5] Be able to apply learned skills to solving practical database related tasks

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2]. Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4]. Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations

[PO.6]. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

Program Specific Outcomes (PSOs)

[PSO.1] Will be able to design, develop and implement efficient software for a given real life problem.
[PSO.2] Will be able to apply knowledge of AI, Machine Learning and Data Mining in analyzing big data for extracting useful information from it and for performing predictive analysis.
[PSO.3] Will be able to design, manage and secure wired/ wireless computer networks for transfer and sharing of information.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	15
	Sessional Exam II (Closed Book)	15
	In class Quizzes and Assignments, Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Closed Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work at home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

Introduction: Distributed Data Processing, Complicating Factors, and Problem Areas; **Distributed DBMS Architecture:** DBMS Standardization, Distributed DBMS Architecture; **Distributed Database Design:** Alternative Design Strategies, Distribution Design Issues, Fragmentation, Distribution Transparency, Allocation; **Semantic Data Control:** Authentication and Access rights, View Management, Semantic Integrity control & its enforcement; **Overview of Query Processing:** Query Processing Problem, Objective of Query Processing, Complexity of Relational Algebra Operations, Characterization of Query Processors, Layers of Query Processing; **Distributed Concurrency Control:** Serializability Theory, Deadlock Management, Relaxed Concurrency Control; **Distributed DBMS Reliability:** Reliability Concepts & Measures, Failures & Fault Tolerance in Distributed systems, Dealing with site failures, Network Partitioning; **Parallel Database Systems:** Database Servers, Parallel Architectures, Parallel DBMS Techniques, Parallel Execution problems; **Database Interoperability:** Database Integration, Query Processing, Transaction Management, Object Orientation & Interoperability; **Current Issues:** World Wide Web, Push-based Technologies, Mobile Databases.

TEXTBOOKS

T1. M. T. Ozsu and P. Valduriez; Principles of Distributed Database Systems, 3rd Edition, Springer Publishing, 2011

REFERENCE BOOKS

R1. S. K. Rahimi and Frank S Haug: Distributed Database Management Systems-A Practical Approach, Wiley Publication, 2010.

R2. C. M. Ricardo: *Database Systems:* Principles, Design, and Implementation, 8th Edition, McMillan, 1990

F. Lecture Plan:

Class Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1	**Introduction:** Course Hand-out briefing	To acquaint and clear teachers' expectations and understand student expectations	Lecture & Interaction	-	-
2	**Introduction:** Introduction to Distributed Database	To understand fundamentals of Distributed Database	PPT, Lecture, Class Notes	**CS 1653.1**	Mid Term I, Quiz & End Term
3	**Introduction:** Complicating Factors, and Problem Areas	To understand problems area and its factors	PPT, Lecture, Class Notes	**CS 1653.1**	Mid Term I, Quiz & End Term
4	**Distributed DBMS Architecture:** DBMS Standardization	To understand DBMS standardization	PPT, Lecture, Class Notes	**CS 1653.1& CS 1653.2**	Mid Term I, Quiz & End Term
5	**Distributed DBMS Architecture:** Distributed DBMS Architecture	Distributed Database architecture and its comparison with DBMS	PPT, Lecture, Class Notes	**CS 1653.1& CS 1653.2**	Mid Term I, Quiz & End Term
6	**Distributed Database Design:** Alternative Design Strategies	Understand different design strategies of Distributed Database	PPT, Lecture, Class Notes	**CS 1653.1& CS 1653.2**	Mid Term I, Quiz & End Term
7	**Distributed Database Design:** Distribution Design Issues	Challenges in Distributed Database	PPT, Lecture, Class Notes	**CS 1653.1& CS 1653.2**	Mid Term I, Quiz & End Term
8	**Distributed Database Design:** Fragmentation	To present the various fragmentation strategies and algorithms	PPT, Lecture, Class Notes	**CS 1653.1& CS 1653.2**	Mid Term I, Quiz & End Term
9	**Distributed Database Design:** Distribution Transparency	Transparency and its advantages	PPT, Lecture, Class Notes	**CS 1653.1& CS 1653.2**	Mid Term I, Quiz & End Term
10	**Distributed Database Design:** Allocation	To address allocation problem and its solutions	PPT, Lecture, Class Notes	**CS 1653.1& CS 1653.2**	Mid Term I, Quiz & End Term
11	**Semantic Data Control:** Authentication	Data protection: prevent unauthorized users from understanding the physical content of data	PPT, Lecture, Class Notes	**1653.2 & CS 1653.3**	Mid Term I, Quiz & End Term
12	**Semantic Data Control:** Access rights	Access control to authorized user	PPT, Lecture, Class Notes	**1653.2 & CS 1653.3**	Mid Term I, Quiz & End Term

13	**Semantic Data Control** View Management	Logical view of Distributed Database	PPT, Lecture, Class Notes	**1653.2 & CS 1653.3**	Mid Term I, Quiz & End Term
14	**Semantic Data Control** Semantic Integrity control & its enforcement	Semantic Integrity control & its enforcement	PPT, Lecture, Class Notes	**1653.2 & CS 1653.3**	Mid Term I, Quiz & End Term
15	**Overview of Query Processing:** Query Processing Problem	Different strategies and its challenges in query processing	PPT, Lecture, Class Notes	**CS 1653.3**	Mid Term II, Quiz & End Term
16	**Overview of Query Processing** Objective of Query Processing	Objective of Query Processing	PPT, Lecture, Class Notes	**CS 1653.3**	Mid Term II, Quiz & End Term
17	**Overview of Query Processing** Complexity of Relational Algebra Operations	Complexity of Relational Algebra Operations	PPT, Lecture, Class Notes	**CS 1653.3**	Mid Term II, Quiz & End Term
18	**Overview of Query Processing** Characterization of Query Processors	To evaluate and compare query processors in the context of both centralized systems and distributed systems	PPT, Lecture, Class Notes	**CS 1653.3**	Mid Term II, Quiz & End Term
19	**Overview of Query Processing** Layers of Query Processing	Layers of Query Processing	PPT, Lecture, Class Notes	**CS 1653.3**	Mid Term II, Quiz & End Term
20	**Distributed Concurrency Control:** Serializability Theory	Correctness criterion for concurrency control algorithms	PPT, Lecture, Class Notes	**CS 1653.3**	Mid Term II, Quiz & End Term
21	**Distributed Concurrency Control:** Deadlock Management	To understand deadlock occurrence and its solution	PPT, Lecture, Class Notes	**CS 1653.3**	Mid Term II, Quiz & End Term
22	**Distributed Concurrency Control:** Relaxed Concurrency Control	Correctness of concurrent execution	PPT, Lecture, Class Notes	**CS 1653.3**	Mid Term II, Quiz & End Term
23	**Distributed DBMS Reliability:** Reliability Concepts & Measures	Reliability Concepts & Measures	PPT, Lecture, Class Notes	**CS 1653.3**	Mid Term II, Quiz & End Term
	Distributed DBMS Reliability: Failures & Fault Tolerance in Distributed systems	To understand Failures & Fault Tolerance in Distributed systems	PPT, Lecture, Class Notes	**CS 1653.3**	Mid Term II, Quiz & End Term
24	**Distributed DBMS Reliability:** Dealing with site failures	To develop non-blocking termination and independent recovery protocols	PPT, Lecture, Class Notes	**CS 1653.3**	Mid Term II, Quiz & End Term
25	**Distributed DBMS Reliability:** Network Partitioning	The network partitions and its relevant e atomic commit protocols	PPT, Lecture, Class Notes	**CS 1653.3**	Mid Term II, Quiz & End Term
26	**Parallel Database Systems:** Database Servers	Introduction to Database servers	PPT, Lecture, Class Notes	**CS 1653.4**	Mid Term II, Quiz & End Term
27	**Parallel Database Systems:** Parallel Architectures	Design choices in order to provide the aforementioned advantages with a good cost/performance	PPT, Lecture, Class Notes	**CS 1653.4**	Mid Term II, Quiz & End Term
28	**Parallel Database Systems:** Parallel DBMS Techniques	Parallel DBMS Techniques	PPT, Lecture, Class Notes	**CS 1653.4**	Mid Term II, Quiz & End Term
29	**Parallel Database Systems:** Parallel Execution problems	Initialization, interference and skew	PPT, Lecture, Class Notes	**CS 1653.4**	Mid Term II, Quiz & End Term
30	**Database Interoperability:** Database Integration	Database Integration	PPT, Lecture, Class Notes	**CS 1653.4**	Quiz & End Term
31	**Database Interoperability:** Query Processing	Query Processing	PPT, Lecture, Class Notes	**CS 1653.4**	Quiz & End Term
32	**Database Interoperability:** Transaction Management	Implementation of Transaction Management	PPT, Lecture, Class Notes	**CS 1653.4**	Quiz & End Term

33	**Database Interoperability:** Object Orientation	Object Orientation	PPT, Lecture, Class Notes	**CS 1653.4**	Quiz & End Term
34	**Database Interoperability:** Interoperability	Interoperability concepts	PPT, Lecture, Class Notes	**CS 1653.4**	Quiz & End Term
35	**Current Issues:** World Wide Web	Current issues in world wide web	PPT, Lecture, Class Notes	**CS 1653.4 & CS 1653.5**	Quiz & End Term
36	**Current Issues:** Push-based Technologies	Push-based Technologies	PPT, Lecture, Class Notes	**CS 1653.4 & CS 1653.5**	Quiz & End Term
37	**Current Issues:** Mobile Databases	Mobile Databases	PPT, Lecture, Class Notes	**CS 1653.4 & CS 1653.5**	Quiz & End Term

G. Course Articulation Matrix: (Mapping of COs with POs & PSOs)

CO	STATEMENT	Correlation with Program Outcomes **(POs)**												Correlation with Program Specific Outcomes (PSOs)		
		PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**	**PSO 3**
[CS 1653.1]	Get familiar with the currently available models, technologies for and approaches to building distributed database systems and services	**1**						**2**						**1**		**1**
CS 1653.2]	**I**ntroduce architecture and design of distributed database systems	**1**	**1**				**2**	**2**			**2**				**2**	**1**
CS 1653.3]	Expose about query processing, concurrency control and reliability	**1**		**1**			**2**	**2**						**1**	**1**	
CS 1653.4]	Apply parallel database and database interoperability				**2**		**2**	**1**	**2**						**1**	**2**
CS 1653.5]	Be able to apply learned skills to solving practical database related tasks			**1**						**2**		**2**	**2**		**1**	

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Computing and IT

DEPARTMENT OF COMPUTER AND COMMUNICATION ENGINEERING

Course Hand-out

Internet of Things| CC 1653 | 3 Credits | 2 1 0 3

Session: Jan – May 2020 | Faculty: Anubha Parashar | Class: B.Tech. VI semester CSE

A. Introduction: The future Internet will comprise not only millions of computing machines and software services but also billions of personal and professional devices, diminutive sensors and actuators, robots, and so on, and trillions of sentient, smart, and digitized objects. It is an overwhelmingly accepted fact that the fast-emerging and evolving Internet of Things (IoT) idea is definitely a strategic and highly impactful one to be decisively realized and passionately sustained with the smart adoption of the state of-the-art information communication technology (ICT) infrastructures, a bevy of cutting-edge technologies, composite and cognitive processes, versatile and integrated platforms, scores of enabling tools, pioneering patterns, and futuristic architectures. Industry professionals and academicians are constantly looking out for appropriate use and business and technical cases in order to confidently and cogently proclaim the transformational power of the IoT concept to the larger audience of worldwide executives, end users, entrepreneurs, evangelists, and engineers.

B. Course Outcomes: At the end of the course, students will be able to

[CC 1653.1] To explain the vision of IoT from a global context.

[CC 1653.2] To demonstrate sensors and embedded systems work.

[CC 1653.3] To demonstrate how the IoT devices communicate.

[CC 1653.4] To explain storage, analysis and visualize sensor data.

[CC 1653.5] To design end-to-end IoT applications.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1]. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

[PO.2]. **Problem Analysis**: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. **Design/Development of Solutions:** Design solutions for complex engineering problems and design system components or processes_that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4]. **Conduct Investigations of Complex Problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

[PO.5]. **Modern Tool Usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools_including prediction and modeling to complex engineering activities with an understanding of the limitations.

[PO.6]. **The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues_and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. **Environment and Sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. **Ethics:** Apply ethical principles and commit to professional ethics_and responsibilities and norms of the engineering practices

[PO.9]. Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. Communication: Communicate effectively_on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

[PSO.1]. Should be able to clearly understand the basic principles, concepts and applications in the field of computer based Communication/networking, information sharing, signal processing, web based systems, smart devices and communication technology.

[PSO.2]. Should be able to nail down the issues prevalent in the field of Computer and Communication Engineering.

[PSO.3]. Should be able to identify the existing open problems in the field of computing and propose the best possible solutions.

[PSO.4]. Should be able to apply the contextual knowledge in the field of computing and communication to assess social, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional engineering practice.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	15
	Sessional Exam II (Closed Book)	15
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Closed Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

E. SYLLABUS

Introduction: read data sheet, analog and digital signals, serial communication, RF and sensors; Introduction to JSON/XML; Database Basics: create database, tables, SQL queries; Programming on Development Boards: Understanding of the board, tool chain and development environment setup; Sensors and Actuators: Understanding and using analog, digital, SPI, UART, I2C; Nodes and communication protocols: Understanding usage of nodes and gateways for sensor communication and external communication, RF, Zigbee, BT, WI-FI, GSM; IoT Cloud Platform, Cloud using Web Services, Cloud Computing Services for Sensor Management, Python Script; Big Data Analytics: Mongo DB, Map Reduce, Using cloud APIs for analytics, Visualization, NVD3, Mobile interfacing.

F. REFERENCE BOOKS

1. V. Madisetti, A. Bahga, "Internet of Things: A Hands-On- Approach", 1st Edition, VPT, 2014.
2. Rajkumar Buyya, Amir Vahid Dastjerdi, "Internet of Things Principles and Paradigms", 2016.
3. Hwaiyu Geng, "Internet of Things Principles and Data Analytics Handbook", Wiley, 2017.
4. Pethuru Raj, Anupama C. Raman, "The Internet of Things Enabling Technologies, Platforms, and Use Cases", CRC Press, 2017.

G. Lecture Plan:

Class Number	Topics	Sessional Outcomes	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1.	Introduction to IoT, definition and characteristics of IoT	To Define IoT	Lecture	CO1	Ist Sessional, Quiz & ET Exam
2.	Physical design of IoT, Things in IoT, IoT Protocols	To Identify Physical Design of IoT	Lecture	CO1	Ist Sessional, Quiz & ET Exam
3.	Logical design of IoT, IoT Functional Blocks, IoT Communication Models	To Identify Logical and Functional Design of IoT	Lecture	CO1	Ist Sessional, Quiz & ET Exam
4.	IoT Communication APIs, Brief about IoT Enabling Technologies-Wireless Sensor Networks, Cloud	To Explain Basic Components of IoT	Lecture	CO1	Ist Sessional, Quiz & ET Exam
5.	IoT Levels and Deployment Templates, IoT Level 1, IoT Level 2, IoT Level 3, IoT Level 4, IoT Level 5, IoT Level 6.	To Identify Level of IoT	Lecture	CO1	Ist Sessional, Quiz & ET Exam
6.	Domain Specific IoTs & their applications- Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health and Lifestyle.	To Explain IoT Application	Flipped Class	CO1	Ist Sessional, Quiz & ET Exam
7.	Domain Specific IoTs: Agriculture, Industry, Health and Lifestyle.	To Explain IoT Application	Flipped Class	CO1	Ist Sessional, Quiz & ET Exam
8.	Introduction, Difference between IoT and M2M	To Explain M2M	Lecture	CO2	Ist Sessional, Quiz & ET Exam
9.	SDN and NFV for IoT	To Explain SDN and NFV	Lecture	CO2, CO3	Ist Sessional, Quiz & ET Exam
10.	IoT Design Methodology-Purpose and Requirements Specifications, Process Specification	To identify Purpose and Requirement	Lecture	CO3, CO5	Ist Sessional, Quiz & ET Exam

11.	IoT Level Specification, Functional View Specification,	To define Level Specification , Functional and operational view	Lecture	CO3, CO5	Ist Sessional , Quiz
12.	Application Development & Introduction to Node	To define Application development for IoT and Node requirement	Lecture	CO3, CO5	Ist Sessional , Quiz, Assignment & ET Exam
13.	IoT Systems- Logical Design using Python, Python Data Types and Data Structure	To define python data type & structure	Lecture	CO3, CO5	Ist Sessional , Quiz & ET Exam
14.	Python control flow, functions, packages, File Handling, Date/Time Operations.	To define Operations in Python	Lecture	CO3, CO5	Ist Sessional , Quiz & ET Exam
15.	Python Packages of Interest for IoT : JSON, XML, HTTPLib & URLLib, SMTPLib	To describe python packages for IoT	Activity	CO3, CO5	Ist Sessional , Quiz & ET Exam
16.	Arduino. Arduino Interfaces: Serial	To demonstrate Ardunio	Lecture & Activity	CO3, CO5	Ist Sessional , Quiz & ET Exam
FIRST SESSIONAL EXAM(14-18, Feb 2020)					
17.	Programming Arduino: Controlling LED, Interfacing various sensors with Arduino	To programme Ardunio	Lecture & Activity	CO3, CO5	IInd Sessional , Quiz, Assignment & ET Exam
18.	Interfacing various sensors with Arduino	To Demonstrate interfacing of sensor with Ardunio	Lecture & Activity	CO3, CO5	IInd Sessional , Quiz & ET Exam
19.	Interfacing various sensors with Arduino	To Demonstrate interfacing of sensor with Ardunio	Lecture & Activity	CO3, CO5	IInd Sessional , Quiz & ET Exam
20.	Raspberry pi Interfaces: Serial	To demonstrate Raspberry Pi Interfacing	Lecture & Activity	CO3, CO5	IInd Sessional , Quiz & ET Exam
21.	Interfaces: I2C	To demonstrate Raspberry Pi Interfacing	Lecture & Activity	CO3, CO5	IInd Sessional , Quiz & ET Exam

22.	Programming Raspberry pi: Controlling LED	To programme Raspberry pi	Lecture & Activity	CO3, CO5	IInd Sessional , Quiz & ET Exam
23.	Interfacing various sensors with Raspberry pi	To Demonstrate interfacing of sensor with Raspberry pi	L Lecture & Activity	CO3, CO5	IInd Sessional , Quiz
24.	Interfacing various sensors with Raspberry pi	To Demonstrate interfacing of sensor with Raspberry pi	Lecture & Activity	CO3, CO5	IInd Sessional , Quiz & ET Exam
25.	Introduction to cloud storage	To define Cloud Storage	Lecture	CO4	IInd Sessional , Quiz & ET Exam
26.	Cloud storage models	To explain storage Model	Lecture	CO4	IInd Sessional , Quiz & ET Exam
27.	communication APIs	To explain communication API	Lecture	CO4	IInd Sessional , Quiz & ET Exam
28.	ThinkSpeak, Xively, AWS, Azure	To explain communication API	Lecture	CO4	IInd Sessional , Quiz & ET Exam
SENCOND SESSIONAL EXAM(3-7 APR 2020)					
29.	Python Web Application Framework- Django, MongoDB	To Explain Web Application Framework	Lecture	CO4	Quiz & ET Exam
30.	Django Architecture and development with Django	To Explain Web Application Framework	Lecture	CO4	Quiz & ET Exam
31.	Amazon Web Services for IoT	To Explain Web Service for IoT	Lecture	CO4	Quiz & ET Exam
32.	Amazon Web Services for IoT	To Explain Web Service for IoT	Lecture	CO4	Quiz & ET Exam
33.	Data Analytics for IoT: Apache Hadoop, MapReduce programming Model	To Explain Data Analytics	Lecture	CO4	Quiz, Assignment & ET Exam

34.	Different tools for IoT: Chef	To Explain Data Analytics	Lecture	CO4	Quiz & ET Exam
35.	Case Study of IoT Design- Home Automation, Cities, Environment,	To Identify IoT design	Flipped Class	CO5	Quiz & ET Exam
36.	Case Study of IoT Design Energy, Retail, Logistics, Agriculture,	To Identify IoT design	Flipped Class	CO5	Quiz & ET Exam
37.	Case Study of IoT Design- Industry, Health and Lifestyle.	To Identify IoT design	Flipped Class	CO5	Quiz & ET Exam
38.	Conclusion and Course Summarization	NA	Discussion	All	Quiz & ET Exam
END TERM EXAM (27-13 MAY, 2019)					

H. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES			
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
[CC 1653.1]	To explain the vision of IoT from a global context.	3		3		1						1					
[CC 1653.2]	To demonstrate sensors and embedded systems work	3	3	2	3						2		3				
[CC 1653.3]	To demonstrate how the IoT devices communicate			3	3					1							
[CC 1653.4]	To explain storage, analysis and visualize sensor data						2										
[CC 1653.5]	To design end-to-end IoT applications			3						3		3					

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Department of Computer Science and Engineering
Course Hand-out

Advanced Data Structures | CS 1757 | 3 Credits | 3 0 0 3

Session: July 19 – Nov 19 | Faculty: Dr. Sulabh Bansal / Mr. Nitesh Pradhan / Ms. Manjit | Class: CSE 7th Sem | Class: Compulsory

A. **Introduction:** This course is offered by Computer Science and Engineering, targeting students who wish to pursue development and research in industries or higher studies in field of Computer Science, Information Technology and Communication Engineering. This course will form the advanced concept of data structures hence this course is introduced at this level to make the students understand various advanced concept of organizing data and storing it into memory and use the type depending upon the application.

B. **Course Outcomes:** At the end of the course, students will be able to

[CS1757.1]. Learning concepts of dictionaries and their implementations.

[CS1757.2]. Learning of various hashing techniques and their applications.

[CS1757.3]. Demonstrate skip lists, operations on skip lists and their probabilistic analysis.

[CS1757.4]. Describe splay trees and their analysis

[CS1757.5]. Learning of various text processing algorithms.

[CS1757.6] Learning of searching techniques related to computational geometry

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

PO2: Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAM SPECIFIC OUTCOMES

PSO1: Will be able to design, develop and implement efficient software for a given real life problem
PSO2: Will be able to apply knowledge of AI, Machine Learning and Data Mining in analysing big data for extracting useful information from it and for performing predictive analysis.
PSO3: Will be able to design, manage and secure wired/ wireless computer networks for transfer and sharing of information.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I	15
	Sessional Exam II	15
	In class Quizzes and Assignments, Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

Dictionaries: Definition, Dictionary Abstract Data Type, Implementation of Dictionaries. **Hashing:** Review of Hashing, Hash Function, Collision Resolution Techniques in Hashing, Separate Chaining, Open Addressing, Quadratic Probing, Double Hashing, Rehashing, Extendible Hashing. **Skip Lists:** Need for Randomizing Data Structures and Algorithms, Search and Update Operations on Skip Lists, Probabilistic Analysis of Skip Lists, Deterministic Skip Lists. **Splay Trees:** Splaying, Search and Update Operations on Splay Trees, Amortized Analysis of Splaying. **Text Processing:** String Operations, Brute-Force Pattern Matching, The Boyer-Moore Algorithm, The Knuth-Morris-Pratt Algorithm, Standard Tries, Compressed Tries, Suffix Tries, The Huffman Coding Algorithm, The Longest Common Subsequence Problem (LCS), Applying Dynamic Programming to the LCS Problem. **Computational Geometry:** One Dimensional Range Searching, Two Dimensional Range Searching, Constructing a Priority Search Tree, Searching a Priority Search Tree, Priority Range Trees, Quad trees, k-D Trees.

F. TEXT BOOKS

T1. "Data Structures and Algorithm Analysis in C++", Mark Allen Weiss, 2nd Edition, Pearson, 2004.

G. REFERENCE BOOKS

R1. "Roberto Tamassia, Algorithm Design", M T Goodrich, John Wiley, 2002

H. Lecture Plan:

Lecture No.	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1	Dictionaries Definition, Abstract Data Type, Implementation using array and lists	Understanding of Definition of Dictionary and issues in implementation	Lecture	CS1757.1	Class Quiz Sessional 1 End Term
2-3	Implementation of Dictionaries using BST, issues, using Direct Addressing, Issues. Intro to Hash Tables	Capable to implement Dictionaries	Lecture	CS1757.1	Class Quiz Sessional 1 End Term
3-4	Hash Table, Hash Function, uniform load, collision.	Capable to implement Dictionaries	Lecture	CS1757.1	Class Quiz Sessional 1 End Term
5	Chaining, Example, Analysis	Understanding of separate chaining	Lecture	CS1757.2	Class Quiz Home Assignments Sessional 1 End Term
6-7	Open Addressing, Linear probe, Quadratic Probe, Example	Understanding of Open addressing	Lecture	CS1757.2	Class Quiz Home Assignments Sessional 1 End Term
7-8	Double Hashing, Rehashing, Examples	Understanding of Double Hashing	Lecture	CS1757.2	Class Quiz Home Assignments Sessional 1 End Term
9	Extendible Hashing	Understanding of extendible hashing	Lecture	CS1757.2	Class Quiz Home Assignments Sessional 1 End Term
10	Need for Randomizing Data Structures and Algorithms	Understanding the concept of randomization	Lecture	CS1757.3	Class Quiz Sessional 1

					End Term
11-12	Search and Update Operations on Skip Lists	Knowledge of skip lists and understanding the operations on it	Lecture	CS1757.3	Class Quiz Sessional 1 End Term
13-14	Probabilistic Analysis of Skip Lists	Capable to analyse skip lists	Lecture	CS1757.3	Class Quiz Sessional 1 End Term
15	Deterministic Skip Lists	Understanding deterministic skip lists	Lecture	CS1757.3	Class Quiz Sessional 1 End Term
FIRST SESSIONAL EXAM					
16	Splaying	Understanding splaying phenomenon	Lecture	CS1757.4	Class Quiz Sessional 2 End Term
17-18	Search and Update Operations on Splay Trees	Perform search and update operations on splay trees	Lecture	CS1757.4	Class Quiz Home Assignments Sessional 2 End Term
19-20	Amortized Analysis of Splaying	Capable to analyse operations on splay tree	Lecture	CS1757.4	Class Quiz Sessional 2 End Term
21	String Operations	Understanding text processing operations	Lecture	CS1757.5	Class Quiz Sessional 2 End Term
22	Brute-Force Pattern Matching	Understanding Brute-Force Pattern Matching	Lecture	CS1757.5	Class Quiz Sessional 2 End Term
22-23	The Boyer-Moore Algorithm	Understanding the Boyer-Moore Algorithm	Lecture	CS1757.5	Class Quiz Sessional 2 End Term
23-24	The Knuth-Morris-Pratt Algorithm	Understanding the Knuth-Morris-Pratt Algorithm	Lecture	CS1757.5	Class Quiz Sessional 2 End Term

25	Standard Tries	Knowledge of standard tries	Lecture	CS1757.5	Class Quiz Sessional 2 End Term
26	Compressed Tries	Knowledge of compressed tries	Lecture	CS1757.5	Class Quiz Sessional 2 End Term
27	Suffix Tries	Knowledge of suffix tries	Lecture	CS1757.5	Class Quiz Sessional 2 End Term
28	The Huffman Coding Algorithm	Understanding Huffman coding algorithm	Lecture	CS1757.5	Class Quiz Sessional 2 End Term
SECOND SESSIONAL EXAM					
29	The Longest Common Subsequence Problem (LCS)	Understanding LCS problem	Lecture	CS1757.5	Class Quiz End Term
30	Applying Dynamic Programming to the LCS Problem	Capable to apply dynamic programming to LCS problem	Lecture	CS1757.5	Class Quiz End Term
31	One Dimensional Range Searching	Understanding one dimensional range searching	Lecture	CS1757.6	Class Quiz End Term
32	Two Dimensional Range Searching	Understanding two dimensional range searching	Lecture	CS1757.6	Class Quiz End Term
33	Constructing a Priority Search Tree	Capable to construct priority search tree	Lecture	CS1757.6	Class Quiz End Term
34	Searching a Priority Search Tree	Capable to search in a priority search tree	Lecture	CS1757.6	Class Quiz End Term
35	Priority Range Trees	Understanding priority range trees	Lecture	CS1757.6	Class Quiz End Term
36	Quad trees	Understanding quad trees concept	Lecture	CS1757.6	Class Quiz End Term
37	k-D Trees	Understanding k-D trees	Lecture	CS1757.6	Class Quiz End Term
END TERM EXAM					

I. Course Articulation Matrix: (Mapping of COs with POs and PSOs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CS 1757.1	Learning concepts of dictionaries and their implementations	2	2							1	1			2		
CS 1757.2	learning of various hasing techniques and their applications	2	2	2					2				3	1		
CS 1757.3	demonstrate skip lists, operations on skip lists and their probabilistic analysis	2			2	2				1				2	2	
CS 1757.4	describe splay trees and their analysis			2	2							2			2	2
CS 1757.5	learning of various text processing algorithms		2		2								2			2
CS 1757.6	learning of searching techniques related to computational geometry	2		2	2					2				2	2	

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Computing and IT

Department of Computer Science and Engineering
Course Hand-out

Big Data Analytics | CS 1701 | 4 Credits | 3 1 0 4

Session: Jul 19 – Dec 19 | Faculty: Dr. Rishi Gupta/Dr. Yogesh Gupta/Mr. Priyank Singh Hada | Class: VII Semester

A. Introduction: This course provides practical foundation level in big data Analytics. The course provides grounding in basic and advanced methods to big data technology and tools, including Hadoop and its ecosystem.

B. Course Outcomes: At the end of the course, students will be able to

[1701.1] Demonstrate fundamentals of Data Analytics & the need of the Big Data Analytics

[1701.2] Implement the structured lifecycle approach to data science and big data analytics projects skills.

[1701.3] Solve the industry challenges in analyzing big data applications and create statistical models that impact increase employability skills.

[1701.4] Implement various theoretical models of data analytics using the R tool/R studio

[1701.5] Use analytical platforms such as Hadoop, NoSQL DBMS software for performing advanced data analytics

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1] Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2] Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3] Design/development of solutions: Design solutions for complex engineering problems and design system components or processes_that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4] Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5] Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools_including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6] The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues_and the consequent responsibilities relevant to the professional engineering practice

[PO.7] Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8] Ethics: Apply ethical principles and commit to professional ethics_and responsibilities and norms of the engineering practices

[PO.9] Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10] Communication: Communicate effectively_on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11] Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12] Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

[PSO.1] Will be able to design, develop and implement efficient software for a given real life problem.

[PSO.2] Will be able to apply knowledge of AI, Machine Learning and Data Mining in analyzing big data for extracting useful information from it and for performing predictive analysis.

[PSO.3] Will be able to design, manage and secure wired/ wireless computer networks for transfer and sharing of information.

D. Assessment Plan:

Criteria	Description	Date	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	Sept 5 – Sept 9	15
	Sessional Exam II (Closed Book)	Nov 4 – Nov 6	15
	Quizzes and Assignments (Accumulated and Averaged)	Regularly	30
End Term Exam (Summative)	End Term Exam (Closed Book)	Nov 29 – Dec 13	40
	Total		100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.		
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.		
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.		

E. SYLLABUS

Introduction to big data: definition, need and evolution of BDA, applications of Big Data, **Big Data Analytics:** Analysing big data, sources of big data, characteristics of big data (4 V's), Drivers of BDA, types of data, structured vs. unstructured data, data marts, Case study based tutorial, Differences between traditional DWDM and BDA, Limitations of traditional RDBMSs to store and analyse Big Data

Data science, definition and concepts, **data scientists:** key competencies and characteristics of data scientists, More discussions on data science: data wrangling, data munging, data jujitsu, Tutorial based on data science applications, Big Data Analytics Ecosystem, **State of the Practice in Analytics:** Data Analytics Lifecycle and discussions, Roles for a Successful Analytics Project; Case Study to apply the data analytics lifecycle, Analytical databases and DW appliances; Hadoop distributions – Comparing various BDA tools

Analyzing and Exploring the Data: Challenges when managing and analyzing big data, the role of Data Virtualization in a Big Data environment; Why to visualize data. **Statistics for Model Building and Evaluation:** Statistics in the Analytic Lifecycle, Hypothesis Testing, Difference of means

Advanced Analytics – Theory and Methods Overview: K-means clustering, Association Rules, Linear Regression, Logistic Regression, Naïve Bayesian Classifiers, Tutorial based on advanced analytics, Decision Trees, Time Series Analysis, Text Analytics; Tutorial based on analytics

Big Data Platforms and Storage Options: The new multi-platform Analytical Ecosystem; Beyond the Data Warehouse - Analytical databases, Hadoop and NoSQL DBMSs

TEXT BOOKS

T. Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data, EMC Education Services.

REFERENCE BOOKS

R. Michael Minelli, Michele Chambers, Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends", John wiley,2013

F. Lecture Plan:

Lecture No.	Topics	Session outcome	Mode of Delivery	Corresponding CO	Modes of Accessing the CO
1.	Definition, Need and evolution of BDA	Will get to know the need of the BDA	Lecture	1701.1	Mid Term I, Quiz & End Term
2.	Applications of Big Data	Analyse on various real time applications of BDA	Discussion	1701.1	Mid Term I, Quiz & End Term
3.	Analyzing big data	Identify the Need of Big Data	Lecture/PPT	1701.1	Mid Term I, Quiz & End Term
4.	sources of big data, Drivers of BDA	Conclude on various Data sources	Lecture/PPT	1701.1	Mid Term I, Quiz & End Term
5.	characteristics of big data (4 V's)	List out the key characteristics of the BDA	Lecture/PPT	1701.1	Mid Term I, Quiz & End Term
6.	Types of data, structured vs. unstructured data, data marts,	Deal with variety of the data	Flipped Class	1701.1	Mid Term I, Quiz & End Term
7.	Case study-based tutorial	Real time application – Discussion	Activity	1701.1	Mid Term I, Quiz & End Term
8.	Differences between traditional DWDM and BDA, Limitations of traditional RDBMSs to store and analyse Big Data,	Identify the differences between Data Mining and Data Analytics	Lecture/PPT	1701.1	Mid Term I, Quiz & End Term
9.	Data science, definition and concepts,	Would define the definition of Data Science	Flipped Classes	1701.1	Mid Term I, Quiz & End Term
10.	key competencies and characteristics of data scientists	List out the key competencies and characteristics of data scientists	Lecture	1701.2	Mid Term I, Quiz & End Term
11.	More discussions on data science: data wrangling, data munging	Define Data Wrangling and munging	Flipped Classes	1701.2	Mid Term I, Quiz & End Term
12.	data jujitsu, Tutorial based on data science applications	Work on data jujitsu	Lecture	1701.2	Mid Term I, Quiz & End Term

13.	Big Data Analytics Ecosystem,	Analyse on BDA Ecosystem	Lecture	1701.2	Mid Term I, Quiz & End Term
14.	Data Analytics Lifecycle and discussions	Explain on BDA lifecycle	Discussion	1701.2	Mid Term II, Quiz & End Term
15.	Roles for a Successful Analytics Project	Identify the key indicators to make analytics project	Lecture	1701.2	Mid Term II, Quiz & End Term
16.	Case Study to apply the data analytics lifecycle	Implement some real time issues	Activity	1701.2	Mid Term II, Quiz & End Term
17.	Analytical databases and DW appliances	Compare the DW and Analytical DB's	Flipped Class	1701.2	Mid Term II, Quiz & End Term
18.	Hadoop distributions – Comparing various BDA tools	Access the Hadoop platforms	Lecture	1701.2	Mid Term II, Quiz & End Term
19.	Challenges when managing and analysing big data	List the challenges in BDA process.	Discussion	1701.3	Mid Term II, Quiz & End Term
20.	The role of Data Virtualization in a Big Data environment	Create Data Virtualization	Lecture/PPT	1701.3	Mid Term II, Quiz & End Term
21.	Why to visualize data	Mention the advantage of visualization	Lecture/PPT	1701.3	Mid Term II, Quiz & End Term
22.	Statistics in the Analytic Lifecycle	Will do Statistics in the Analytic Lifecycle	Lecture/PPT	1701.3	Mid Term II, Quiz & End Term
23.	Hypothesis Testing	Will perform Hypothesis Testing	Activity	1701.3	Mid Term II, Quiz & End Term
24.	Difference of means	Perform Difference of means	Activity	1701.3	Mid Term II, Quiz & End Term
25.	K-means clustering	Perform K-means clustering	Activity	1701.4	Mid Term II, Quiz & End Term
26	Association Rules	Perform Association Rules	Activity	1701.4	Mid Term II, Quiz & End Term
27	Linear Regression, Logistic Regression	Perform Linear Regression, Logistic Regression	Activity	1701.4	Mid Term II, Quiz & End Term
28	Naïve Bayesian Classifiers	Perform Naïve Bayesian Classifiers	Activity	1701.4	Mid Term II, Quiz & End Term
29	Tutorial based on advanced analytics	Will implement real time issues	Activity	1701.4	Mid Term II, Quiz & End Term
30	Decision Trees	Perform Decision Trees	Activity	1701.4	Mid Term II, Quiz & End Term
31	Time Series Analysis	Perform Time Series Analysis	Activity	1701.4	Mid Term II, Quiz & End Term
32	Text Analytics	Perform Text Analytics	Activity	1701.4	Mid Term II, Quiz & End Term
33	Tutorial based on analytics	Will implement real time issues	Activity	1701.4	Mid Term II, Quiz & End Term
34	The new multi-platform Analytical Ecosystem	Understand Analytical ecosystem	Lecture	1701.5	Quiz & End Term
35	Beyond the Data Warehouse - Analytical databases	Understand Analytical DB's	Lecture/PPT	1701.5	Quiz & End Term
36	Introduction to Hadoop and Hadoop ecosystem	Will learn basics of Hadoop	Lecture/PPT	1701.5	Quiz & End Term
37,38	Advantages of Hadoop & HDFS	Will learn basics of Hadoop file systems	Lecture/PPT	1701.5	Quiz & End Term

39,40	MAPREDUCE, Hadoop Clustering	Will learn basics of Hadoop clustering	Lecture/PPT	1701.5	Quiz & End Term
41,42,43	Ecosystem component: Oozie, Spark, Scala, ML lib, Pig, Hive, kafka, flume	Will run applications on different modern tools	Flipped Class	1701.5	Quiz & End Term
44	Hadoop Usage for Applications	Implement projects on Hadoop platform	Activity	1701.5	Quiz & End Term
45	Introduction to NoSQL Data base, Advantages of NoSQL	Will learn basics of NoSQL	Lecture	1701.5	Quiz & End Term
46, 47	Mongo dB	Incur knowledge on advantages of No SQL	Lecture/PPT	1701.5	Quiz & End Term
47,48	Cassandra	Incur knowledge on No SQL	Lecture/PPT	1701.5	Quiz & End Term
50	NoSQL DBMSs projects & case studies	Incur knowledge on advantages of No SQL	Activity	1701.5	Quiz & End Term

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
[CS 1701.1]	Understand fundamentals of Data Analytics & the need of the Big Data Analytics	2	3										1	3		
[CS 1701.2]	Implement the structured lifecycle approach to data science and big data analytics projects skills.		3											2		
[CS 1701.3]	Solve the industry challenges in analyzing big data applications and create statistical models that impact increase employability skills.		2	2											2	
[CS 1701.4]	Implement various theoretical models of data analytics using the R tool/R studio				3	1									3	
[CS 1701.5]	Use analytical platforms such as Hadoop, NoSQL DBMS software for performing advanced data analytics					2						2		2		

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Computing and IT

Department of Computer and Communication Engineering

Course Hand-out

Wireless Sensors and Adhoc Networks | **CC1755** | 3 Credits | 3 0 0 3

Session: Jul 19 – Dec 19 | Faculty: Dr. Vijay Kr. Sharma| Dr. Dilbag | Dr. Prakash Sharma | Class: CCE VII SEM (Department Elective)

A. **Introduction:** This course is offered by Dept. of Computer and Communication Engineering for seventh semester students as department elective course. The core objective of this course is to make the students understand the concepts of Ad Hoc Networks as well as Wireless Sensor Networks (WSN), their characteristics, novel applications, and technical challenges. The prerequisites are to have basic understanding of infrastructured networks, basic protocols used on computer networking.

B. **Course Outcomes:** At the end of the course, students will be able to

[1755.1]- Describe the concept of wireless ad hoc networks and specialized ad hoc networks like sensor networks.

[1755.2]- Analyse different categories of routing protocols in ad hoc networks and main design issues.

[1755.3]- Analyse design issues of Wireless sensor networks such as Energy consumption, Clustering of Sensors, QoS and applications.

[1755.4]- Describe the basic concepts of MAC layer, routing layer and high level application layer in WSN.

[1755.5]- Illustrate Security issues in wireless ad hoc networks, cooperation in MANETs, Intrusion detection systems.

[1755.6]- Build the required skills to read and research the current literature in ad hoc and sensor networks.

C. **PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES**

[PO.1] **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2] **Problem analysis**: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3] **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4] **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5] **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6] **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issuesand the consequent responsibilities relevant to the professional engineering practice

[PO.7] **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8] **Ethics**: Apply ethical principles and commit to professional ethicsand responsibilities and norms of the engineering practices

[PO.9] **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10] **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11] **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12] **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

[PSO.1] Should be able to clearly understand the basic principles, concepts and applications in the field of computer based Communication/networking, information sharing, signal processing, web based systems, smart devices and communication technology.

[PSO.2] Should be able to nail down the issues prevalent in the field of Computer and Communication Engineering.

[PSO.3] Should be able to identify the existing open problems in the field of computing and propose the best possible solutions.

[PSO.4] Should be able to apply the contextual knowledge in the field of computing and communication to assess social, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional engineering practice.

D. Assessment Plan:

Criteria	Description	Date	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	Sept 5- Sept 9	15
	Sessional Exam II (Closed Book)	Nov 4- Nov 6	15
	Quizzes and Assignments (Accumulated and Averaged)	Regularly	30
End Term Exam (Summative)	End Term Exam (Closed Book)	Nov 29 – Dec 13	40
	Total		100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.		

E. SYLLABUS

Introduction to Ad Hoc Wireless Networks: Characteristics of Mobile Ad-hoc Networks (MANETs), Applications of MANETs, Challenges; **Routing in MANETs:** Topology-based versus Position-based approaches, Topology based routing protocols, Position based routing, Other Routing Protocols; **Data Transmission in MANETs, TCP over Ad Hoc Networks. Basics of Wireless Sensors and Applications:** Design issues, Energy consumption, Clustering of Sensors, Applications; **Data Retrieval in Sensor Networks:** Classification of WSNs, MAC layer, Routing layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs; **Security:** Security in Ad hoc Wireless Networks, Key Management, Secure Routing, Cooperation in MANETs, Intrusion Detection Systems; **Sensor Network Platforms and Tools:** Sensor Network Hardware, Sensor Network Programming Challenges, Node-Level Software Platforms.

F. TEXT BOOKS

T1. C.S.R. Murthy, B.S. Manoj, *"Adhoc Wireless Networks — Architectures and Protocols"*, 1st Edition, Pearson Education, 2006.

T2. C. M. Cordeiro, D. P. Aggarwal, *"Ad Hoc and Sensor Networks — Theory and Applications"*, 2nd Edition, World Scientific Publications, 2011

G. REFERENCE BOOKS

R1. F. Zhao,L. Guibas, "Wireless Sensor Networks: An Information Processing Approach", 1st Edition, Morgan Kauffman Publishers, 2004

R2. F. Hu,X. Cao, "Wireless Sensor Networks — Principles and Practice", An Auerbach Publications, CRC Press, Taylor & Francis Group, 2010.

R3. C.E. Perkins, "Ad hoc Networking", Addison-Wesley, 2008.

Lecture Plan:

Lecture No.	Major Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1.	Introduction and Course Hand-out briefing	To acquaint and clear teachers expectations and understand student expectations	Lecture	NA	NA
2.	Introduction to basic of Ad Hoc Network	To acquaint infrasture-based and infrastructure-less network and fundamental concepts used in ad hoc networks	Lecture	1755.1	Mid Term I, Quiz & End Term
3.	Characteristics and Applications of MANETs	Describe the need of MANET, its characteristics and different applications of MANET and finding different scenarios of its applicability	Lecture	1755.1	Mid Term I, Quiz & End Term
4.	Challenges in Ad Hoc Networks	Identify different design issues of ad hoc networks in realistic environment	Lecture	1755.1	Mid Term I, Quiz & End Term
5.	Data Transmission in MANETs	Describe the process of data transmission in MANETs	Lecture	1755.1	Mid Term I, Quiz & End Term
6.	Issues in Designing routing Protocols	Illustrate different design issues in routing of Ad hoc networks	Lecture	1755.2	Mid Term I, Quiz & End Term
7.	Classification of Routing Protocols	Describe various parameters for classification of routing protocols	Lecture	1755.2	Mid Term I, Quiz & End Term
8.	Distance vector and Link state routing protocols	Recall distance vector and link state routing protocols and their applications	Flipped Class	1755.2	Mid Term I, Quiz & End Term
9.	Destination Sequenced distance vector routing protocol	Describe Destination Sequenced distance vector routing protocol	Lecture	1755.2	Mid Term I, Quiz & End Term
10.	Destination Sequenced distance vector routing protocol	Describe working and applications of DSDV	Lecture	1755.2	Mid Term I, Quiz & End Term
11.	Wireless routing protocol, Cluster-head	Describe WRP and CGSR routing and applicability in real world	Lecture	1755.2	Mid Term I, Quiz & End Term

	gateway switch routing protocol				
12.	On demand routing protocols	Recall on-demand routing protocols and its advantages over table-driven routing protocols	Flipped Class	1755.2	Mid Term I, Quiz & End Term
13.	Dynamic source routing protocol	Describe DSR routing protocol and its working and advantages	Lecture	1755.2	Mid Term I, Quiz & End Term
14.	Ad hoc on demand distance vector routing protocol	Describe AODV routing protocol and its working and advantages	Lecture	1755.2	Mid Term I, Quiz & End Term
15.	Location-aided routing	Describe LAR routing protocol and its working and advantages	Lecture	1755.2	Mid Term I, Quiz & End Term
16.	Hybrid routing protocols, Zone routing protocol	Describe Hybrid routing protocol and its working and advantages. Illustrate the trade-off among all routing protocols in realistic environment	Lecture	1755.2	Mid Term I, Quiz & End Term
17.	Transport layer Design issues for Ad Hoc Networks	Describe different design issues at transport layer in ad hoc networks	Lecture	1755.4& 1755.6	Mid Term I, Quiz & End Term
18.	Transport layer Goals for Ad Hoc Networks	Describe design goals of transport layer protocol for ad hoc wireless networks.	Lecture	1755.4& 1755.6	Mid Term I, Quiz & End Term
19.	TCP performance in Ad Hoc	Revisit to traditional TCP and recount the performance of traditional TCP protocols in wireless ad hoc networks	Lecture	1755.4& 1755.6	Mid Term I, Quiz & End Term
20.	Feedback based TCP	Describe Feedback based TCP	Lecture	1755.4& 1755.6	Mid Term II, Quiz & End Term
FIRST SESSIONAL EXAM					
21.	TCP –BUS , Ad Hoc TCP	Describe TCP- BUS, Ad Hoc TCP and compare with traditional TCP	Lecture	1755.4& 1755.6	Mid Term II, Quiz & End Term
22.	Ad Hoc TCP , Split TCP	Describe Split TCP and compare with traditional TCP	Lecture	1755.4& 1755.6	Mid Term II, Quiz & End Term
23.	Comparative study of various protocols	Analyse various transport layer protocols in Ad hoc environment	Flipped Class	1755.4& 1755.6	Mid Term II, Quiz & End Term

24.	Other Transport layer Protocols	Trade-off study of various protocols at transport layer	Activity	1755.4& 1755.6	Mid Term II, Quiz & End Term
25.	Issues and challenges in Security of Ad Hoc Networks	Describe the need of security in ad hoc networks due to its unique characteristics	Lecture	1755.5	Mid Term II, Quiz & End Term
26.	Security attacks	Describe issues and challenges in security provisioning in wireless ad hoc networks	Flipped Class	1755.5	Mid Term II, Quiz & End Term
27.	Key Management algorithms	Describe symmetric and Asymmetric kay algorithms	Lecture	1755.5	Mid Term II, Quiz & End Term
28.	Key Management approaches in Ad Hoc Networks	Describe various key management approaches used in Wireless Ad Hoc Networks	Lecture	1755.5	Mid Term II, Quiz & End Term
29.	Secure Routing	Describe the requirement of secure routing protocol for ad hoc network and elaborate security versions of studied routing protocols	Lecture	1755.5	Mid Term II, Quiz & End Term
30.	Cooperation in MANET	Describe the need of cooperation in security provisioning of mobile ad hoc networks	Lecture	1755.5	Mid Term II, Quiz & End Term
31.	Intrusion Detection System	Describe intrusion detection system for Ad hoc networks	Lecture	1755.5	Mid Term II, Quiz & End Term
SECOND SESSIONAL EXAM					
32.	Design issues, Clustering of Sensors	Describe different design issues and challenges of wireless sensor network	Lecture	1755.3 & 1755.6	Quiz & End Term
33.	Clustering of Sensors	Describe clustered architecture of wireless sensor network	Lecture	1755.3 & 1755.6	Quiz & End Term
34.	Energy consumption	Describe small minimum energy communication network	Lecture	1755.3 & 1755.6	Quiz & End Term
35.	Applications	Describe various applications of wireless sensor network	Lecture	1755.3 & 1755.6	Quiz & End Term
36.	Classification of WSNs	Classify Wireless Sensor Networks based on various parameters	Flipped Class	1755.3 & 1755.6	Quiz & End Term

37.	MAC layer, Routing layer	Describe MAC and routing layer design issues of Wireless Sensor Networks	Lecture	1755.3 & 1755.6	Quiz & End Term
38.	High-level application layer support	Describe application layer architecture of WSN	Lecture	1755.3 & 1755.6	Quiz & End Term
39.	Adapting to the inherent dynamic nature of WSNs	Identify the impact of different parameters on solutions designed for WSN	Lecture	1755.3 & 1755.6	Quiz & End Term
40.	Sensor Network Hardware	Identify the hardware components required for WSN and their characteristics	Lecture	1755.3 & 1755.6	Quiz & End Term
41.	Sensor Network Programming Challenges, Node-Level Software Platforms.	Build solutions in WSN using node level software platforms	Lecture	1755.3 & 1755.6	Quiz & End Term
END TERM EXAM					

H. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	Correlation with Program Outcomes**(POs)**												Correlation with program specific outcomes **(POs)**			
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
[1755.1]	Describe the concept of wireless ad hoc networks and specialized ad hoc networks like sensor networks.	**2**	**1**										**1**	**2**			
[1755.2]	Analyse different categories of routing protocols in ad hoc networks and main design issues	**3**	**2**										**1**		**2**		
[1755.3]	Analyze design issues of Wireless sensor networks such as Energy consumption, Clustering of Sensors, QoS and applications.	**2**	**2**	**1**		**3**							**1**	**1**			**1**
[1755.4]	Describe the basic concepts of MAC layer, routing layer and high level application layer in WSN.	**3**	**2**			**3**							**2**			**1**	
[1755.5]	Illustrate Security issues in wireless ad hoc networks, cooperation in MANETs, Intrusion detection systems.	**3**	**2**	**1**									**2**	**1**	**1**	**1**	**1**
[1755.6]	Build the required skills to read and research the current literature in ad hoc and sensor networks.												**2**	**1**		**1**	**1**

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR
SCHOOL OF COMPUTING & INFORMATION TECHNOLOGY

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
Course Hand-out

Information System Security | CS1704 | 4 credits | [3 1 0 4]

Session: JUL 19 – DEC.19| Faculty: Mr. Prashant Manuja | Class: (VII Sem)

A. Introduction: This course is offered by Dept. of Computer Science, the aim of the course to provide the students basic background on information systems. This is targeting students who wish to pursue career in the field of information security. The course includes understanding the principles for multi-layer security and management systems for the network. The focus is on techniques and protocol used for different types of security policies.

B. Course Objectives: At the end of the course, students will be able to

[1704.1] To understand the concept of information system and classical cryptography.
[1704.2] To master the concepts of cipher algorithms with mathematical standards.

[1704.3] To understand the concepts of public key encryption with key exchange fundamentals.

[1704.4] Understand authentication management and its relevant issues.

[1704.5] To master the applications of cryptography in network.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1] Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2] Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3] Design/development of solutions: Design solutions for complex engineering problems and design system components or processes_that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4] Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5] Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools_including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6] The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7] Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8] Ethics: Apply ethical principles and commit to professional ethics_and responsibilities and norms of the engineering practices

[PO.9] Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10] Communication: Communicate effectively_on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11] Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12] Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

Program Specific Outcomes (PSOs)

At the end of the B Tech CSE program, the student:

[PSO.1] Will be able to design, develop and implement efficient software for a given real life problem.

[PSO.2] Will be able to apply knowledge of AI, Machine Learning and Data Mining in analyzing big data for extracting useful information from it and for performing predictive analysis.

[PSO.3] Will be able to design, manage and secure wired/ wireless computer networks for transfer and sharing of information.

D. **Assessment Plan:**

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Close Book)	15
	Sessional Exam II (Close Book)	15
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Close Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. Syllabus

Introduction – Basic objectives of cryptography, secret-key and public-key cryptography, one-way and trapdoor one-way functions, cryptanalysis, attack models, classical cryptography; **Block ciphers:** Modes of operation, DES and its variants, AES, linear and differential cryptanalysis; **Message digest:** Properties of hash functions, MD2, MD5 and SHA-1, keyed hash functions, attacks on hash functions; **Public-key parameters:** Modular arithmetic, gcd, primality testing, Chinese remainder theorem, modular square roots, finite fields; **Intractable problems:** Integer factorization problem, RSA problem, modular square root problem, discrete logarithm problem, Diffie-Hellman problem, known algorithms for solving the intractable problems; **Public-key encryption:** RSA, Rabin and EIGamal schemes, side channel attacks; **Key exchange:** Diffie-Hellman and MQV; **Digital signatures:** RSA, DSA and NR signature schemes, blind and undeniable signatures; **Entity authentication:** Passwords, challenge-response algorithms, zero-knowledge protocols; **Standards:** IEEE, RSA and ISO standards.**Network security:** Certification, public-key infra-structure (PKI), secure socket layer (SSL), Kerberos; **Advanced topics:** Elliptic and hyper-elliptic curve cryptography, number field sieve, lattices and their applications in cryptography, hidden monomial cryptosystems, cryptographically secure random number generators.

Text Books

1. B. A. Forouzan, D. Mukhopadhyay, "*Cryptography and Network Security"*, Mc-Graw Hill, 2nd Edition, 2008.
2. W. Stallings, "Cryptography and Network Security: Principles and Practice", Prentice Hall, 5th edition, 2010.

References:

1. J. Pieprzyk, T. Hardjono, J. Seberry, Fundamentals of Computer Security, Springer International Edition, 2003.

F. Lecture Plan:

Sr.No.	Topics to be covered	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1	Basic objectives of cryptography	To acquaint and clear teachers expectations and understand student expectations	Lecture	NA	NA
2	secret-key and public-key cryptography	Understanding of different key concepts	Lecture	1704.1	Class Quiz Sessional 1 End Term
3	one-way and trapdoor one-way functions	Understanding of different functions involved in network	Flipped Class	1704.2	Class Quiz Sessional 1 End Term
4	cryptanalysis	Understanding of basic component and standards for cryptography	Lecture	1704.2	Class Quiz Sessional 1 End Term
5	attack models- Passive & active attacks	Knowledge about different attack models	Lecture and Flipped Class	1704.2	Class Quiz Sessional 1 End Term
6	classical cryptography	Understanding the working of classical cryptography	Lecture	1704.2	Class Quiz Sessional 1 End Term

7	Cipher techniques- block cipher & stream cipher	Understanding the working of substitution techniques of cipher			
8	Cipher techniques- ceaser cipher, affine cipher, vigenere cipher, playfair cipher, hill cipher, transposition technique	Understanding the working of transposition techniques of cipher			
8	Modes of operation DES and its variants	Knowledge of DES	Lecture	1704.2	Class Quiz Sessional 1 End Term
9	DES and its variants	Knowledge of DES & its variant	Lecture	1704.2	Class Quiz Sessional 1 End Term
10	AES Structure, AES Round Functions	Knowledge of AES		1704.2	Class Quiz Sessional 1 End Term
11	AES Key Expansion	Knowledge of AES & their functions	Lecture	1704.2	Class Quiz Sessional 1 End Term
12	linear and differential cryptanalysis	Knowing about cryptanalysis	Lecture / Flipped Class	1704.2	Class Quiz Sessional 1 End Term
13	Properties of hash functions	Understand the concepts of hash functions	Lecture	1704.2	Class Quiz Sessional 1 End Term
14	MD2	Recall different hash algorithms	Flipped Lecture	1704.3	Class Quiz Sessional 2 End Term

15-16	MD5	Recall different hash algorithms	Flipped Class	1704.3	Class Quiz Sessional 2 End Term
17	SHA-1	Identify SHA-1 & hash algorithms	Lecture	1704.3	Class Quiz Sessional 2 End Term
18	keyed hash functions	Explain keyed hash algorithms	Lecture	1704.3	Class Quiz Sessional 2 End Term
19	attacks on hash functions	Recall attacks on hash functions	Lecture	1704.4	Class Quiz Sessional 2 End Term
20	Modular arithmetic	Understanding of modular functions	Lecture	1704.4	Class Quiz Sessional 2 End Term
21-22	gcd, primality testing	Know about GCD & primality testing	Lecture	1704.4	Class Quiz Sessional 2 End Term
23	Chinese remainder theorem	Understanding of Chinese remainder theorem	Lecture	1704.4	Class Quiz Sessional 2 End Term
24	modular square roots, finite fields	Understanding the square roots concept	Lecture	1704.4	Class Quiz Sessional 2 End Term
25	Integer factorization problem, RSA problem	Understanding factorization Concepts	Lecture	1704.4	Class Quiz Sessional 2 End Term
26	modular square root problem	Knowing concept of modular square	Lecture	1704.4	Class Quiz Sessional 2 End Term

27	discrete logarithm problem	Knowing Concept of DLP	Lecture	1704.4	Class Quiz Sessional 2 End Term
28	Diffie-Hellman problem, known algorithms for solving the intractable problems	Understanding concept of DH problem	Lecture	1704.5	Class Quiz Sessional 2 End Term
29-30	RSA, Rabin and EIGamal schemes	Know the concept of RSA	Lecture	1704.5	Class Quiz Sessional 2 End Term
31	side channel attacks, Diffie-Hellman and MQV	Understanding the concept of side channel attacks	Lecture	1704.5	Class Quiz Sessional 2 End Term
32	RSA Signature	Understanding the RSA signature	Lecture	1704.5	Class Quiz Sessional 2 End Term
33	DSA and NR signature schemes	Understanding the concept of DH	Lecture	1704.5	Class Quiz Sessional 2 End Term
34	blind and undeniable signatures	Understanding the signature	Lecture	1704.5	Class Quiz Sessional 2 End Term
35	Passwords, challenge-response algorithms	Know the concept of CR algorithms	Lecture	1704.5	Class Quiz Sessional 2 End Term
36	zero-knowledge protocols	Know the concept of zero knowledge protocols	Lecture	1704.5	Class Quiz End Term

37	IEEE, RSA standards	Know the concept of IEEE, RSA standards	Lecture	1704.5	Class Quiz End Term
38	ISO standards	Know the concept of ISO standards	Lecture	1704.5	Class Quiz End Term
39	Certification, public-key infra-structure (PKI)	Understanding the concept of PKI	Lecture	1704.5	Class Quiz End Term
40	secure socket layer (SSL)	Understanding the concept of SSL	Lecture	1704.5	Class Quiz End Term
41	Kerberos	Understanding the concept of Kerberos	Lecture	1704.5	Class Quiz End Term
42	Elliptic and hyper-elliptic curve cryptography	Understanding the concept of ECC	Lecture	1704.5	Class Quiz End Term
43	number field sieve	Know the number field sieve	Lecture	1704.5	Class Quiz End Term
44	lattices and their applications in cryptography	Applications of cryptography	Lecture	1704.5	Class Quiz End Term
45	hidden monomial cryptosystems	Understanding of cryptosystems	Lecture	1704.5	Class Quiz End Term
46	Cryptographically secure random number generators.	Know the concept of secure random number generators	Lecture	1704.5	Class Quiz End Term

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CS 1704. 1	To understand the concept of information system and classical cryptography.	3	2							1	1			2		
CS 1704. 2	To master the concepts of cipher algorithms with mathematical standards.		3	3	2					1				2		
CS 1704. 3	To understand the concepts of public key encryption with key exchange fundamentals.	3			3	2				1				3	2	
CS 1704. 4	Understand authentication management and its relevant issues.			3	2							3			2	3
CS 1704. 5	To master the applications of cryptography in network.		3		2									3		2

I- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

INSPIRED BY LIFE

SCHOOL OF COMPUTING & INFORMATION TECHNOLOGY

DEPARTMENT OF COMPUTER SCIENCE ENGG.
COURSE HAND-OUT

BIG DATA ANALYTICS LAB || CS1730|| 1 Credits|| [0 0 2 1]
Session: JULY-NOV-2019 | Faculty: Dr Rishi Gupta/ Dr YOGESH GUPTA/Mr. Priyank Singh Hada | VII SEM

A. Introduction:

This course is meant to offer to computer science engineering undergraduate students in their seventh semester to have an overview in the field of Data Science and Big Data Analytics. Students will learn the basic concepts in data analytics like retrieving, visualization of the data, Hypothesis testing on the data sets using R Tool. Students will also learn the fundamentals how to design and perform basic Hadoop platform operations.

B. Course Outcomes: At the end of the course, students will be able to

[CS1730.1]: Identify and practice basic functions and commands in R Programming

[CS1730.2]: Identify and perform different techniques in visualization of the analytical results and develop analytical skills.

[CS1730.3]: Use of software tools for performing Hypothesis tests for data analytical problems to increase employability skills.

[CS1730.4]: Configure the Hadoop clusters and perform map reduce concepts.

[CS1730.5]: To identify the depth of the problem and to propose the solution.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1] Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2] Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3] Design/development of solutions: Design solutions for complex engineering problems and design system components or processes_that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4] Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5] Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools_including prediction and modeling to complex engineering activities with an understanding of the limitations

- **[PO.6] The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues_and the consequent responsibilities relevant to the professional engineering practice
- **[PO.7] Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
- **[PO.8] Ethics**: Apply ethical principles and commit to professional ethics_and responsibilities and norms of the engineering practices
- **[PO.9] Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
- **[PO.10] Communication**: Communicate effectively_on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
- **[PO.11] Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
- **[PO.12] Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

Program Specific Objectives

- **[PSO.1]** Will be able to design, develop and implement efficient software for a given real life problem.
- **[PSO.2]** Will be able to apply knowledge of AI, Machine Learning and Data Mining in analyzing big data for extracting useful information from it and for performing predictive analysis.
- **[PSO.3]** Will be able to design, manage and secure wired/ wireless computer networks for transfer and sharing of information.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Weekly evaluation (Record + Execution + Viva)	50
	Mini project	20
End Term Exam (Summative)	End Term Exam	30
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

E. SYLLABUS

Introduction to data environment accessing lab environment, database environment-retail data, census data; Introduction to R; Basic Statistics, visualization and hypothesis tests; K-means clustering; Association rules; Linear regression; logistic regression; naïve Bayesian classifier building naïve Bayesian classifier, census data; Decision trees; time series analysis with arima; HADOOP, HDFS, MAPREDUCE and PIG; In-database analytics click stream data, computation of ordered aggregates, logistic regression with MADLIB; Case study

TEXT BOOK

T1. Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting

Data, EMC Education Services.

T2. Michael Minelli, Michele Chambers, Ambiga Dhiraj, “Big Data, Big Analytics: Emerging

Business Intelligence and Analytic Trends”, john wiley,2013.

REFERENCE

R. Dr Mark Gardener, “Beginning R, *The Statistical Programming Language*”, 2nd Edition, John Wiley India pvt. Ltd, 2017.

F. Lecture Plan

Lec No	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1	Introduction and Course Hand-out briefing	To acquaint and clear teachers expectations and understand student expectations	Lecture	NA	NA
2,3	Working with R Basic commands and visualization.	To study and implement basic functions and commands in R Programming as following: • Basic Statistics • Visualization methods using R Tool	Lecture/ Demonstration	CS1730.1 CS 1730.2	Internal Evaluation
4-10	Performing Various hypothesis tests	To perform data analytics hypothesis tests such as : Logistic, Regression, Time Series Analysis etc. in R Tool	Demonstration	CS 1730.1 CS 1730.2 CS 1730.3	Internal Evaluation Project End Sem Exam
10-14	Configure Hadoop systems and perform Map Reduce concepts	Implement the following file management tasks in Hadoop System (HDFS): Adding files and directories, retrieving files, Deleting files, Map Reduction	Lecture/ Demonstration	CS 1730.4 CS 1730.5	Internal Evaluation Project End Sem Exam

G. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES (**PO's**)												Correlation with Program Specific Outcomes (**PSOs**)		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
[CS1730.1]:	Identify and practice basic functions and commands in R Programming	2	1			2								1	2	
[CS1730.2]:	Identify and perform different techniques in visualization of the analytical results and develop analytical skills.	1	2	1	1	2									2	
[CS1730.3]:	Use of software tools for performing Hypothesis tests for data analytical problems to increase employability skills.	1	2		1	2								1		
[CS1730.4]:	Configure the Hadoop clusters and perform map reduce concepts.	1	2		2	2								1	2	
[CS1730.5]:	To identify the depth of the problem and to propose the solution.	1	1	1	1	1								1	1	

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Computing & Information Technology

Department of Computer Science & Engineering
Course Hand-out

Machine Learning | CS 1750 | 3 Credits | 3 0 0 3

Session: July 19– Dec 19 | Faculty: Dr. Sandeep Chaurasia, Mr. Tarun Jain | Class: Department Elective VII Sem

A. Introduction: This course is offered by Dept. of Computer Science & Engineering as an department core, targeting students who wish to pursue research & development in industries or higher studies in field of Artificial Intelligence, including supervised machine learning, unsupervised learning & reinforcement learning. Offers in depth knowledge of use Machine Learning for personal purpose, handle specific topics like Reinforcement Learning, NLP and Deep Learning, handle advanced techniques like Dimensionality Reduction, know which Machine Learning model to choose for each type of problem, build an army of powerful Machine Learning models and know how to combine them to solve any problem.

B. Course Objectives: At the end of the course, students will be able to

[CS1750.1] Explain the range of machine learning algorithms along with their strengths and weaknesses.
[CS1750.2] Explain the basic theory underlying machine learning.
[CS1750.3] Identify how to apply a variety of learning algorithms to data.
[CS1750.4] Perform evaluation of learning algorithms and model selection and hence enhance entrepreneurship skills.
[CS1750.5] Identify machine learning problems corresponding to different applications.
[CS1750.6] Explain the concept of transfer learning and deep learning architecture and hence improve employability skills.

C. Program Outcomes and Program Specific Outcomes

[PO.1]. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
[PO.2]. Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
[PO.3]. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations
[PO.4]. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions
[PO.5]. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations
[PO.6]. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice
[PO.7]. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
[PO.8]. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices
[PO.9]. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
[PO.10]. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
[PO.11]. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
[PO.12]. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

Program Specific Outcomes (PSOs)

The graduation from B.Tech. in Computer Science & Engineering will empowers the student:

PSO 1: Will be able to design, develop and implement efficient software for a given real life problem.
PSO 2: Will be able to apply knowledge of AI, Machine Learning and Data Mining in analysing big data for extracting useful information from it and for performing predictive analysis.
PSO 3: Will be able to design, manage and secure wired/ wireless computer networks for transfer and sharing of information.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Open Notes)	15
	Sessional Exam II (Open Notes)	15
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Open Notes)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. Syllabus

Introduction: concept learning and decision trees: Learning Problems**, Designing Learning systems**, Perspectives and Issues, Decision Tree learning, Heuristic Space Search; **Neural networks and genetic algorithms:** Neural Network Representation, Problems, Perceptrons, Multilayer Networks and Back Propagation Algorithms, Advanced Topics, Genetic Algorithms, Hypothesis, Space Search, **Bayesian and computational learning:** Bayes Theorem, Maximum Likelihood, Minimum Description, Length Principle, Bayes Optimal Classifier, Gibbs Algorithm, Naïve Bayes Classifier, Bayesian Belief Network – EM Algorithm – Probably Learning; **Evaluation Hypothesis:** Sampling Theory-Mean, Bias, Variance; **Instant based learning and learning set of rules:** K- Nearest Neighbor Learning, Locally Weighted Regression, Case-Based Reasoning, Sequential Covering Algorithms, Learning Rule Sets: Learning First Order Rules, Learning Sets of First Order Rules; **Analytical learning and reinforced learning**: Perfect Domain Theories, Explanation Based Learning, Inductive-Analytical Approaches, Reinforcement Learning, Task, Q-Learning, Temporal Difference Learning

F. Text Books

T1. M. Mohri, A. Rostamizadeh, A. Talwalker, “Foundations of Machine Learning”, MIT Press, Cambridge, MA, 2012.

T2. T.M. Mitchell, “Machine learning”, 1 st Indian Edition, McGraw-Hill India, 2013.

G. Reference Books

R1. T. Hastie, R. Tibshirani, J. Friedman, “The Elements of Statistical Learning”, 2nd Edition, Springer, 2009.

R2. C.M. Bishop, “Pattern Recognition and Machine Learning”, 1st Edition, Springer Verlag, 2010.

R3. S.N. Sivanandam, S.N. Deepa, “Principles of Soft Computing”, 2nd Edition, Wiley, 2011.

R4. EthemAlpaydin, “Introduction to Machine Learning”, 2nd Ed., PHI Learning Pvt. Ltd., 2013.

H. Lecture Plan:

Lec No	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1	Machine Learning – Introduction	To acquaint and clear teachers expectations and understand student expectations	Lecture	NA	NA
2	Use of ML, Types of ML	Supervised, Unsupervised, Reinforcement, Batch & Online Learning	Lecture	1750.1	In Class Quiz
3,4	Challenges of ML	Quality of training data, Non representative training data, Poor quality data.	Lecture	1750.1	In Class Quiz End Term
5,6	Challenges of ML	Poor-Quality Data, Irrelevant Features, Overfitting the Training Data, under fitting the Training Data Stepping Back, Testing and Validating	Lecture	1750.1	Home Assignment End Term
7,8	Machine learning on Real Data	Frame the Problem, Select a Performance Measure, Check the assumptions, Get the data, create a test.	Lecture	1750.2	In Class Quiz End Term
9	Visualization of Data	Visualizing geographical data, correlations, experiment with attribute	Lecture	1750.2	Class Quiz Mid Term I End Term
10	Pre-processing of Data for ML	Data cleaning, Handling text, feture scaling & transformation.	Lecture	1750.2	Class Quiz Mid Term I End term
11	Training & Testing of Model	Training and evaluating on a training set, cross validation.	Lecture	1750.2	Home Assignment Class Quiz Mid Term I End Term
12	Classification	Case Study of MNIST dataset Performance Measures Multi Class Classification	Lecture	1750.2	Class Quiz Mid Term I End Term
13	Linear Regression	Formulation	Lecture	1750.3/4/5	Class Quiz Mid Term I End Term
14	Gradient Decent	Batch Gradient, Stochastic Gradient & Mini Batch	Lecture	1750.3/4/5	Class Quiz End Term
15,16	Polynomial Regression	Multi variate regression	Lecture	1750.3/4/5	Class Quiz Mid Term II End Term

17, 18	Regularization & Logistic Regression	Regression, Estimating Probability, Decision Boundaries, Softmax regression	Lecture	1750.3/4/5	Class Quiz Mid Term II End Term
19, 20	Artificial Neural Network -	Introduction, Neuron, Model, Perceptron	Lecture	1750.3/4/5	Class Quiz Mid Term II End Term
21- 23	Multilayer Perceptron & Backpropagation.	Activation Function, Hidden Layers, Weights, Bias	Lecture	1750.3/4/5	Class Quiz Mid Term II End Term
24 - 26	Decision Tree	Training & visualizing, making prediction, CART training algorithm, Computational Complexity, Entropy, Regularization hyper parameter.	Lecture	1750.3/4/5	Class Quiz End Term
27 – 29	Naïve Bayes	Learning Classifiers based on Bayes Rule, Discrete Inputs, Continuous Input, Conditional independence Multinomial Naive Bayes	Lecture	1750.3/4/5	Class Quiz End Term
30 – 31	Belief Network	Gaussian Bayes classifiers, Document classification Bayesian belief Network	Lecture	1750.3/4/5	Class Quiz End Term
32 -35	Support Vector Machine	Linear SVM Soft Margin Classifier Non Linear SVM SVM Regression	Lecture	1750.3/4/5	Class Quiz End Term
36-37	Ensemble Learning & Random Forest	Voting Classifiers Bagging Random Forest Boosting	Lecture	1750.3/4/5	Class Quiz End Term
38-39	Instance Based Learning	k-Nearest Neighbours KNN algorithm How do we choose the factor K	Lecture	1750.3/4/5	Class Quiz End term
40	Unsupervised Learning	Concept of clustering with some example, K-means algorithm	Lecture	1750.3/4/5	Class Quiz
41	Reinforcement Learning	Learning Task Markov Decision Process Learning to optimize rewards	Lecture	1750.3/4	Class Quiz Mid Term II End Term
42	Convolution Neural Network	Architecture Convolution Layer Pooling Layer CNN Architecture	Lecture	1750.6	Class Quiz Mid Term II End Term

43	Recurrent Neural Network	Recurrent Neurons Basic RNN Deep RNN LSTM GRU	Lecture	1750.6	Class Quiz Mid Term II End Term
44	Natural Language Processing	Introduction and application of NLP. Processing Raw text Learning to classify text Developing Chatbot	Lecture	1750.3/4/5	Class Quiz End Term
45	Conclusion and Course Summarization	NA	Lecture		NA

I. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
[CS1750.1]	Explain the range of machine learning algorithms along with their strengths and weaknesses.	3							1					1		
[CS1750.2]	Explain the basic theory underlying machine learning.		2	2								2			1	
[CS1750.3]	Identify how to apply a variety of learning algorithms to data.				2	2									1	
[CS1750.4]	Perform evaluation of learning algorithms and model selection and hence enhance entrepreneurship skills.						2		2	3					1	
[CS1750.5]	Identify machine learning problems corresponding to different applications.			1						1	1			1	1	
[CS1750.6]	Explain the concept of transfer learning and deep learning architecture and hence improve employability skills.	3	2	2	2					2			1		1	

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

SCHOOL OF COMPUTING & INFORMATION TECHNOLOGY

DEPARTMENT OF COMPUTER SCIENCE &ENGINEERING

Course Hand-out

Advanced Computer Networks | CS1756 | 3 credits| [3 0 0 3]

Session: Aug – Dec 2019 | Faculty: Mr. Amit Kumar Bairwa | Class: Dep. Elective (VII Sem)

A. **Introduction:** This course is offered by Dept. of Computer Science as a department elective, the aim of the course to provide the students advanced background on relevant computer networking topics to have a comprehensive and deep knowledge. This is targeting students who wish to pursue research& development in industries or higher studies in field of Computer Networks. The course includes understanding the principles for multi-layer network and management systems for the network. The focus is on techniques and protocol for medium access control, remote procedure calls and quality assurance.

B. **Course Outcomes:** At the end of the course, students will be able to:

[LN 1756.1] Compare the OSI reference model and the TCP-IP reference model

[LN 1756.2] Extend the MAC layer concepts for wireless medium

[LN 1756.3] Make use of concepts of protocols, network interfaces, and performance issues in local and wide area networks

[LN 1756.4] Analysis network management and its protocols

[LN 1756.5] Apply QoS parameters on models

[LN 1756.6] Develop an entrepreneurship skills in the field of IT Infrastructure

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1] **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2] **Problem analysis**: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3] **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4] **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5] **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6] **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7] **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8] **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9] **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10] **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11] Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

[PSO. 1] Design, develop and implement efficient software for a given real life problem.

[PSO. 2] Apply knowledge of AI, Machine Learning and Data Mining in analyzing big data for extracting useful information from it and for performing predictive analysis.

[PSO. 3] Develop, manage and secured wired/ wireless computer networks for transfer and sharing of information

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	15
	Sessional Exam II (Closed Book)	15
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Closed Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work at home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

Introduction – network architecture - protocol implementation issues – Quantitative performance metrics - network design. **Reference models**- The OSI Reference Model- The TCP/IP Reference Model - A Comparison of the OSI and TCP/IP Reference Models **Low level network technologies**-Ethernet to token ring to wireless-Issues with data link protocols Encoding framing and error detection and correction-sliding window protocol **Medium access control sub layer**-Basic models of switched networks-Datagrams versus virtual circuits switching technologies-Switched Ethernet and ATM- The design of hardware based switches **Network layer** – network layer design issues-Routing algorithms-Congestion control algorithms-Internetworking- The network layer in the internet-Internet Protocol (IP).-Unicast, multicast, and inter domain routing **Transport layer**-Elements of transport protocol Congestion control – Performance issues The Internet's Trans-mission Control Protocol (TCP)- Remote Procedure Call (RPC)- –Implementation semantics of RPC -client-server applications- The Real-time Transport Protocol(RTP) - Multimedia applications- Congestion control and resource allocation.-congestion control in TCP–UDP –Quality of service in IP. **Application layer**-Domain name server-World wide web-Hypertext transfer protocol Presentation formatting and data compression- **Network security**- crypto graphic tools- the problems of key distribution – General authentication techniques - Pretty Good Privacy (PGP)-Secure Shell (SSH),- IP Security architecture(IPSEC).-Firewalls .**Network applications and the protocols**- File transfer protocol - email and the Web, multimedia applications such as IP telephony and video streaming-

Overlay networks like peer-to-peer file sharing and content distribution networks- Web Services architectures for developing new application protocols.

TEXTBOOKS

T1. A S Tanenbaum, Computer Networks, 5th Ed., Pearson, 2010.

T2. Behrouz A. Forouzan, TCP/IP Protocol Suite,4th Ed., McGraw Hill Education, 2010.

T3. James F. Kurose & Keith W. Ross, Computer Networking- A Top Down Approach, Pearson Education, 2017.

REFERENCE BOOKS

R1. L. L. Peterson and Bruce S. Davie, Computer Network a systems approach, 5th Ed., MK ,2011.

R2. Douglas Comer and David L Stevens, Internetworking with TCP/IP-Vol II, 3rd Ed, Pearson Education (India), 2015.

F. Lecture Plan:

Class Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1	Introduction and course Hand-out briefing	To acquaint and clear teacher's expectations and understand student expectations	Lecture	NA	NA
2	Reference Model: The OSI Reference Model-TCP/IP Model and Comparison	Recall OSI and TCP/IP Reference Models	Lecture	1756.1	Class Quiz Sessional 1 End Term
3	Introduction to Local Area Network, Network Devices	Recall Networks, Local Area Networks	Flipped Class	1756.2	Class Quiz Sessional 1 End Term
4	Introduction to Data Link Protocol, Error Correction and Error Detection	Recall DLL basic and Error Correction and Error Detection	Flipped Lecture	1756.3	Class Quiz Sessional 2 End Term
5-6	Medium Access Control: Protocol, Datagram versus Virtual Circuits	Know about MAC protocols, Datagram and Virtual Circuit	Flipped Class	1756.3	Class Quiz Sessional 2 End Term
7	Random Access, Control Access	Identify MAC protocols, Medium Access Techniques	Lecture	1756.3	Class Quiz Sessional 2 End Term
8	Channelization, Data Link layer Switching	Explain Channelization and Switching	Lecture	1756.3	Class Quiz Sessional 2 End Term
9	Ethernet Protocol, Standard Ethernet,	Understanding of basic component and standards for Ethernet	Lecture	1756.2	Class Quiz Sessional 1 End Term
10	Fast Ethernet, Gigabit Ethernet	Knowledge about Fast Ethernet and Gigabit and Application of Ethernet	Lecture and Flipped Class	1756.2	Class Quiz Sessional 1 End Term
11	Telephone Network, Cable Network, ATM	Understanding of working of telephone network	Lecture	1756.2	Class Quiz Sessional 1 End Term
12	SONET	Knowledge of Architecture, Protocol for SONET	Lecture	1756.2	Class Quiz Sessional 1 End Term

13	ATM	Enable to explanation Protocol, Specifications, devices required for ATM	Lecture	1756.2	Class Quiz Sessional I End Term
14	Wireless LANs: IEEE 802.11	Understand protocol and Architecture of Wireless LANs	Lecture	1756.2	Class Quiz Sessional I End Term
15	Bluetooth	Explain Blue tooth and Blue tooth Scenarios	Lecture	1756.2	Class Quiz Sessional I End Term
FIRST SESSIONAL EXAM					
16	WiMAX, Cellular Telephony,	Knowing about WiMAX, Cellular Telephony	Lecture / Flipped Class	1756.2	Class Quiz Sessional I End Term
17	Satellite Network Virtual LANs: Connecting Devices, Virtual LANs	Understand Virtual network and Connecting Devices	Lecture	1756.2	Class Quiz Sessional I End Term
18	Network Layer: Introduction to Routing Algorithm and Congestion Control Algorithm	Recall Routing Algorithm and Congestion Control	Lecture	1756.4	Class Quiz Sessional 2 End Term
19	Transport Layer: A simple Transport Layer Protocol,	Understanding of Transport Layer	Lecture	1756.4	Class Quiz Sessional 2 End Term
20-21	Remote Procedure Call	Know about Remote procedure call components	Lecture	1756.4	Class Quiz Sessional 2 End Term
22	Real Time Transport Protocol	Understanding of Real Time Transport protocol	Lecture	1756.4	Class Quiz Sessional 2 End Term
23	Standard Client Server Protocols : TALNET	Understanding TALNET	Lecture	1756.4	Class Quiz Sessional 2 End Term
24	Network Management	Understanding Network Management Concepts	Lecture	1756.4	Class Quiz Sessional 2 End Term
25	SNMP	Knowing concept of SNMP	Lecture	1756.4	Class Quiz Sessional 2 End Term
26	ANS.1	Knowing Concept of ANS.1	Lecture	1756.4	Class Quiz, Sessional 2, End Term
27	Quality of Service: Data Flow Characteristics	Understanding concept of Quality of Services	Lecture	1756.5	Class Quiz, End Term
SECOND SESSIONAL EXAM					
28-29	Flow Control to Improve QoS	Know the method to improve QoS	Lecture	1756.5	Class Quiz End Term
30-31	Integrated Services	Identifying Integrated Service and Application	Lecture	1756.5	Class Quiz End Term
32-33	Differentiated Services.	Identifying Differentiated Services and Application	Lecture	1756.5	Class Quiz, End Term
34	Conclusion and Course Summarization	Summarization	Lecture	All	End Term

35-36	Revision			All	End Term
END TERM EXAM					

G. Course Articulation Matrix: (Mapping of COs with POs & PSOs)

CO	STATEMENT	Correlation with Program Outcomes **(POs)**							Correlation with Program Specific Outcomes (**PSOs**)				
		PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**
[LN1756.1]	Compare the OSI reference model and the TCP-IP reference model	**1**		**1**					**2**			**1**	
[LN1756.2]	Extend the MAC layer concepts for wireless medium	**2**		**1**		**1**		**1**		**1**		**1**	
[LN1756.3]	Make use of concepts of protocols, network interfaces, and performance issues in local and wide area networks	**1**	**1**						**1**		**2**	**2**	
[LN1756.4]	Analysis network management and its protocols	**2**		**1**	**1**						**3**		
[LN1756.5]	Apply QOC parameters on models		**2**				**1**		**1**			**2**	
[LN1756.6]	Develop an entrepreneurship skills in the field of IT Infrastructure	**1**		**1**	**1**						**2**		

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Department of Computer and Science Engineering
Course Hand-out

Principles of Distributed Systems CS 1760 | 3 Credits | 3 0 0 3

Session: July 19 – Nov 19 (2019-20 odd sem) | Faculty: Mr. Manoj R | Class: Program Elective Course: B.Tech. 4th Year VII

A. Introduction This course provides fundamentals and structure of distributed systems using multiple levels of software. Specific topics include: distributed algorithms, distributed file systems, distributed databases, security and protection, distributed services such as the world-wide web, and examples of research and commercial distributed systems.

B. Course Outcomes: At the end of the course, students will be able to

[1760.1] Describe and implement various communication mechanisms between different processes and systems.

[1760.2] Describe and examine the naming conventions and name resolution mechanisms.

[1760.3] Use algorithms to coordinate and synchronize multiple tasks in a distributed system.

[1760.4] Identify how replication of resources improves performance and scalability in distributed systems, and examine algorithms that maintain consistent copies of replicas.

[1760.5] Describe the common security issues in distributed systems and various mechanisms to secure the system.

[1760.6] Apply principles of distributed systems in real-world applications like Distributed File Systems, Virtualization, and provide employability skills.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1] Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2] Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3] Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4] Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5] Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6] The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7] Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8] Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9] Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10] Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11] Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12] Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAM SPECIFIC OUTCOMES

[PSO.1] Will be able to design, develop and implement efficient software for a given real life problem.

[PSO.2] Will be able to apply knowledge of AI, Machine Learning and Data Mining in analyzing big data for extracting useful information from it and for performing predictive analysis.

[PSO.3] Will be able to design, manage and secure wired/ wireless computer networks for transfer and sharing of information

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (closed Book)	15
	Sessional Exam II (closed Book)	15
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (closed Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to get eligible for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class should report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	

E. SYLLABUS

CS1760 Principles of Distributed Systems

Introduction , Introduction concepts related to distributed computing and distributed operating systems. , Clients/Server Architecture , Communications , Communication via Message Passing and Various Message Passing Models, Hardware and Software Sides of C/S Architecture , File Server , Database Server , Transaction Processing , Centralized Processing , Distributed Processing , Logical Time, Physical Time and Local and Global State, Ordering of Messages (Causal Ordering) and Group Communication via Broadcasting of Messages, Termination Detection, Global Predicate Detection, Distributed Mutual Exclusion Algorithms, Distributed Deadlock Detection Algorithms, Distributed Shared Memory Systems, Check pointing and Rollback Recovery, Consensus and Agreement Algorithms, Failure Detection and Self Stabilization, etc. The design aspects of various advanced distributed computing models like Cluster of cooperative computers, Grid computing, Peer-to-Peer networks, and Internet of Things.

TEXT BOOKS

T1. G. Coulouris, J. Dollimore, T. Kindberg, *"Distributed Systems, Concepts and Design*", Pearson, 3rd Edition, 2001.

T2. A. S. Tanenbaum, M. Van Steen, *"Distributed Systems, Principles and Paradigms"*, Pearson, 1st Indian Reprint, 2002.

T 3. A. D. Kshemkalyani, M. Singhal, "Distributed Computing: Principles, Algorithms, and Systems", Cambridge University Press/ Foundation Books India, 2008.

REFERENCE BOOKS

R1. Mei- Ling Liu, *"Distributed Computing: Principles and Application*", Pearson Education, 2004.

F. **Lecture Plan:**

Lecture No.	Topic(s) to be covered	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1	Introduction concepts related to distributed computing and distributed operating systems	To understand basics about distributed computing	Lecture	1760.1	In Class Quiz End Term
2	Clients/Server Architectures and Models	To learn basic client server models	Lecture	1760.1	Class Quiz Mid Term I End Term
3	Hardware and Software Sides of C/S Architecture	To learn basic client server models	Lecture	1760.1	Class Quiz Mid Term I End term
4	Name resolution Telnet, FTP	To learn basic client server models	Lecture	1760.1	Home Assignment Class Quiz Mid Term I End Term
5	C/S communication, NSlookup	To learn client server communication	Lecture	1760.1, 1760.2	Class Quiz Mid Term I End Term
6	Communication via Message Passing	To learn client server communication	Lecture	1760.1, 1760.2	Class Quiz Mid Term I End Term
7	Logical Time, Physical Time	To learn client server communication	Lecture	1760.2, 1760.3	Class Quiz End Term
8	Local and Global State	To learn client server communication	Lecture	1760.2, 1760.3	Class Quiz Mid Term I End Term
9	Ordering of Messages (Causal Ordering)	To learn client server communication	Lecture	1760.1, 1760.3	Class Quiz Mid Term I End Term
10	Group Communication via Broadcasting of Messages	To learn client server communication	Lecture	1760.1, 1760.3	Class Quiz Mid Term I End Term
11	Various Message Passing Models	To learn client server communication	Lecture	1760.1, 1760.3	Class Quiz Mid Term I End Term

12	Alternative communication methods- RPC	To learn client server communication	Lecture	1760.1, 1760.3	Class Quiz End Term Mid Term II
13	Inet address and Sockets	To learn client server networking using Sockets	Lecture	1760.1, 1760.2	Class Quiz End Term Mid Term II
14	Distributed File system	To learn File system	Lecture	1760.3	Class Quiz End Term Mid Term II
15	Practical Considerations of File System	To learn File system	Lecture	1760.3	Class Quiz End Term Mid Term II
16	Database and SQL Programming	To learn databases in distributed systems	Lecture	1760.1, 1760.2	Class Quiz End Term Mid Term II
17	Introduction to Transaction Processing	To learn basics about transaction server	Lecture	1760.1, 1760.2	Class Quiz End term Mid Term II
18	Single-User Vs. Multi-User Systems	To learn transaction server as single user and multi-user system	Lecture	1760.1, 1760.2	Class Quiz Mid Term II
19	Read and Write Operations of a Transaction	To learn transaction server	Lecture	1760.1, 1760.2	Class Quiz Mid Term II End Term
20	Problems in Concurrency Operations	To learn transaction server	Lecture	1760.4	Class Quiz Mid Term II End Term
21	Types of Transaction Failures	To learn transaction server	Lecture	1760.4	Class Quiz Mid Term II End Term
22	Serializability of Schedules	To learn transaction server	Lecture	1760.4	Class Quiz End Term Mid Term II
23	View Serializable Schedules	To learn transaction server	Lecture	1760.4	Class Quiz End Term Mid Term II
24	Termination Detection, Global Predicate Detection	To learn transaction server	Lecture	1760.4	Class Quiz End Term Mid Term II

25	Distributed Mutual Exclusion Algorithms	To learn transaction server	Lecture	1760.4	Class Quiz End Term
26	Types of Schedule	To learn transaction server	Lecture	1760.4	Class Quiz End Term
27	Concurrency Problems	To learn transaction server	Lecture	1760.4	Class Quiz End Term
28	Conflict and Serializability	To learn transaction server	Lecture	1760.4	NA
29	Precedence graph, More practice exercise/problems	To learn transaction server	Lecture	1760.4	In Class Quiz (Not Accounted)
30	Distributed Deadlock Detection Algorithms	To learn transaction server	Lecture	1760.2, 1760.3,1760.4	In Class Quiz End Term
31	Parallel Computing and Programming models	To learn parallel computing	Lecture	1760.2, 1760.3,1760.4	Home Assignment End Term
32	Routing Mechanisms for Interconnection Networks	To learn parallel computing	Lecture	1760.2, 1760.3,1760.4	In Class Quiz End Term
33	Decomposition Techniques	To learn parallel computing	Lecture	1760.2, 1760.3,1760.4	Class Quiz End Term
34	Parallel Scalability	To learn parallel computing	Lecture	1760.2, 1760.4	Class Quiz End term
35	Numerical problems on Scalability	To learn parallel computing	Lecture	1760.2, 1760.4	Home Assignment Class Quiz End Term
36	Distributed Shared Memory Systems	To learn distributed shared memory systems	Lecture	1760.4, 1760.5	Class Quiz End Term
37	Check pointing and Rollback Recovery	To learn distributed shared systems	Lecture	1760.4, 1760.5	Class Quiz End Term
38	Consensus and Agreement Algorithms	To learn distributed system algorithms	Lecture	1760.4, 1760.5	Class Quiz End Term

39	Failure Detection and Self Stabilization	To learn distributed system algorithms for fault detection	Lecture	1760.4, 1760.5	Class Quiz End Term
40	The design aspects of various advanced distributed computing models	To understand distributed computing	Lecture	1760.4, 1760.5	Class Quiz End Term
41	Cluster of cooperative computers	To understand clusters in cooperative networks	Lecture	1760.4, 1760.5	Class Quiz End Term
42	Fault tolerance: Introduction to fault tolerance, Process Resilience,	To understand fault tolerance in distributed systems	Lecture	1760.4, 1760.5	Class Quiz End Term
43	Reliable Client-Server Communication, Reliable Group communication	To understand clusters in client-server communication	Lecture	1760.4, 1760.5	Class Quiz End Term
44	Security: Introduction to security, Secure Channels, Access control	To understand security in distributed network of systems	Lecture	1760.4, 1760.5	Class Quiz End Term
45	Grid Computing and IOT	To understand basic concepts of grid computing and IOT	Lecture	1760.6	Class Quiz End Term
46	Problems and Questionnaire	-	Lecture	1760.1, 1760.2,1760.3, 1760.4, 1760.5, 1760.6	Class Quiz End Term

G. Course Articulation Matrix: (Mapping of COs with POs and PSOs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CS 1760.1	Describe and implement various communication mechanisms between different processes and systems.	2		2									2	3		2
CS 1760.2	Describe and examine the naming conventions and name resolution mechanisms.	2											2	1		1
CS 1760.3	Use algorithms to coordinate and synchronize multiple tasks in a distributed system.	2	2	2									2	3		2
CS 1760.4	Identify how replication of resources improves performance and scalability in distributed systems, and examine algorithms that maintain consistent copies of replicas.	2	2										2	2		3
CS 1760.5	Describe the common security issues in distributed systems and various mechanisms to secure the system.	2	2	2	1								2	2		3
CS 1760.6	Apply principles of distributed systems in real-world applications like Distributed File Systems, Virtualization and provide employability skills.	3		2	2								2	3		3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Computing & Information Technology

Department of Computer Science & Engineering
Course Hand-out

Information Retrieval | CS1759 | 3 Credits | 3 0 0 3

Session: Jul 19 – Dec 19 | Faculty: Ms. Anjana Syamala, Ms. Ginika and Dr. Vaishali Yadav |

Class: CSE 7th Semester (Program Elective)

A. **Introduction:** This course is offered by Dept. of Computer Science & Engineering as program elective, targeting students who wish to pursue research & development in industries or higher studies in field of Engineering, including search engines optimization and document retrieval. Offers introductory knowledge of various ranking based retrievals. Introducing the concept of clustering & classification, understating the concepts of indexing & crawling.

B. **Course Outcomes:** At the end of the course, students will be able to

[CO 1759.1] Apply information retrieval principles to retrieve the relevant records in large collections of data and hence enhance the employability skills.

[CO 1759.2] Describe the techniques of indexing in retrieval i.e. Boolean retrieval and rank based retrieval.

[CO 1759.3] Observe the behaviours of wild card queries, free text queries & representation of queries in vector space model and hence inculcate entrepreneurship skills.

[CO1759.4] Apply the concept of text similarity measures in retrieval for optimizing the relevant records retrieved and hence improve the employability skills.

[CO 1759.5] Describe web characteristics, how indexing & crawling managed in web server.

[CO 1759.6] Analyse of classification & clustering on text data and hence entrepreneurship skills.

C. **PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES**

- **PO1: Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
- **PO2: Problem analysis**: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
- **PO3: Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations
- **PO4: Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

- **PO5: Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations
- **PO6: The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice
- **PO7: Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
- **PO8: Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices
- **PO9: Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
- **PO10: Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
- **PO11:Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
- **PO12: Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAM SPECIFIC OUTCOMES

- **PSO1** : Will be able to design, develop and implement efficient software for a given real life problem.
- **PSO2** : Will be able to apply knowledge of AI, Machine Learning and Data Mining in analysing big data for extracting useful information from it and for performing predictive analysis.
- **PSO3** : Will be able to design, manage and secure wired/ wireless computer networks for transfer and sharing of information.

D. Assessment Plan:

Criteria	Description	Date	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	Sept 05 – Sept 09	15
	Sessional Exam II (Closed Book)	Nov 04 – Nov 06	15
	Quizzes (4) and Assignments (3) (Accumulated and Averaged)	Regularly	30
End Term Exam (Summative)	End Term Exam (Closed Book)	Nov 29 – Dec 13	40
	Total		**100**
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.		
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.		

E. SYLLABUS

Boolean retrieval - The term vocabulary and postings lists. Dictionaries and tolerant retrieval. Index construction. Index compression. **Rank retrieval** - Scoring, term weighting and the vector space model. Computing scores in a complete search system. Evaluation in information retrieval. Relevance feedback and query expansion. **XML retrieval**- Probabilistic information retrieval. Language models for information retrieval. Text classification. Vector space classification. **Support vector machines**- and machine learning on documents, flat clustering, Hierarchical clustering, Matrix decompositions and latent semantic indexing. **Web search basic -** Searching the Web, Challenges, Characterizing the Web, Search Engines, Browsing, Mata searchers, Web crawlers, robot exclusion, Web data mining, Metacrawler, Collaborative filtering, Web agents (web shopping, bargain finder), Economic, ethical, legal and political issues.

F. TEXT BOOKS

T1. Christopher D. Manning, Prabhakar Raghavan and Hinrich Schütze, Introduction to Information Retrieval, Cambridge University Press. 2008

T2. B. Croft, D. Metzler, T. Strohman, Search Engines: Information Retrieval in Practice, The MIT Press, 2010.

G. REFERENCE BOOKS

R1. K. Sparck Jones & P. Willett, Readings in Information Retrieval. Morgan Kaufmann, 1997.

R2. Witten, A. Moffat, & T. Bell, Managing Gigabytes: Compressing and Indexing Documents and Images. Morgan Kaufmann, Second Edition, 1999.

R3. S. Buttcher, C. Clarke, G. Cormack, Information Retrieval: Implementing and Evaluating search Engines, Addison Wesley, 2010

R4. R. Baeza-Yates & B. Ribeiro-Neto, Modern Information Retrieval. Addison Wesley, 1999, 2nd Edition, 2011

H. Lecture Plan:

Sr.No.	Topics to be covered	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1.	**Boolean Model:** Introduction to information retrieval: An example information retrieval problem	To acquaint and clear teachers expectations and understand student expectations	Lecture	NA	NA
2.	A first take at building an inverted index	Understanding of different functions involved in Boolean IR	Lecture/PPT	1759.1	Class Quiz Sessional 1 End Term
3.	Boolean retrieval, Processing Boolean queries, The extended Boolean model versus ranked retrieval	Understanding of basic component and standards for Boolean IR	Lecture/PPT	1759.1	Class Quiz Sessional 1 End Term
4.	Pre-processing: Document processing, stemming, String matching,	Knowledge about different pre-processing techniques	Flipped Class	1759.1	Class Quiz Sessional 1 End Term
5.	Basic NLP tasks – POS tagging shallow parsing	Understanding the working of POS tagging	Lecture/PPT	1759.1	Class Quiz Sessional 1 End Term
6.	Overview of text retrieval systems: System architecture, Boolean models	Knowledge of Boolean Models	Lecture and Flipped Class	1759.1	Class Quiz Sessional 1 End Term
7.	Inverted Indexes, Document ranking, IR iEvaluation	Knowledge of Inverted Index	Lecture/PPT	1759.2	Class Quiz Sessional 1 End Term
8.	The term vocabulary and postings lists: Document delineation and character sequence decoding	Knowledge of Document ranking	Lecture/PPT	1759.2	Class Quiz Sessional 1 End Term
9.	Obtaining the character sequence in a document, Choosing a document unit	Knowledge of IR Evaluation	Lecture/PPT	1759.2	Class Quiz Sessional 1 End Term

10.	Determining the vocabulary of terms: Tokenization, Dropping common terms: stop words	Knowing about Tokenization	Lecture/PPT	1759.2	Class Quiz Sessional 1 End Term
11.	Normalization(equivalence classing of terms), Stemming and lemmatization	Understand the concepts of Normalization	Lecture/PPT	1759.2	Class Quiz Sessional 1 End Term
12.	Dictionaries and tolerant retrieval: Faster postings list intersection via skip pointers, Positional postings and phrase queries	Understand the concepts of tolerant retrieval	Lecture / Flipped Class	1759.2	Class Quiz Sessional 1 End Term
13.	Bi-word indexes, Positional indexes, Combination schemes, Search structures for dictionaries, Wildcard queries, General wildcard queries	Understand the concepts of Indexes	Lecture/PPT	1759.2	Class Quiz Sessional 1 End Term
14.	Permuterm indexes, k-gram indexes for wildcard queries, Spelling correction, Implementing spelling correction, Forms of spelling correction	Understand the concepts of Permuterm Indexes	Flipped Lecture	1759.3	Class Quiz Sessional 2 End Term
15.	Index construction: Hardware basics, blocked sort-based indexing, Single-pass in-memory indexing	Explain Index construction	Flipped Class	1759.3	Class Quiz Sessional 2 End Term
16.	Distributed indexing, Dynamic indexing, Index compression	Explain about Distributing Indexing	Lecture/PPT	1759.3	Class Quiz Sessional 2 End Term
17.	**Rank Retrieval:** Scoring, term weighting and the vector space model: Parametric and zone indexes, Weighted zone scoring, Learning weights	Understanding Rank retrieval	Lecture/PPT	1759.3	Class Quiz Sessional 2 End Term
18.	The optimal weight G, Term frequency and weighting, Inverse document frequency, Tf-idf weighting	Know about Term frequency, IDF	Lecture/PPT	1759.3	Class Quiz Sessional 2 End Term
19.	The vector space model for scoring: Dot products,	Understanding of Vector Space Model	Lecture	1759.3	Class Quiz Sessional 2 End Term
20.	Queries as vectors, Computing vector scores.	Understanding the Queries and VSM	Lecture	1759.3	Class Quiz Sessional 2 End Term

21.	Variant TF-IDF functions : Sublinear TF scaling, Maximum TF normalization	Understanding TF-IDF	Lecture/PPT	1759.4	Class Quiz Sessional 2 End Term
22.	Document and query weighting schemes, Pivoted normalized document length	Knowing concept of Document and query weighting schemes	Lecture/PPT	1759.4	Class Quiz Sessional 2 End Term
23.	Evaluation in information retrieval: Information retrieval system evaluation	Knowing Concept of IR evaluation	Lecture/PPT	1759.4	Class Quiz Sessional 2 End Term
24.	Standard test collections, Evaluation of unranked retrieval sets	Understanding concept of Test Collection	Lecture/PPT	1759.4	Class Quiz Sessional 2 End Term
25.	Evaluation of ranked retrieval results, Relevance feedback and query expansion	Know the concept of relevance feedback	Lecture/PPT	1759.4	Class Quiz Sessional 2 End Term
26.	**XML Retrieval :** XML retrieval: Basic XML concepts, Challenges in XML retrieval, A vector space model for XML retrieval	Understanding the concept XML retrieval	Lecture/PPT	1759.4	Class Quiz Sessional 2 End Term
27.	Evaluation of XML retrieval, Text-centric vs. data-centric XML retrieval, Language models for information retrieval.	Understanding the evaluation of XML	Lecture/PPT	1759.4	Class Quiz Sessional 2 End Term
28.	Text classification and Naive Bayes: Naive Bayes text classification	Understanding the concept of Text classification	Lecture/PPT	1759.4	Class Quiz Sessional 2 End Term
29.	The Bernoulli model, Properties of Naive Bayes	Understanding Bernoulli model	Lecture/PPT	1759.5	Class Quiz Sessional 2 End Term
30.	Vector space classification; Document representations and measures of relatedness in vector spaces	Know the concept of VSM	Lecture/PPT	1759.5	Class Quiz Sessional 2 End Term

31.	Rocchio classification, k nearest neighbor, Classification with more than two classes, The bias-variance trade-off	Know the concept of Rocchio classification	Lecture/PPT	1759.5	Class Quiz Sessional 2 End Term
32.	**Support Vector Machines:** SVM and machine learning on documents	Know the concept of SVM	Lecture/PPT	1759.5	Class Quiz Sessional 2 End Term
33.	Flat clustering: Evaluation of clustering, K-means	Know the concept of clustering	Lecture/PPT	1759.5	Class Quiz End Term
34.	Cluster cardinality in K-means, Cluster pruning	Understanding the concept of PKI	Lecture/PPT	1759.5	Class Quiz End Term
35.	Hierarchical clustering,	Understanding the concept of Clustering	Lecture/PPT	1759.5	Class Quiz End Term
36.	Matrix decompositions and latent semantic indexing	Understanding the concept of Matrix decompositions	Lecture/PPT	1759.5	Class Quiz End Term
37.	**Web search basic:** Web search: Background and history, searching the web, Characterizing the Web	Understanding the concept of Web search basic	Lecture/PPT	1759.5	Class Quiz End Term
38.	Search engines, Browsing, Meta searchers, Web crawlers	Understanding the concept of search engines	Lecture/PPT	1759.6	Class Quiz End Term
39.	Web crawler features, Crawler architecture, Distributing the crawler	Know the features of crawler	Lecture/PPT	1759.6	Class Quiz End Term
40.	Robot exclusion, Web data mining, Meta Crawler	Applications of web mining	Lecture/PPT	1759.6	Class Quiz End Term
41.	Collaborative filtering, Web agents (Web shopping, bargain finder)	Understanding collaborative filtering	Lecture/PPT	1759.6	Class Quiz End Term
42.	Economic issues, Ethical issues, Legal issues and political issues	Know all the issues of IR	Lecture/PPT	1759.6	Class Quiz End Term

I. **Course Articulation Matrix: (Mapping of COs with POs)**

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO175 9.1	Apply information retrieval principles to retrieve the relevant records in large collections of data and hence enhance the employability skills.	3	3	2	2	2								1	2	
CO175 9.2	Describe the techniques of indexing in retrieval i.e. Boolean retrieval and rank based retrieval.	3	2		2	3								2	1	
CO175 9.3	Observe the behaviours of wild card queries, free text queries & representation of queries in vector space model and hence inculcate entrepreneurship skills.	3	2		2	3								2	3	
CO175 9.4	Apply the concept of text similarity measures in retrieval for optimizing the relevant records retrieved and hence improve the employability skills.	3	2	1	2	2	2							2	2	
CO175 9.5	Describe web characteristics, how indexing & crawling managed in web server.	1	2		2	3	1	2							1	2
CO175 9.6	Analyse of classification & clustering on text data and hence entrepreneurship skills.	3	2	3	2	3		2				2	2	2	3	

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

J. Course Outcome Attainment Level Matrix:

CO	STATEMENT	ATTAINMENT OF PROGRAM OUTCOMES **THRESHOLD VALUE: 40%**												ATTAINMENT OF PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12	PSO 1	PSO 2	PSO 3
CO1759.1	Apply information retrieval principles to retrieve the relevant records in large collections of data and hence enhance the employability skills.															
CO1759.2	Describe the techniques of indexing in retrieval i.e. Boolean retrieval and rank based retrieval.															
CO1759.3	Observe the behaviours of wild card queries, free text queries & representation of queries in vector space model and hence inculcate entrepreneurship skills.															
CO1759.4	Apply the concept of text similarity measures in retrieval for optimizing the relevant records retrieved and hence improve the employability skills.															
CO1759.5	Describe web characteristics, how indexing & crawling managed in web server.															
CO1759.6	Analyse of classification & clustering on text data and hence entrepreneurship skills.															

0-No Attainment; 1- Low Attainment; 2- Moderate Attainment; 3- Substantial Attainment

MANIPAL UNIVERSITY JAIPUR

School of Computing & Information Technology

Department of Information Technology

Course Hand-out

Mobile Computing |**IT 1753**| 3 Credits | 3 0 0 3

Session: July-Nov 2019 (2019-20 odd sem) | Faculty: Neha V Sharma | Class: VII (DE) Course: B.Tech. 4th Year VII

A. Introduction: This course aims providing in-depth coverage on mobile/wireless networking, the characteristics of wireless radio channels, propagation models, architectures and protocols of mobile/wireless networks, wide-area and local-area wireless network, cellular networks and Bluetooth.

B. Course Objectives: At the end of the course, students will be able to:

[1753.1]: Explain the basic fundamentals of Mobile Communications.
[1753.2]: Analyze transmission fundamentals and various propagation and modulation techniques.
[1753.3]: Apply the cellular radio concepts and developments and improve employability.
[1753.4]: Compare and Contrast the concept of WLAN and
Bluetooth.
[1753.5]: Describe the functionality of Mobile IP and WWWW.

C. Program Outcomes and Program Specific Outcomes

PROGRAM OUTCOMES

[PO.1]. Engineering knowledge: Demonstrate and apply knowledge of Mathematics, Science and Engineering to classical and recent problems of electronic design & communication system.

[PO.2].Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3]. Design/development of solutions: Design a component system, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

[PO.4].Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5].Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6].The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7].Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8].Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9].Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10]. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environment.

[PO.12]. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAM SPECIFIC OUTCOMES

[PSO.1]. To apply creativity in support of the design, simulation, implementation and inference of existing and advanced technologies.

[PSO.2]. To participate & succeed in IT oriented jobs/competitive examinations that offer inspiring & gratifying careers.

[PSO.3]. To recognize the importance of professional developments by pursuing postgraduate studies and positions.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Open Book)	15
	Sessional Exam II (Closed Book)	15
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Closed Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. Syllabus:

Syllabus: Evolution of mobile radio communication, Transmission fundamentals; Modulation techniques: Signal encoding criteria, Overview of ASK, PSK, FSK, MSK, Spread spectrum modulation; Cellular concepts: Frequency reuse, Channel assignment strategies, Handoff strategies; Wireless LAN: Overview of Wireless LAN Technology; Infrared LANS, Spread Spectrum LANs, Narrowband microwave LANS; IEEE 802 Protocol Architecture, IEEE 802.11 Architecture and Services, IEEE 802.11 Medium Access Control and IEEE 802.11 Physical Layer. Bluetooth: Radio Specification; Baseband Specification; Link Manager Specification; Logic Link Control and Adaptation Protocol; HiperLAN 1 and HiperLAN 2; Wireless Sensor Networks. Mobile Computing: Mobile IP, ubiquitous and nomadic computing; Wireless LANS & the wireless world wide web; Mobile agent technology and standards; Case studies: Agent TCL, aglets, PMADE, system design.

Text Books:

T1. T.S. Rappaport, "*Wireless Communications - Principle and Practice*", Second Edition, PHI, 2005.

T2. W. Stallings, "*Wireless Communication and Network",*' Second Edition, PHI, 2004.

T3. R. Pandya "*Mobile and Personal Communication systems and services*", PHI, 2001.

REFERENCE BOOKS

R1. M. Ciampa, "*Guide to Designing and Implementing wireless LANs*", Thomson learning, Vikas Publishing House, 2001.

F. Lecture Plan:

Lecture no.	Topic to be covered	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing CO
L-1	Introduction and Evolution to Mobile Communication	To understand basics about evolution of mobile communication	Lecture	CO1	In class Quiz Mid Term I End Term Exam
L-2	Basics of Propagation	To learn basics of Propagation	Lecture	CO2	In class Quiz Mid Term I End Term Exam
L-3	Propagation Models	To learn Propagation Models	Lecture	CO2	In Class Quiz, Mid Term I End Term
L-4	Free-Space Propagation Model, Large-Scale Path Loss	To learn Propagation Models	Lecture	CO2	In Class Quiz Mid Term I End Term
L-5	Small Scale Multipath Propagation	To learn Propagation Models	Flipped Class	CO2	In Class Quiz Mid Term I End Term
L-6 to L-7	Modulation Techniques	To learn Propagation Models	Flipped Class	CO2	Class Quiz, Mid Term I End Term
L-8 to L10	Liner Modulation Techniques - ASK, PSK, FSK, MSK	To learn Modulation Techniques	Lecture	CO2	Class Quiz Mid Term I End Term
L-11 to L- 12	Spread spectrum modulation	To learn Spectrum modulation	Flipped Class	CO2	Class Quiz Mid Term I End Term
L-13	Cellular Concepts	To learn Cellular Concepts	Lecture	CO3	Class Quiz Mid Term I End Term
L-14	Frequency reuse	To learn Frequency Reuse	Lecture	CO3	Class Quiz Mid Term I End Term

L-15	Channel assignment strategies	To learn Channel assignment strategies	Tutorial	CO3	Class Quiz Mid Term I End Term
L-16	Handoff strategies: Prioritizing Handoffs and practical handoff consideration	To learn Handoff strategies	Tutorial	CO3	Class Quiz Mid Term I End Term
L-17	Interference and System Capacity	To learn Interference and System Capacity	Lecture	CO3	Class Quiz Mid Term I End Term
L-18	Trunking and Grade of Service	To learn trunking and Grade of Service	Lecture	CO3	Class Quiz Mid Term I End Term
L-19	Overview of Wireless LAN Technology	To learn Wireless LAN Technology	Lecture	CO4	Class Quiz Mid Term II End Term
L-20	Challenges in Wireless LAN	To learn Challenges in Wireless LAN	Lecture	CO4	Class Quiz Mid Term II End Term
L-21 to L- 23	Infrared LANS, Spread Spectrum LANs , Narrowband microwave LANS	To learn types of wireless LANs	Lecture	CO4	Class Quiz Mid Term II End Term
L-24	WLAN applications	To learn WLAN applications	Lecture	CO4	Class Quiz Mid Term II End Term
L-25	Introduction to IEEE 802	To learn IEEE 802	Lecture	CO4	Class Quiz Mid Term II End Term
L-26 to L- 28	IEEE 802.11 Protocol Introduction, IEEE 802.11 Architecture, IEEE 802.11 Services	To learn IEEE 802.11 Protocol Architecture and services	Lecture	CO4	Class Quiz Mid Term II End Term
L-29	IEEE 802.11 MAC and Physical Layer	To learn IEEE 802.11 MAC	Lecture	CO4	Class Quiz Mid Term II

					End Term
L-30	Bluetooth: Radio Specification	To learn Bluetooth Radio Specification	Flipped Class	CO4	Class Quiz Mid Term II End Term
L-31	Baseband Specification	To learn Bluetooth Base band specification	Lecture	CO4	Class Quiz End Term
L-32	Link Manager Specification	To learn Link Manager Specification	Lecture	CO4	Class Quiz End Term
L-34	Logic Link Control and Adaptation Protocol	To learn Bluetooth Logical link control	Tutorial	CO4	Class Quiz End Term
L-35	Hiper LAN & WSN	To learn Bluetooth Hiper LAN and WSN	Lecture	CO4	Class Quiz End Term
L-36	Introduction to Mobile Computing	To learn Mobile IP	Lecture	CO5	Class Quiz End Term
L-37 to L- 39	Mobile IP Introduction and architecture	To learn Mobile IP	Lecture	CO5	Class Quiz End Term
L-40	Introduction to WWWW & Mobile Agent Applications and architecture of wireless world wide web Mobile agent technology and standards	To understand Wireless world wide web	Lecture	CO5	End Term
L-41	Case Study 1 & 2	Case Study demonstration	Lecture	CO5	

G. Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1753.1	Explain the basic fundamentals of Mobile Communications.	3				1					1		2		2	2
1753.2	Analyse transmission fundamentals and various propagation and modulation techniques.	3				1		2			1		2		2	2
1753.3	Apply the cellular radio concepts and developments and improve employability.	3	2	2	2	1	1				1	1	2	3	2	2
1753.4	Compare and Contrast the concept of WLAN and Bluetooth.	3				2	1	1			1	1	2	2	2	2
1753.5	Describe the functionality of Mobile IP and WWWW	3				2	1				1	1	2	3	2	2

MANIPAL UNIVERSITY JAIPUR

School of Computing & Information Technology

DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE HAND-OUT

SOCIAL NETWORK ANALYSIS || IT1759|| 3 Credits|| [3 0 0 3]
Session: JUL-DEC-2019 | Faculty name: Mr. Jayakrishna R||class: B. Tech VII semester elective

A. Introduction:

This course is offered by the Department of Information Technology as the influence of online social Networks in our everyday life is inevitable as they have presented novel techniques of communication and serve as a medium for news propagation, ideas, thoughts and any other information. Such information propagate via friendships between people, which leads to advertising and viral marketing. In this course we study about network structure link formation, communities, influence etc.,

B. Course Outcomes: At the end of the course, students will be able to

[IT1759.1]:	Analyse basic knowledge and concept of Complex networks and importance of different algorithms of computation in Social Network Analysis.
[IT1759.2]:	Critically analyse and process available online datasets with the help of networkx or similar packages to
[IT1759.3]:	Acquire basic skill set required for employability or entrepreneurship.

C PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

PO1. **Engineering knowledge**: Apply the knowledge of mathematics, computer science, and communication engineering fundamentals to the solution of complex engineering problems.

PO2. **Problem analysis**: The sophisticated curriculum would enable a graduate to identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using basic principles of mathematics, computing techniques and communication engineering principles.

PO3. **Design/development of solutions**: Upon analysing, the B Tech IT graduate should be able to devise solutions for complex engineering problems and design system components or processes that meet the specified requirements with appropriate consideration for law, safety, cultural & societal obligations with environmental considerations.

PO4. **Conduct investigations of complex problems**: To imbibe the inquisitive practices to have thrust for innovation and excellence that leads to use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO6. **The engineer and society**: The engineers are called society builders and transformers. B. Tech IT graduate should be able to apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. Environment and sustainability: The zero effect and zero defect is not just a slogan, it is to be practised in each action. Thus a B Tech IT should understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. Ethics: Protection of IPR, staying away from plagiarism are important. Student should be able to apply ethical principles and commit to professional ethics, responsibilities and norms of the engineering practice.

PO9. Individual and team work: United we grow, divided we fall is a culture at MUJ. Thus an outgoing student should be able to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. Communication: Communicate effectively for all engineering processes & activities with the peer engineering team, community and with society at large. Clarity of thoughts, being able to comprehend and formulate effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in varied environments.

PO12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)

At the end of the B Tech IT program, the student:

[PSO.1]: To apply creativity in support of the design, simulation, implementation and inference of existing and advanced technologies.

[PSO.2]: To participate & succeed in IT oriented jobs/competitive examinations that offer inspiring & gratifying careers.

[PSO.3]: To recognize the importance of professional developments by pursuing postgraduate studies and positions.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Quiz	5
	Mini project	10
	Assignments	15
	MTE1 ,MTE II	30
End Term Exam (Summative)	End Term Exam	40
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

E. SYLLABUS

Introduction to Social Web: Nodes, Edges and Network measures, Describing Nodes and Edges, Describing Networks, Layouts; **Visualizing Network features:** The role of Tie Strength, Measuring Tie Strength, Tie Strength and Network Structure, Tie Strength and Network Propagation, Link Prediction, Entity Resolution; **Link Prediction:** Case Study Friend Recommendation, Introduction to Community Discovery, Communities in Context, Quality Functions; **Algorithms:** The Kernighan-Lin algorithm, Agglomerative Algorithms, Spectral Algorithms, Multi-level Graph Partitioning, Markov Clustering, Other Approaches; **Introduction to Social Influence**: Influence Related Statistics, Social Similarity and Influence, Homophile, Existential Test for Social Influence, Influence and Actions, Influence and Interaction, Influence Maximization in Viral Marketing

F. TEXT BOOKS

T1. J. Goldbeck, *"Analyzing the Social Web",* Morgan Kaufmann Publications, 2013.
T2. C. C. Aggarwal, "*Social Network Data Analytics*", Springer Publications, 2011.

G. REFERENCE BOOKS

R1. J. Scott, *"Social Network Analysis", (3e),* SAGE Publications Limited, 2013.
R2. Jay Goldman, *"Facebook Cookbook",* O'Reilly, 2009.
R3. S.Kumar, F. Morstatter, H. Liu, "Twitter Data Analytics", Springer Publications, 2013

H . Lecture Plan:

Class No.	**Topics**	**Session Outcome**	**Mode of Delivery**	**Corresponding Couse outcome**	**Mode of Assessing the Outcome**
1-2	Introduction to Social Web	Know about different graphs and networks	Lecture, Activity	**IT1759.1**	Class Quiz Mid Term I End Term
3-4	Nodes, Edges and Network measures	Know how to create a node and its properties	Lecture, Activity	**IT1759.1**	Class Quiz Mid Term I End Term
5-6	Describing Nodes and Edges	Know how to create a node and its properties	Lecture, Activity	**IT1759.1**	Class Quiz Mid Term I End Term
7-8	Describing Networks, Layouts, Networkx Introduction	Know how to create a graph in Python	Lecture, Activity	**IT1759.1**	Class Quiz Mid Term I End Term
9-10	Visualizing Network features in NetworkX	Know how to Visualize a graph in Python	Lecture, Activity	**IT1759.1** **IT1759.2**	Class Quiz Mid Term I End Term

11-12	The role of Tie Strength, Measuring Tie Strength	Role of tie strength and link prediction	Lecture, Activity	**IT1759.1** **IT1759.2**	Class Quiz Mid Term I End Term
13-14	Tie Strength and Network Structure, Tie Strength and Network Propagation	Role of tie strength	Lecture, Activity	**IT1759.1** **IT1759.2**	Class Quiz Mid Term I End Term
15-16	Link Prediction, Entity Resolution	Role of link prediction	Lecture, Activity	**IT1759.1** **IT1759.2**	Class Quiz Mid Term I End Term
17-18	**Link Prediction**: Case Study Friend Recommendation,	MTE-I Examination	Lecture, Problem based learning, Flipped Class	**IT1759.2**	Class Quiz Mid Term II End Term
19-20	Introduction to Community Discovery	How find a community in a network	Lecture, Problem based learning, Flipped Class	**IT1759.2**	Class Quiz Mid Term II End Term
21-22	Communities in Context	How find a community in a network	Lecture, Problem based learning, Flipped Class	**IT1759.2**	Class Quiz Mid Term II End Term
23-24	Community Detection Algorithms	How find a community in a network	Lecture, Problem based learning, Flipped Class	**IT1759.2**	Class Quiz Mid Term II End Term
25-26	Quality Functions	How find a community in a network	Lecture, Problem based learning, Flipped Class	**IT1759.2**	Class Quiz Mid Term II End Term

27-28	**Algorithms**: The Kernighan-Lin algorithm	Learn different algorithms in finding a community	Lecture, Problem based learning, Flipped Class	**IT1759.2**	Class Quiz Mid Term II End Term
29	Agglomerative Algorithms, Spectral Algorithms	Learn different algorithms in finding a community	Lecture, Problem based learning, Flipped Class	**IT1759.2**	Class Quiz Mid Term II End Term
30	Markov Clustering, Other Approaches	Learn different algorithms in finding a community	Lecture, Problem based learning, Flipped Class	**IT1759.2**	Class Quiz Mid Term II End Term
31	Other Approaches: Label Propagation, Clique Percolation	Learn different algorithms in finding a community	Lecture, Problem based learning, Flipped Class	**IT1759.2**	Class Quiz Mid Term II End Term
32	**Introduction to Social Influence**: Influence Related Statistics, Social Similarity and Influence, Homophile, Existential Test for Social Influence, Influence and Actions, Influence and Interaction, Influence Maximization in Viral Marketing	Learn different algorithms in finding a community	Lecture, Problem based learning, Flipped Class	**IT1759.2** **IT1759.3**	Class Quiz Mid Term II End Term
33	Introduction to Social Influence	MTE-II Examination	Lecture, Problem based learning, Flipped Class	**IT1759.2** **IT1759.3**	Class Quiz End Term
34	Influence Related Statistics, Social Similarity and Influence, Homophile,	Spread of Influence and how to become viral in	Lecture, Problem based learning, Flipped Class	**IT1759.2** **IT1759.3**	Class Quiz End Term

		social networks			
35	Existential Test for Social Influence, Influence and Actions	Spread of Influence and how to become viral in social networks	Lecture, Problem based learning, Flipped Class	**IT1759.2** **IT1759.3**	Class Quiz End Term
36	Influence Maximization in Viral Marketing	Spread of Influence and how to become viral in social networks	Lecture, Problem based learning, Flipped Class	**IT1759.2** **IT1759.3**	Class Quiz Mid Term I End Term
		Spread of Influence and how to become viral in social networks			
		Spread of Influence and how to become viral in social networks			

1 Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
[IT1759.1]:	Understand basic knowledge and concept of Complex networks and importance of different algorithms of computation in Social Network Analysis.	2	1	1	1		1				1	1		1	1	
[IT1759.2]:	Critically analyse and process available online datasets with the help of network x package.		1	1	1	1								2	1	
[IT1759.3]:	Introduce the concept of connectivity, network robustness, Influence and will explore ways of measuring the importance or centrality of a node in a network		2	2	2		1			1	1	1	1	2		1

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Department of Information Technology
Course Hand-out

Natural Language Processing | IT 1760 | 3 Credits | 3 0 0 3

Session: July 19 – Dec 19 | Faculty: Vivek K Verma/Shikha Mundra | Class: B.Tech VII semesterDept. Elective

A. Introduction: This course is offered by Dept. of Information Technology as an elective subject, targeting students who wish to pursue development in industries or higher studies in field of Natural Language Processing. This course aims to make the students understand the models, methods, and algorithms of Natural Language Processing for common NLP tasks, such as speech recognition, machine translation, spam filtering, text classification, spell checking etc. After learning through this course, students will be able to understand and implement probabilistic models, estimate parameters for such models, and run meaningful experiments to validate such language models. The student will gain understanding of linguistic phenomena and will explore the linguistic features relevant to each NLP task. Prerequisite for the course is knowledge of fundamental mathematics including Linear algebra Probability and Statistics, AI, and programming in any high-level language, preferably python.

B. Course Outcomes: At the end of the course, students will be able to

[1760.1]. Understand the models and methods of Natural Language Processing to enhance employability.

[1760.2]. Describe and analyse parts of speech used for any natural language with key concepts NLP.

[1760.3]. Design and Implement the grammatical components of a language and how it apply with NLP models.

[1760.4]. Comprehend the models for word sense and discourse analysis in terms of entrepreneurship.

[1760.5]. Apply technical skills to implement real world applications with of NLP models.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO1] Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO2] Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO3] Design/development of solutions: Design solutions for complex engineering problems and design system components or processes_that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO4] Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO5] Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO6] The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues_and the consequent responsibilities relevant to the professional engineering practice

[PO7] Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO8] Ethics: Apply ethical principles and commit to professional ethics_and responsibilities and norms of the engineering practices

[PO9] Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO10]: Communication: Communicate effectively_on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO11] Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO12] Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

[PSO1] To apply creativity in support of the design, simulation, implementation and inference of existing and advanced technologies.

[PSO2] To participate & succeed in IT oriented jobs/competitive examinations that offer inspiring & gratifying careers.

[PSO3] To recognize the importance of professional developments by pursuing postgraduate studies and positions.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I	15
	Sessional Exam II	15
	In class Quizzes and Assignments, Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

Introduction: Human languages, models, ambiguity, processing paradigms; Phases in natural language processing, applications. Text representation in computers, encoding schemes; **Linguistics resources:** Introduction to corpus, elements in balanced corpus, WordNet, VerbNet; **Part of Speech** tagging- Stochastic POS tagging, HMM, Transformation based tagging (TBL), Handling of unknown words, named entities, multi word expressions; **Natural language grammars**: lexeme, phonemes, phrases and idioms, word order, agreement, tense, aspect and mood and agreement, Context Free Grammar, spoken language syntax; **Parsing-** Unification, probabilistic parsing, Tree-Bank; **Semantics:** Meaning representation, semantic analysis, lexical semantics, WordNet; **Word Sense Disambiguation**: Selection restriction, machine learning approaches, dictionary based approaches; **Discourse:** Reference resolution, constraints on co-reference, algorithm for pronoun resolution, text coherence, discourse structure; **Applications of NLP**: Spell-checking, Text Summarization and Information Retrieval; **IBM Watson Machine Translation:** Overview, Sentiment Analysis; Text Entailment, Textual Alignment, Skip Bigram, LFACS, Logical Form Graphs.

F. TEXT BOOKS

T1. D. Jurafsky, J. H. Martin, "Speech and Language Processing", 2e, Pearson Education, 2009.

G. REFERENCE BOOKS

R1. C. Eugene, "Statistical Language Learning", MIT Press, 1999.
R2. T. Siddiqui, U. S. Tiwary, "Natural language processing and Information retrieval", OUP, 2008.

H. Lecture Plan:

Lec. No	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1.	Introduction	Introduction to NLP with real time application	Lecture	IT 1760.1	Class Quiz
2.	Phases of NLP	About pipeline of Natural Language Processing	Lecture	IT 1760.1	Class Quiz Home Assignments I Sessional End Term
3-4	Text Representation and Encoding Schemes	How to represent text and encoding Schemes and its need	Lecture	IT 1760.1	Class Quiz Home Assignments I Sessional End Term
5.	Linguistics resources	Introduction to corpus along with what is balanced corpus	Lecture	IT 1760.1	Class Quiz Home Assignments I Sessional End Term
6.	WordNet, Verb-Net	Learn linguist resource like wordnet and verbnet	Lecture	IT 1760.1	Class Quiz Home Assignments I Sessional End Term
7-8	Part of Speech tagging	What is POS tag and role of tagging in NLP models	Lecture	IT 1760.1	Class Quiz Home Assignments I Sessional End Term
9.	Stochastic Part of Speech tagging	Learn about stochastic POS tagging and its implementation	Lecture	IT 1760.1	Class Quiz Home Assignments I Sessional End Term
10-11	Hidden Markov Model	How HMM can be useful in language modelling and POS tagging	Lecture	IT 1760.1	Class Quiz Home Assignments I Sessional

12.	Transformation based tagging (TBL)	How TBL can be useful in language modelling and POS tagging	Lecture	IT 1760.1	Class Quiz Home Assignments I Sessional End Term
13.	Multiword Expression	Handling of unknown words, named entities, multi word expressions	Lecture	IT 1760.1	Class Quiz Home Assignments I Sessional End Term
14.	Natural language grammars	Learn about features like Lexeme, phonemes, Phrases and idioms	Lecture	IT 1760.2	Class Quiz Home Assignments I Sessional End Term
15.	Order of Words	Roles of Word order in NLP models	Lecture	IT 1760.2	Class Quiz Home Assignments I Sessional End Term
16.	Agreement, tense, aspect and mood and agreement	Role of agreement, tense, aspect and mood in natural language understanding	Lecture	IT 1760.2	Class Quiz Home Assignments I Sessional End Term
17-18	Context Free Grammar	How Context Free Grammar can be parsed and in spoken language syntax	Lecture	IT 1760.2	Class Quiz Home Assignments I Sessional End Term
19-20	Parsing	Unification, problems of probabilistic parsing, examples of probabilistic parsing	Lecture	IT 1760.3	Class Quiz Home Assignments II Sessional End Term
21.	Parsing	Learn multiple type of parsing like Tree-Bank parsing	Lecture	IT 1760.3	Class Quiz Home Assignments II Sessional End Term
22.	Semantics	Meaning representation, semantic analysis in language processing	Lecture	IT 1760.3	Class Quiz Home Assignments II Sessional End Term
23.	Lexical semantics	Role of lexical semantics and WordNet	Lecture	IT 1760.3	Class Quiz Home Assignments II Sessional End Term

24.	Word Sense Disambiguation	Learn about the Selection restriction	Lecture	IT 1760.4	Class Quiz Home Assignments II Sessional End Term
25-27	Word Sense Disambiguation (Machine learning approaches)	Learn disambiguation of words based on Machine learning approaches	Lecture	IT 1760.4	Class Quiz Home Assignments II Sessional End Term
28.	Word Sense Disambiguation (Dictionary based approaches)	Learn disambiguation of words based on Dictionary based approaches	Lecture	IT 1760.4	Class Quiz Home Assignments II Sessional End Term
29-30	Discourse Analysis	Role of Discourse in NLP models and also about Reference resolution	Lecture	IT 1760.4	Class Quiz Home Assignments II Sessional End Term
31.	Constraints on co-reference	Learn about the constraints on co-reference and how to resolve it	Lecture	IT 1760.4	Class Quiz Home Assignments II Sessional
32.	Algorithm for pronoun resolution	Learn about existing algorithm for pronoun resolution and what more can be done	Lecture	IT 1760.4	Class Quiz Home Assignments II Sessional End Term
33.	Text coherence, discourse structure	Learn about the details of text coherence and discourse structure	Lecture	IT 1760.4	Class Quiz Home Assignments II Sessional End Term
34.	Applications of NLP- Spell-checking	How NLP can contribute to Spell-checking feature in any application	Lecture	IT 1760.5	Class Quiz Home Assignments II Sessional
35.	Text Summarization	Process of Text Summarization, Information Retrieval and their need in real time.	Lecture	IT 1760.5	Class Quiz Home Assignments II Sessional End Term
36.	IBM Watson Machine Translation	Will get to know about IBM WATSON and its feature like M/C translation	Lecture	IT 1760.5	Class Quiz Home Assignments II Sessional End Term
37.	Sentiment Analysis	Role of Sentiment Analysis in predicting sentiment of reviews as positive or negative	Lecture/Expert Lec.	IT 1760.5	Class Quiz Home Assignments

38.	Text Entailment	Learn about application of natural language processing like Text Entailment	Lecture/Expert Lec	IT 1760.5	Class Quiz Home Assignments End Term
39.	Textual Alignment	Learn about application of natural language processing like Textual alignment	Lecture	IT 1760.5	Class Quiz Home Assignments End Term
40.	Skip Bigram	How Skip Bigram can be used for vectorization	Lecture	IT 1760.5	Class Quiz Home Assignments End Term
41.	CBOW	How Continuous Bag Of Word can be used for vectorization	Lecture	IT 1760.5	Class Quiz Home Assignments End Term
42.	Logical Form Graphs	How to form a Logical Form Graphs from large data.	Lecture	IT 1760.5	Class Quiz Home Assignments End Term

I. Course Articulation Matrix: (Mapping of COs with POs and PSOs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
IT1760.1	Understand the models and methods of Natural Language Processing for common NLP tasks.	3			2				2					1		
IT1760.2	Describe and analyse parts of speech used for any natural language with key concepts NLP.		1	3				2				2			1	2
IT1760.3	Design and Implement the grammatical components of a language and how it apply with NLP models				3	2								2	1	3
IT1760.4	Comprehend the models for word sense and discourse analysis.						2		2	3				3	2	
IT1760.5	Apply real world applications with of NLP models.	2		2								2	1	3		2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

DEPARTMENT OF COMPUTER AND COMMUNICATION ENGINEERING

Course Hand-out

Principles of Web Services | CC 1753| 3 Credits | 3 0 0 0

Session: July 19 20-Nov 19 | Faculty: Dr. Punit Gupta and DR. Rohit Verma | Class: VII SEM

A. **Introduction:** This course is offered by the Department of Computer and Communication Engineering as this course focuses on propagate communication between the client and server applications on the World Wide Web. Principles of Web Services allows student to learn popular service protocols like SOAP, WSDL, REST and other standard languages and architecture of web service deployment. Web services provide a common platform that allows multiple applications built on various programming languages to have the ability to communicate with each other

B. **Course Outcomes:** At the end of the course, students will be able to:

[CC 1753.1] To identify and describe various web services technologies like WSDL, UDDI, SOAP

[CC 1753.2] To practice xml technology and message passing

[CC 1753.3] To identify various web service models and messaging techniques

[CC 1753.4] To summarize SOA design implementation and managing SOA environment

[CC 1753.5] To evaluate and identify suitable service for a business model.

[CC 1753.5] To design and develop web service models using beans and spring framework

C. **PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES**

[PO.1]. **Engineering knowledge:** Apply the knowledge of mathematics, computer science, and communication engineering fundamentals to the solution of complex engineering problems.

[PO.2]. **Problem analysis:** The sophisticated curriculum would enable a graduate to identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using basic principles of mathematics, computing techniques and communication engineering principles.

[PO.3]. **Design/development of solutions:** Upon analysing, the B Tech CCE graduate should be able to devise solutions for complex engineering problems and design system components or processes that meet the specified requirements with appropriate consideration for law, safety, cultural & societal obligations with environmental considerations.

[PO.4]. **Conduct investigations of complex problems:** To imbibe the inquisitive practices to have thrust for innovation and excellence that leads to use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

[PO.5]. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

[PO.6]. **The engineer and society:** The engineers are called society builders and transformers. B. Tech CCE graduate should be able to apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

[PO.7]. **Environment and sustainability:** The zero effect and zero defect is not just a slogan, it is to be practised in each action. Thus a B Tech CCE should understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

[PO.8]. Ethics: Protection of IPR, staying away from plagiarism are important. Student should be able to apply ethical principles and commit to professional ethics, responsibilities and norms of the engineering practice.

[PO.9]. Individual and team work: United we grow, divided we fall is a culture at MUJ. Thus an outgoing student should be able to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

[PO.10]. Communication: Communicate effectively for all engineering processes & activities with the peer engineering team, community and with society at large. Clarity of thoughts, being able to comprehend and formulate effective reports and design documentation, make effective presentations, and give and receive clear instructions.

[PO.11]. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in varied environments.

[PO.12]. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

[PSO.1]. Should be able to clearly understand the basic principles, concepts and applications in the field of computer based Communication/networking, information sharing, signal processing, web based systems, smart devices and communication technology.

[PSO.2]. Should be able to nail down the issues prevalent in the field of Computer and Communication Engineering. Should be able to identify the existing open problems in the field of computing and propose the best possible solutions.

[PSO.3]. Should be able to identify the existing open problems in the field of computing and propose the best possible solutions.

[PSO.4]. Should be able to apply the contextual knowledge in the field of computing and communication to assess social, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional engineering practice.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	15
	Sessional Exam II (Closed Book)	15
	In class Quizzes and/or Assignments , Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Open Handwritten Notes)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work at home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

Evolution and Emergence of Web Services: Evolution of distributed computing, emergence of Web Services and Service Oriented Architecture (SOA). Introduction to Web Services – The definition of web services, basic operational model of web services, tools and technologies enabling web services, benefits and challenges of using web services;

Web Service Architecture: Web services Architecture and its characteristics, , web services communication, basic steps of implementing web services. Describing Web Services – WSDL introduction, non-functional service description, WSDL1.1

Vs. WSDL 2.0, WSDL document, WSDL elements, WSDL binding, WSDL tools, WSDL port type, limitations of WSDL; Brief Over View of XML: XML technologies – XML, XML Document structure, XML namespaces, Defining structure in XML, documents, Reuse of XML schemes, Document navigation ,DTD, XSD, XSLT, X-Query-Path Web services technologies - Web services and SOA, WSDL, SOAP, UDDI Standards (WS-*) - Web services and Service- oriented enterprise (SOE), WS-Coordination and WS-Transaction, transformation WS-Security and the Web services security specifications, WS-Reliable Messaging, WSPolicy, WS-Attachments;

SOA Design implementation, Managing SOA Environment: service-oriented design process, design activities, determine services and tasks based on business process model, choosing appropriate standards, articulate architecture, mapping business processes to technology, designing service integration environment (e.g., ESB, registry), implementing SOA, security implementation, implementation of integration patterns, services enablement, quality assurance,impact of changes to services in the SOA lifecycle;

SOAP : Simple Object Access Protocol Inter-application communication and wire protocols, SOAP as a messaging protocol, Structure of a SOAP message, SOAP envelope, Encoding, Service Oriented Architectures, SOA revisited, Service roles in a SOA, Reliable messaging, The enterprise Service Bus, SOA Development Lifecycle, SOAP HTTP binding, SOAP communication model, Error handling in SOAP.

F. REFERENCE BOOKS

R1. Coyle, Frank P., "XML, Web services, and the data revolution", 1st Edition, Addison-Wesley,2002..

R2. S. Graham "Building web Services with Java", 2nd Edition, Pearson Education, 2004.

R3. McGovern, "Java web Services Architecture", 1st Edition, Morgan Kaufmann , 2005.

R4. Ethan Cerami, "Web Services Essentials: Distributed Application with XML – RPC, SOAP, UDDI & WSDL", O' Reilly, 2000.

R5. Thomas Erl, "Service-Oriented Architecture: A Field Guide to Integrating XML and Web Services", Prentice Hall, 2004.

G. Lecture Plan:

Class Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome		
1	Introduction and Course Hand-out briefing	To acquaint and clear teachers expectations and understand student expectations	Lecture	NA	NA		
2,3	Introduction to web services	understand web services	Lecture	CO 1	Class Quiz	Mid Term I	
4,5	Type of Sevices & difference between distributed system and web services	describe and identify various web service models	Lecture	CO 1	Class Quiz	Mid Term I	
6,7	Emergence of Web Services and Service Oriented Architecture (SOA) fundamentals.	understand web services models using SOA	Lecture	CO 1	Class Quiz	Mid Term I	
8	QoS, Web service interportability, SLA.	describe and identify various web service performance parameters	Lecture	CO 2	Class Quiz	Mid Term I	End Term
9,10,11	Distributed computing Infrastructure and	distinguish between distributed model and web services.	Lecture	CO 2	Class Quiz	Mid Term I	End Term

	communication models.						
12,13	Brief Over View of XML: XML technologies	learn and design XML messages	Lecture	CO 2	Class Quiz	Mid Term I	
14,15	XML DTD & XSD	design XML using XSD	Lecture	CO 2	Class Quiz	Mid Term I	End Term
16,17	SOAP Protocol, communication protocol.	learn SOAP messaging protocol for web services	Lecture	CO 2	Class Quiz	Mid Term I	
FIRST SESSIONAL EXAM From 05-09-2019 to 09-09-2019							
18,19	SOAP Message Structure, SOAP encoding	learn SOAP messaging protocol design and architecture	Lecture	CO 2	Class Quiz	Mid Term II	End Term
20	Describing web services	understand need of WSDL in web services	Lecture	CO 2	Class Quiz	Mid Term II	
21	WSDL services	learn WSDL protocol and its design	Lecture	CO 3	Class Quiz	Mid Term II	
22	WSDL binding.	understand WSDL binding with soap protocol	Lecture	CO 3	Class Quiz	Mid Term II	
23,24	Register and discovery services	learn various phases of deploying web services.	Lecture	CO 3	Class Quiz	Mid Term II	
25,26	WSDL to UDDI, maping & services.	learn UDDI protocol	Lecture	CO 4	Class Quiz	Mid Term II	
27-28	SOA, service composition	explain the complete layered architecture of web services.	Lecture	CO 4	Class Quiz	Mid Term II	
29-30	WS- BPEL process	learn and design business models in web services	Lecture	CO 4	Class Quiz	Mid Term II	End Term
31-32	Service Transactions, distributed transaction, nected transactions	design service transaction in SOAP	Lecture	CO 4	Class Quiz	Mid Term II	
SECOND SESSIONAL EXAM From 04-11-2019 to 06-11-2019							
33	SOAP Scurity policies	understand need of security in services	Lecture	CO 4	Class Quiz		End Term
34-35	xml secuity standards	understand ways to implement security in XML	Lecture	CO 5	Class Quiz		End Term
36-37	service policies	understand various service policies	Lecture	CO 5	Class Quiz		End Term

38	Service transactions	describe transactions in web services and rollback	Lecture	CO 5	Class Quiz End Term
39-40	EJB service architecture, Beans model	to design and deploy EJB based web services and its various model	Lecture	CO 6	Class Quiz End Term
41-42	REST protocol	Design and deploy RESTful services on HTTP	Lecture	CO 6	Class Quiz End Term
END TERM EXAM From 29-11-2019 to 13-12-2019					

H. Course Articulation Matrix: (Mapping of COs with POs & PSOs)

CO	STATEMENT	Correlation with Program Outcomes **(POs)**												Correlation with Program Specific Outcomes (**PSOs**)			
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
[CC1753.1]	To identify and describe various web services technologies like WSDL, UDDI, SOAP	**2**		**2**	**2**								**2**				
[CC1753.2]	To practice xml technology and message passing	**2**			**3**								**2**		**1**		
[CC1753.3]	To identify various web service models and messaging techniques	**2**		**1**		**3**							**2**	**2**			
[CC1753.4]	To summarize SOA design implementation and managing SOA environment	**3**	**1**	**3**									**2**	**3**			
[CC1753.5]	To evaluate and identify suitable service for a business model.	**3**		**3**	**2**								**3**	**3**			
[CC1753.6]	To design and develop web service models using beans and spring framework	**3**		**3**		**3**							**1**	**1**			

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Department of Computer Science & Engineering
Course Hand-out

Real Time System CS 1758 | 3 Credits | 3 0 0 3

Session: July 19 – Nov 19 | Faculty: Saket Acharya| Class: Department Elective (7th Semester)

A. Introduction The course will enable the students to get familiar with the implementation and application of real time system in various disciplines. This course is focused on abstract models of real time systems. The course exposes students to the timings constraint, deadlines, workloads, time scheduling algorithms and real time communication systems.

B. Course Objectives: At the end of the course, students will be able to

[1758.1] CO1: Analyse the need and use of Real Time System in different disciplines.
[1758.2] CO2 Implement scheduling algorithms in real time applications
[1758.3] CO3: To develop skills to implement real time scheduling uniprocessor algorithms.
[1758.4] CO4: Evaluate the effect of Resource Contention and Resource sharing and Access Control (RAC)
[1758.5] CO5: Detailed understanding of real time database management systems to enhance technical skills and improve employability.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

1. **PO1: Engineering knowledge**: : Apply the knowledge of basic science and fundamental computing in solving complex engineering problems

2. **PO2: Problem analysis**: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **PO3: Design/development of Computing solutions**: Design solutions for complex IT engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the Information oriented public health and safety, and the cultural, societal, and environmental considerations

4. **PO4: Conduct investigations of complex problems**: Use IT domain research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

5. **PO5: Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

6. **PO6: The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

7. **PO7: Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

8. **PO8: Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

9. **PO9: Individual and team work**: Function effectively as an individual, and as a member or leader in diverse IT teams, and in multidisciplinary settings.

10. PO10: Communication: Communicate effectively on complex computing engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

11. PO11:Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

12. PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

D. PROGRAM SPECIFIC OUTCOMES

The graduation from B.Tech. in Computer Science & Engineering will empowers the student:

PSO 1: Will be able to design, develop and implement efficient software for a given real life problem.
PSO 2: Will be able to apply knowledge of AI, Machine Learning and Data Mining in analysing big data for extracting useful information from it and for performing predictive analysis.
PSO 3: Will be able to design, manage and secure wired/ wireless computer networks for transfer and sharing of information.

E. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	15
	Sessional Exam II (Closed Book)	15
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Closed Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	

F. SYLLABUS

Introduction to real-time systems, Modeling of a Real-Time System, Task assignment and scheduling, Resource management, Real-time operating systems, RTOS services, Programming language with real-time support, System design techniques, Inter task communication, Fault tolerant techniques, Reliability evaluation methods; Performance analysis, Case studies of real-time systems.

G. TEXT BOOKS

1. Liu, Jane W.S., Real Time Systems, Pearson Education, 2000.
2. Laplante, Phillip A., Real-Time Systems Design and Analysis, WSE, 3rd Ed., 2004.

H. REFERENCE BOOKS

1. Li Quing, Real-Time Concepts for Embedded Systems, CMP books, paperback 2003.

2. Burns Allen and Wellings Andy, Concurrent and Real-Time Programming in ADA, Cambridge University Press, paperback 2007.

I. Lecture Plan:

S. No.	Lecture no.	Topic to be covered	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1.	1	Introduction	To learn basics about real time systems	Lecture	1758.1	In Class Quiz End Term
2.	2	Real - Time System Characteristics	To learn basic characteristics of real time systems	Lecture	1758.1	Class Quiz Mid Term I End Term
3.	3	Few Basic Issues	To analyse basic issues of real time systems	Lecture	1758.1	Class Quiz Mid Term 1 End term
4.	4	Modelling Timing Constraints	To learn timing constraints in real time systems	Lecture	1758.1	Home Assignment Class Quiz Mid Term 1 End Term
5.	5	Modelling Timing Constraints (Contd.), FSM and EFSM	To learn timing constraints in real time systems	Lecture	1758.1	Class Quiz Mid Term 1 End Term
6.	6-10	Real Time Tasks, Types of Events,	To understand scheduling	Lecture	1758.1	Class Quiz Mid Term I End Term
7.	11-12	Deadline Constraints	To understand scheduling algorithms	Lecture	1758.1, 1758.2	Class Quiz End Term
8.	13-14	Event - Driven Scheduling, Rate Monotonic Scheduler	To understand scheduling algorithms	Lecture	1758.1, 1758.2	Class Quiz Mid Term 1 End Term
9.	15-16	RMA Scheduling : Further Issues	To understand scheduling algorithms	Lecture	1758.1, 1758.2	Class Quiz Mid Term 1 End Term

10.	17	Deadline Monotonic Scheduling and Other Issues	To understand scheduling algorithms	Lecture	1758.1, 1758.2, 1758.3	Class Quiz Mid Term 1 End Term
11.	17	Few Issues in Use of RMA	To understand issues in scheduling algorithms	Lecture	1758.3	Class Quiz End Term Mid Term II
12.	18	Resource Sharing Among Real-Time Tasks	To understand resource sharing	Lecture	1758.3	Class Quiz End Term Mid Term II
13.	19	Highest Locker and Priority Ceiling Protocols, An Analysis of Priority Ceiling Protocol	To understand priority protocols	Lecture	1758.3	Class Quiz End Term Mid Term II
14.	20	Handling Task Dependencies	To understand task dependencies	Lecture	1758.3	Class Quiz End Term Mid Term II
15.	21	Real-Time Task Scheduling on Multiprocessors and Distributed Systems	To understand scheduling algorithms	Lecture	1758.3, 1758.4	Class Quiz End term Mid Term II
16.	22	Real-Time Task Scheduling on Multiprocessors and Distributed Systems (Contd.)	To understand scheduling algorithms in distributed systems	Lecture	1758.3, 1758.4	Class Quiz Mid Term II
17.	23-24	Clock Synchronization in Distributed Real-Time Systems, Internal Clock Synchronization in Presence of Byzantine Clocks	To understand clock synchronization in real time systems	Lecture	1758.3, 1758.4	Class Quiz Mid Term II End Term

18.	25	Unix and Windows as RTOS	To learn operating systems as real time system	Lecture	1758.4	Class Quiz End Term Mid Term II
19.	25	Real - Time POSIX	To learn POSIX as real time system	Lecture	1758.4	Class Quiz End Term
20.	26	Real - Time POSIX (Contd.)	To learn POSIX as real time system	Lecture	1758.4	Class Quiz End Term
21.	27	Open Source and Commercial RTOS	To learn commercial real time system	Lecture	1758.4	Class Quiz End Term
22.	28	Open Source and Commercial RTOS (Contd.)	To learn commercial real time system	Lecture	1758.4	Class Quiz End Term
23.	29	Benchmarking Real - Time Computer & Operating Systems	To learn commercial real time system	Lecture	1758.4	In Class Quiz (Not Accounted)
24.	30	Benchmarking Real - Time Computer & Operating Systems (Contd.)	To learn commercial real time system	Lecture	1758.4, 1758.5	In Class Quiz End Term
25.	31	Real - Time Communications	To understand real time communication	Lecture	1758.4, 1758.5	Home Assignment End Term
26.	32	Few Basic Issues in Real - Time Communications	To understand basic issues in real time systems	Lecture	1758.4, 1758.5	In Class Quiz End Term
27.	33	Review of Computer Networking	To understand computer networking	Lecture	1758.4, 1758.5	Class Quiz End Term
28.	34	Real - Time Communication in a LAN	To understand computer networking	Lecture	1758.4, 1758.5	Class Quiz End term

29.	35	Real - Time Communication in a LAN (Contd.)	To understand computer networking	Lecture	1758.4, 1758.5	Home Assignment Class Quiz End Term
30.	36	Performance of Two Real -Time Communication Protocols	To understand real time communication in networks	Lecture	1758.4, 1758.5	Class Quiz End Term
31.	37	Real - Time Communication over Packet Switched Networks	To understand real time communication in networks	Lecture	1758.4, 1758.5	Class Quiz End Term
32.	38	Real - Time Communication over Packet Switched Networks (Contd.)	To understand real time communication in networks	Lecture	1758.4, 1758.5	Class Quiz End Term
33.	39	Real - Time Communication over Packet Switched Networks (Contd.)	To understand real time communication in networks	Lecture	1758.4, 1758.5	Class Quiz End Term
34.	40	Real - Time Databases	To learn real time databases	Lecture	1758.4, 1758.5	Class Quiz End Term

J. Course Articulation Matrix: (Mapping of COs with POs and PSOs)

	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
CO STATEMENTS	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
[1758.1]: CO1: Analyse the need and use of Real Time System in different disciplines.	**3**	**3**			**3**	**3**						**3**	3		
[1758.2]: CO2: Understand the parameters affecting the Real Time System including timing constraints, deadlines, Temporal Parameters of Real Time Workload, etc	**3**	**3**											3		
[1758.3] : CO3 : Implement real time scheduling algorithms	**3**	**3**	**3**										3		
[1758.4]: CO4: Evaluate the effect of Resource Contention and Resource Access Control (RAC)	**3**	**3**						**3**	**2**	**3**		**3**	3		
[1758.5]: CO5: Detailed understanding of real time communication systems	**3**	**3**								**2**	**2**		3	2	2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation