MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

DEPARTMENT OF INFORMATION TECHNOLOGY

PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

B.Tech - INFORMATION TECHNOLOGY | ACADEMIC YEAR 2019-20

PROGRAM 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]: 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.

ARTICULATION MATRIX, 2019-20

Semester	Course Code	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
I & II	CS1001	3	1	3	-	-	-	-	-	-	-	-	3	-	-	-
	CS1030	3	1	3	-	-	-	-	-	-	-	-	3	-	-	-
	CV1001	3	3	2	3	3	2	2	-	3	2	3	3	-	-	-
	CY1001	2	2	2	-	3	-	3	2	-	3	-	3	-	-	-
	CY1002	3	3	1	2	3	3	3	3	3	-	1	3	-	-	-
	CY1030	2	-	2	-	3	-	3	2	-	3	-	3	-	-	-
	EC1101	3	3	3	2	2	1	1	-	-	-	-	2	-	-	-
	EE1101	3	2	1	-	-	1	1	-	-	-	-	3	-	-	-
	LN1101	-	1	-	-	-	1	-	2	2	2	-	-	-	-	-
	MA1101	3	3	2	3	3	-	-	-	3	-	3	1	-	-	-
	ME1001	3	3	3	2	-	2	2	-	-	-	-	1	-	-	-
	ME1002	3	3	3	2	3	-	-	-	-	-	-	2	-	-	-
	BB1101	-	-	-	-	-	1	3	2	1	2	1	2	-	-	-
III	CS1301	3	2	1	-	-	-	-	-	-	-	-	2	2	1	2
	CS1302	3	3	2	-	-	-	-	-	-	-	-	3	3	3	3
	CS1303	3	2	2	-	-	-	-	-	-	-	-	2	3	2	2
	CS1304	3	2	2	2	-	-	-	-	1	1	1	2	3	-	-
	CS1331	3	2	2	-	-	-	-	-	-	-	-	2	3	2	2
	CS1332	1	2	2	1	1	-	-	-	-	-	-	-	1	-	-
	MA1307	3	3	3	2	2	-	-	-	1	1	2	3	3	3	2
IV	CS1401	2	2	3	1	1	-	-	-	-	1	1	2	1	1	2
	CS1402	2	1	1	1	1	1	1	1	1	1	1	1	2	3	-
	CS1403	2	2	3	2	2	2	-	-	1	-	2	1	1	1	1
	CS1431	1	1	2	2	1	1	-	1	1	1	1	-	1	1	1
	CS1432	2	1	1	1	1	1	1	1	1	1	1	1	2	3	-
	CS1433	3	3	1	2	-	-	-	-	-	-	-	1	3	1	1
	HS1401	-	3	-	-	1	-	-	-	2	-	-	-	3	-	-
	MA1406	3	3	3	3	2	2	-	1	-	-	1	2	3	3	3
	CS1501	1	3	3	2	1	2	1	2	2	2	2	-	1	3	3
	CS1505	2	2	2	3	3	2	2	1	1	1	1	2	2	2	2

ARTICULATION MATRIX, 2019-20

V	IT1502	3	3	3	2	-	-	-	-	-	-	-	2	3	1	3
	IT1504	3	2	1	-	-	-	-	-	1	2	-	1	3	2	1
	CS1530	2	3	3	2	1	2	-	-	-	-	-	2	-	1	3
	IT1532	3	2	2	2	3	2	-	-	3	-	-	3	3	2	1
	IT1551	2	2	3	3	3	1	2	2	2	2	3	3	3	2	3
	IT1552	2	2	2	1	-	-	2	-	-	-	-	3	2	-	2
VI	CS1602	-	-	2	-	3	-	1	-	1	-	-	-	3	1	2
	IT1603	1	2	2	1	1	1	-	1	2	1	1	-	2	1	2
	CS1630	2	2	2	3	3	-	-	1	2	1	1	1	2	2	3
	IT1631	2	2	2	3	3	-	-	1	2	1	1	1	2	2	3
	IT1693	3	3	3	2	1	1	1	2	1	-	1	2	2	2	1
	IT1653	1	2	1	-	1	-	-	-	-	-	1	1	-	1	1
	IT1654	3	1	3	2	2	2	2	2	3	2	1	1	3	2	2
VII	IT1701	2	2	1	2	2	1	1	-	1	-	1	1	1	1	1
	IT1702	1	3	3	3	-	1	-	2	2	-	2	2	3	3	3
	IT1732	1	1	1	1	2	1	1	1	1	-	1	-	2	2	2
	IT1733	2	2	2	2	-	1	1	1	1	-	1	1	2	1	1
	IT1753	2	2	1	2	2	2	-	-	2	-	-	-	2	2	1
	IT1754	1	-	-	1	2	1	-	-	1	1	1	-	2	1	2
	IT1759	3	1	3	3	3	-	-	-	-	-	-	3	3	1	-
	IT1760	2	1	1	-	-	-	1	-	1	1	-	1	2	1	1
	IT1761	2	2	2	2	2	2	2	1	1	2	1	2	2	2	2
	IT1762	2	2	1	1	3	1	-	-	1	-	-	3	3	3	-
	IT1792	2	2	2	1	2	1	1	-	-	-	-	2	1	-	1
VIII	IT1881	3	2	2	1	1	1	2	1	2	2	3	1	1	-	1

MANIPAL UNIVERSITY JAIPUR

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. ntroduction: 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

[CS1001.1]. Demonstrate bitwise operations and conversion of numbers in different representations through Number System.

[CS1001.2]. Demonstrate a deep knowledge of computer for better understanding of devices, basic fundamental of computer comprises in this course.

[CS1001.3]. Design flow chart, Write algorithm and pseudo code parallel with Control Statements to understand flow of program execution.

[CS1001.4]. Create memory oriented operation using pointers and understating programming skills by Array, Structure, Union, Enum and String are added.

[CS1001.5]. Create program using concept of re-usability by means of functions in C.

[CS1001.6]. 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
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 continue and break	Lecture	1001.3	Mid Term II, Quiz & End Term
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

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

[CS1030.1]. Demonstrate bitwise operations and conversion of numbers in different representations through Number System.

[CS1030.2]. Demonstrate a deep knowledge of computer for better understanding of devices, basic fundamental of computer comprises in this course.

[CS1030.3]. Design flow chart, Write algorithm and pseudo code parallel with Control Statements to understand flow of program execution.

[CS1030.4]. Create memory oriented operation using pointers and understating programming skills by Array, Structure, Union, Enum and String are added.

[CS1030.5]. Create program using concept of re-usability by means of functions in C.

[CS1030.6]. 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

1- 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: Jul 19 – Nov 19 | 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

Faculty of Engineering

Department of Chemistry
Course Hand-out

Engineering Chemistry | CY1001 | 3 Credits | 2 1 0 3

Session: Jul 19 – Nov 19 | 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 scientificallythe various chemistry related problems in the industry/engineering field.

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

[CY1001.1]. Understand and apply concepts of various types of fuel technology
[CY1001.2]. Develop skill of synthesis and applications of polymer and some advanced materials.
[CY1001.3]. Explain different the water softening methods.
[CY1001.4]. Understand and apply the concepts in electrochemistry and corrosion science in protecting metallic objects.
[CY1001.5]. Apply the concept of phase rule to construct phase diagram
[CY1001.6]. 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 average and weight average molecular weights, Numerical problems.	Analyse and solve numerical problems	Lecture, Activity	1001.2	Class Quiz Mid Term I End Term
10.	Preparation, properties and applications of Polythene (LDPE and HDPE), Nylon(6:6, 6, 6:10,	Identify alternative ways to synthesize rubbers.	Lecture	1001.2	Class Quiz Mid Term I

	11), PF resins and Polyester. Natural rubber, Processing of Natural Rubber, Vulcanization, Compounding of rubber; Synthetic Rubber: Buna-N, Buna-S				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. Nature of oxide layers; PB Rule	Describe corrosion and its preventions	Lecture, Activity	1001.4	Class Quiz Mid Term II End Term
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 analysis. Chromatographic techniques.	Gain skill in various modern analytical techniques.	Lecture	1001.6	Class Quiz End Term
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											
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
[CY1001.1]	Understand and apply concepts of various types of fuel technology.	2						3			2		2
[CY1001.2]	Understand the synthesis and applications of polymer and some advanced materials			2					2				3
[CY1001.3]	Develop understanding about the water softening methods.	2				3					3		2
[CY1001.4]	Understand and apply the concepts in electrochemistry and corrosion science in protecting metallic objects.								2				2
[CY1001.5]	Develop concept of phase rule		2			2			2				3
[CY1001.6]	Understand various modern analytical techniques.	2				3			2				3

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

MANIPAL UNIVERSITY JAIPUR

School of Basic Sciences

Department of Chemistry
Course Hand-out

Environmental Studies | CY 1002 | 3 Credits | 3 0 0 3

Session: Jul 19 – Nov 19 | 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;

[CY1002.1]. Develop fundamental skills in understanding the environment, ecology and ecosystem for sustainable development saving the environment.

[CY1002.2]. 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.

[CY1002.3]. Impart knowledge on the application of the techniques / procedures to predict / qualitatively assess the reduction in the environmental impact for sustainable development.

[CY1002.4]. 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.

[CY1002.5]. 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.

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

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
[CY1002.1].	Apply the fundamental knowledge of environment, ecology and ecosystem to save the environment for sustainable development.	3		1			1	2					3
[CY1002.2].	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			
[CY1002.3].	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
[CY1002.4].	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			
[CY1002.5].	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

1- 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: Jul 19 – Nov 19 | 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

[CY1030.1]. Develop skill in quantitative chemical analysis.
[CY1030.2]. Apply concept of synthetic chemistry.
[CY1030.3]. 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 solution by performing a pH-metric titration.	Analyse physical property of materials	Activity	1030.1	Practical Assessments and End Term Lab Assessment
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

Department of Electronics & Communication Engineering
Course Hand-out

Basic Electronics| EC 1001 | 3 Credits | 2 1 0 3

Session: July 19 – Nov 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:

[EC1001.1]. Apply principles of physics to describe and analyse the working of semiconductor devices and integrated circuits and hence develop employability skills.

[EC1001.2]. Analyse different biasing configurations of Bipolar Junction Transistor

[EC1001.3]. Analyse Inverting or Non-Inverting amplifier structures comprising of Operational Amplifier and to promote development of skills towards core employability

[EC1001.4]. Demonstrate inter-conversion on different number systems

[EC1001.5]. Demonstrate minimization of Boolean expressions

[EC1001.6]. Identify different elements of communication

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	20
	Sessional Exam II	20
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	20
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

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. BJT: 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. Operational Amplifier: Ideal 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, De Morgan's Theorem, logic gates; Truth tables, SOP, POS form, K-map for minimization of Boolean expressions, Implementation of Boolean expressions with logic gates, Introduction to combinational & sequential circuits. Communication Systems: Elements of communication systems, Analog modulation scheme.

TEXT BOOKS

1. R. L. Boylestad, L. Nashelsky, Electronic Devices and Circuit Theory, (10e), Pearson, 2009.
2. S. Salivahanan, S. Arivazhagan, Digital circuits and Design, (5e), Oxford University Press, 2018.
3. G. Kennedy, B. Davis, S R M Prasanna, Electronic Communication systems, (6e), Mcgraw Hill, 2017.
4. V. K. Mehta, Rohit Mehta, Principles of Electronics, (10e), S. Chand Publication, 2006.
5. B. L. Thereja, Basic Electronics: Solid state, (5e), S. Chand Publication, 2005.

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		EC1001.1 (CO 1)	NA
2	Introduction to Extrinsic Semiconductors	Understanding of Doping	Lecture	EC1001.1 (CO 1)	In Class Quiz
3	Introduction to PN junction diode, Formation of depletion region	Understanding of switches	Lecture	EC1001.1 (CO 1)	In Class Quiz
4	Forward and reverse bias, I-V Characteristics	Understanding of switch operation and their characteristics	Lecture	EC1001.1 (CO 1)	In Class Quiz Mid Term I
5, 6	Equivalent circuits of ideal and practical diode	Model of the diode for circuits	Lecture	EC1001.1 (CO 1)	In Class Quiz
7	Diode equation	Introduction to the drift and diffusion in diode equation.	Lecture	EC1001.1 (CO 1)	In Class Quiz Mid Term I End Term
8-10	Application to Diodes: Series and Parallel combination of diode circuits	Use of switches to get different function in electrical circuits	Lecture	EC1001.1 (CO 1)	In Class Quiz Mid Term I End Term
11	Half and Full wave rectifiers	Introduction to pulsating D.C	Lecture	EC1001.1 (CO 1)	In Class Quiz Mid Term I End Term
12	Capacitor Filter	Introduction to Filters	Lecture	EC1001.1 (CO 1)	
13-14	Clipper circuits	Understanding of wave shaping circuits	Lecture	EC1001.1 (CO 1)	In Class Quiz Mid Term I End Term

15	Clamper circuits	Understanding of wave shaping circuits	Lecture	EC1001.1 (CO 1)	In Class Quiz Mid Term I End Term
16	Zener diode and its I-V characteristics	Understanding of voltage regulating device.	Lecture	EC1001.1 (CO 1)	In Class Quiz
17-18	Zener regulators	Understanding of voltage regulating circuits	Lecture	EC1001.1 (CO 1)	In Class Quiz Mid Term I End Term
19	Tutorial				
20	Introduction to BJT	Understanding of three terminal devices	Lecture	EC1001.2 (CO 2)	In Class Quiz
21	Operation of BJT	Understanding of minority carrier movement	Lecture	EC1001.2 (CO 2)	In Class Quiz
22	Transistor configuration: symbolic representation and CB Characteristics.	Characteristics of BJT under various config.	Lecture	EC1001.2 (CO 2)	In Class Quiz Mid Term II End Term
23	Transistor configuration: symbolic representation and CE Characteristics	Characteristics of BJT under various config.	Lecture	EC1001.2 (CO 2)	In Class Quiz Mid Term II End Term
24	CC configuration w.r.t. CE, Relation between α and β	Characteristics of BJT under various config.	Lecture	EC1001.2 (CO 2)	In Class Quiz Mid Term II End Term
25	Transistor Biasing, Q-point, Load line	Effect of load on the characteristics	Lecture	EC1001.2 (CO 2)	In Class Quiz Mid Term II End Term
26	Fixed biasing	Effect of load on the characteristics	Lecture	EC1001.2 (CO 2)	In Class Quiz Mid Term II End Term
27	Self-biasing	Effect of load on the characteristics	Lecture	EC1001.2 (CO 2)	In Class Quiz Mid Term II End Term
28	Introduction to Operational Amplifier, Op. Amp Characteristics.	Understanding the OPAMP characteristics and its difference from BJT as an amplifier.	Lecture	EC1001.3 (CO 3)	In Class Quiz
29	Inverting amplifier	Application of OPAMP	Lecture	EC1001.3 (CO 3)	In Class Quiz Mid Term II End Term
30	NON-Inverting amplifier, Linear applications of Op. Amp as voltage follower	Application of OPAMP	Lecture	EC1001.3 (CO 3)	In Class Quiz Mid Term II End Term
31	Summing amplifier, Subtractor	Application of OPAMP	Lecture	EC1001.3 (CO 3)	In Class Quiz Mid Term II End Term
32	Integrator, Differentiator	Application of OPAMP	Lecture	EC1001.3 (CO 3)	In Class Quiz Mid Term II End Term
33	Tutorial				

34	Digital Electronics: Number system	Mathematical understanding of Number System	Lecture	EC1001.4 (CO 4)	In Class Quiz
35	Boolean algebra, DeMorgan's theorem	Understanding the Algebra in Digital Electronics	Lecture	EC1001.5 (CO 5)	In Class Quiz End Term
36	Logic gates, Truth table.	Basic entities of Digital Electronics	Lecture	EC1001.5 (CO 5)	In Class Quiz End Term
37	Implementation of Boolean expression with logic gates	Use of Logic Gates to implement any Logic in Digital	Lecture	EC1001.5 (CO 5)	In Class Quiz End Term
38	SOP, POS forms	Understanding of various forms to represent a Logic	Lecture	EC1001.5 (CO 5)	In Class Quiz End Term
39	K-Map for minimization of Boolean expressions	A systematic way to minimize the given logic	Lecture	EC1001.5 (CO 5)	In Class Quiz End Term
40	S-R Flip Flop	Understanding of Basic Sequential Circuits	Lecture	EC1001.5 (CO 5)	In Class Quiz End Term
41	Introduction to communication system & Analog Modulation Scheme	Basic concept of Communication	Lecture	EC1001.6 (CO 6)	In Class Quiz End Term
42	Tutorial				

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
[EC1101.1]	Apply principles of physics to describe and analyse the working of semiconductor devices and integrated circuits	3	2	3	1			1					1
[EC1101.2]	Analyse different biasing configurations of bipolar junction transistor	3	2	1	2	1							**1**
[EC1101.3]	Analyse inverting or non-inverting amplifier structures comprising of operational amplifiers	3	3	3	2	**2**							1
[EC1101.4]	Demonstrate interconversion on different number systems	3	2	3	2	**2**		1					1
[EC1101.5]	Demonstrate minimization of Boolean expressions	**3**	3	1	**2**	**2**							1
[EC1101.6]	Identify different elements of communication	**3**	2	**2**	2		1						2

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

MANIPAL UNIVERSITY JAIPUR

School of Electrical, Electronics and Communication

Department of Electrical Engineering
Course Hand-out

Basic Electrical Technology | EE 1001 | 4 Credits | 2 1 0 3

Session: July. 19 – Nov. 19 | Faculty: Dr. Manish Kumar Thukral | Class: B.Tech. 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

[EE1101.1]. Recall basic circuit laws and apply theorems to analyse different types of DC circuits.
[EE1101.2]. Understand and apply the basic concepts of electromagnetism.
[EE1101.3]. Identify and evaluate different configurations of single phase & three phase ac circuits.
[EE1101.4]. Understand and apply the construction and operating principle of transformer.
[EE1101.5]. 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

T1. Nagasarkar & Sukhija, Basic Electrical Engineering, Oxford University Press, 2006.

T2. S.K. Sahdev, Fundamentals of Electrical Engineering & Electronics, Dhanpat Rai & Co, 2010.

T3. D. C. Kulsheshtha, Basic Electrical Engineering, McGraw Hill Education India, 2011.

G. REFERENCE BOOKS

R1. S. N. Singh, Basic Electrical Engineering, PHI, 2011.

R2. 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: July19-Nov 19 | Faculty: Dr Arun Kumar Poonia| Class: B-Tech I Sem: I

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:

R1. Meenakshi Raman and S. Sharma, Technical Communication: Principles and Practice, (2/e), Oxford University Press, 2013.
R2. N. Krishnaswamy, Modern English: A Book of Grammar Usage and Composition, Macmillan India, 2018.
R3. Sanjay Kumar and Pushplata, Communication Skills, Oxford University Press, 2016.
R4. 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 for specific purposes	Lecture, Discussion and any case study	1001.1, 1001.2, 1001.3	Quizzes
Day 19	Telephonic Etiquettes	Use appropriate co mmunication 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 co mmunication 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 co mmunication 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)**											
		PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
[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

School of Engineering

Department of Mathematics & Statistics
Course Hand-out

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

Session: July 19 – Nov 19 | **Dr Sunil Joshi** | Class: B.Tech
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:

T1. Grewal B. S., *Higher Engineering Mathematics*, (42e), Khanna Publishers, 2013

G. Reference Book:

R1. Kreyszig E., Advanced *Engineering Mathematics*, (10e), Wiley Eastern, 2011
R2. Lay David C., *Linear Algebra and applications*, (3e), Pearson Education, 2009
R3. Sastry S. S., *Introductory methods of Numerical analysis*, (4e), PHI, 2007

R4. Iyengar S.R.K. and Jain, Rajendra K., *Advance Engineering Mathematics (3e)*, Narosa book distributors Pvt Ltd-New Delhi, 2007
R5. 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	3	2	2	2	2				3		3	1

	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 the their skill to solve engineering application based problems.	3	3	2	3	2				1		2	1
[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

MANIPAL UNIVERSITY JAIPUR

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: July 19 – Nov. 19 | Faculty: Hemant Raj Singh | Class: B.Tech 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.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 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

H. 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	

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
[ME1001.1]	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											
[ME1001.2]	Apply laws of thermodynamics on engineering processes.	3	2										
[ME1001.3]	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								
[ME1001.4]	Analyse the concept of second law and entropy in the context of thermal applications.	3	2	3	2		2	2					
[ME1001.5]	Apply the concept of thermodynamics and manufacturing processes to design/utilize the power generating, power consuming and manufacturing devices.	3	3	3			2	2					

MANIPAL UNIVERSITY JAIPUR

School of Automobile, Mechanical and Mechatronics

DEPARTMENT OF MECHANICAL ENGINEERING

Course Hand-out

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

Session: July 19 – Nov 19 | Course Coordinator: Dr. Mithilesh Kumar Dikshit | Class: B.Tech I Year

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 understanding 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:

T1. Bhat N. D., Engineering Drawing Charotar Publishing House, Anand , 2000.
T2. Jeyapoovan T. Engineering Drawing and graphics Using AutoCAD, 3rd Ed. Vikas Publishing House Pvt. Ltd.,2010.

G. Reference Books:

R1. Gopalkrishna K. R., Engineering Graphics, Suhas Publications, Bangalore, 2001.
R2. Venugopal K., Engineering Drawing and Graphics + Autocad Newage International Publishers, Delhi (2001).
R3. 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 apparent top view and apparent front view, angle of inclinations with both the planes.	Board/PPT	ME1002.2	
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	Board/PPT	ME1002.2	Sheet performance

		solids w.r.t. HP and VP			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,	Board/PPT	ME1002.3	Sheet performance in class/End terms

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

		isometric lines and isometric planes			
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	

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	3	1	2	1								2

	engineerin g drawing.												
[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 Basic Sciences

Department of Physics

Course Hand-out

Engineering Physics | PY1001 | 4 Credits | 3 1 0 4

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

[PY1001.1] identify clearly the wide range of diversity in science and technology with the help of knowledge of the basic Physics.
[PY1001.2] justify and explain various processes involved in understanding the nature of light.
[PY1001.3] categorize and investigate the problems and applications of quantum physics.
[PY1001.4] understand and relate the fundamentals of quantum mechanics and apply the skills to solve one dimensional motion of particles.
[PY1001.5] impart the knowledge of empirical laws based on Solid State Physics and Atomic and Molecular Physics.
[PY1001.6] 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

T1. Halliday, Resnick, Krane, PHYSICS, Volume 2, 5th edition, John Wiley & Sons, Inc, 2011
T2. Beiser & Mahajan, Modern Physics, Mc Graw Hill, 6th edition., 2009

G. REFERENCE BOOK

R1. 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 interference, coherence	Understanding of the concept of coherent waves and interference	Lecture	**1001.2**	Class Quiz – 1 Home Assignment - 1 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 – 1 Home Assignment - 1 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 – 1 Home Assignment - 1 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 – 1 Home Assignment - 1 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 – 1 Home Assignment- 1 Mid Term I End Term
9	**TUTORIAL: 2**		Activity (Think Pair Share)		
10-11	Michelson interferometer – construction &	Description of Michelson interferometer and derivation of the formula	Lecture	**1001.2**	Class Quiz – 1 Home Assignment - 1

	theory (Qualitative approach only), Applications of Michelson interferometer (determination of wavelength)	for determination of wavelength using it.			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, Diffraction at a circular aperture	Develop the theory and formula for single slit diffraction	Lecture	**1001.2**	Class Quiz – 2 Home Assignment - 2 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 multipleslit 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,	Understand the phenomena of polarisation	Lecture	**1001.2**	Class Quiz – 3 Home Assignment - 3

	Polarization by reflection, Double refraction, Malus law & Brewsters law	and different approaches to polarise EM waves			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, UV Catastrophe, Planck's hypothesis and Planck's law of black body radiation	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
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 Classroom, Lecture	**1001.3**	Class Quiz – 5 Home Assignment - 5 Mid Term II End Term
34	**TUTORIAL: 10**		Activity (Think	**1001.3**	

			Pair Share)		
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,	Understand the lasers and the related optical phenomena.	Lecture	**1001.4 & 1001.5**	Class Quiz – 7 End Term

	Population inversion and metastable state,				
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 the basic Physics.	3	2			1	2	1	2		2		1				
[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 ractical nowledge to real time solution of industrial problems	2	1		2	1		2	1		2	1					

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and IT

Department of Information Technology
Course Hand-out

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

Session: Jul 19 – Dec 19 | Faculty: Vineeta Soni| 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

[CS1301.1]. Describe the interconnection between various functional units of a computer system and able to assess the performance of a computer.

[CS1301.2]. Describe various data representations and analyse the design of fast arithmetic circuits.

[CS1301.3]. Formulate assembly language programs for a given high level language construct.

[CS1301.4]. Describe various parts of a system memory hierarchy and caching techniques.

[CS1301.5]. Evaluate the performance of CPU, memory and I/O operations.

[CS1301.6]. 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]: 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	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.

F. TEXT BOOKS

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.

G. 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

H. Lecture Plan:

Lecture No	Major Topics	Topics	Session Outcomes	Mode of Delivery	Corresponding CO	Mode of Assessing CO
1.	Basic Structure of Computers (1-6 Lecture)	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
2.		Functional units		Lecture	1301.1	Mid Term I, Quiz & End Term
3.		Basic operational concepts		Lecture	1301.1	Mid Term I, Quiz & End Term
4.		Bus structures, software		Lecture	1301.1	Mid Term I, Quiz & End Term
5.		Performance		Flipped Class	1301.1	Mid Term I, Quiz & End Term
6.		Tutorial		Activity	1301.1, 1301.5	Mid Term I, Quiz & End Term
7.	Machine Instructions and Programs (7-18 Lecture)	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
8.		Memory Locations and Addresses, Memory Operations		Lecture	1301.2	Mid Term I, Quiz & End Term
9.		Instructions and Instruction Sequencing		Lecture	1301.2 & 1301.3	Mid Term I, Quiz & End Term
10.		Register Transfer Notation, Assembly Language Notation		Lecture	1301.2	Mid Term I, Quiz & End Term
11.		Basic Instruction Types, Instruction Execution and Straight-Line Sequencing		Lecture	1301.2 & 1301.3	Mid Term I, Quiz & End Term
12.		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
13.		Addressing Modes, Implementation of Variables and Constants, Indirection and Pointers		Flipped Class	1301.2	Mid Term I, Quiz & End Term
14.		Indexing and Arrays, Relative Addressing		Lecture	1301.2	Mid Term I, Quiz & End Term
15.		Additional Modes		Lecture	1301.2	Mid Term I, Quiz & End Term
16.		Basic I/O operations, Additional Instructions		Lecture	1301.2 & 1301.3	Mid Term I, Quiz & End Term
17.		Example programs		Lecture	1301.2 & 1301.3	Mid Term I, Quiz & End Term
18.		Tutorial		Activity	1301.2	Mid Term I, Quiz & End Term
19.		Addition and Subtraction of Signed Numbers		Flipped Class	1301.2	Mid Term I, Quiz & End Term

20.	Arithmetic (19-33 Lecture)	Design of Fast Adders	Analyse the design of various fast adder circuits.	Lecture	1301.2 & 1301.6	Mid Term II, Quiz & End Term
21.		Carry Look Ahead Adders- Bit Stage Cell,4 Bit CLA		Lecture	1301.2 & 1301.5	Mid Term II, Quiz & End Term
22.		Carry Look Ahead Adders 16 Bit		Lecture	1301.2 & 1301.5	Mid Term II, Quiz & End Term
23.		Tutorial		Activity	1301.2	Mid Term II, Quiz & End Term
24.		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
25.		Signed Operand Multiplication-Booth Algorithm		Lecture	1301.2	Mid Term II, Quiz & End Term
26.		Fast Multiplication-Bit Pair Recoding of Multipliers		Lecture	1301.2	Mid Term II, Quiz & End Term
27.		Carry-save addition of summands		Flipped Class	1301.2	Mid Term II, Quiz & End Term
28.		Integer Division-Restoring		Lecture	1301.2	Mid Term II, Quiz & End Term
29.		Integer Division-Nonrestoring		Lecture	1301.2	Mid Term II, Quiz & End Term
30.		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
31.		Arithmetic Operations on Floating Point Numbers		Lecture	1301.2	Mid Term II, Quiz & End Term
32.		Examples on Arithmetic Operation on Floating Point Numbers		Lecture	1301.2	Mid Term II, Quiz & End Term
33.		Tutorial		Activity	1301.2	Mid Term II, Quiz & End Term
34.	Memory Systems (34-42 Lecture)	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
35.		Speed, Size & Cost		Lecture	1301.4 & 1301.5	Mid Term II, Quiz & End Term
36.		Cache Memories-Mapping Functions		Lecture	1301.4 & 1301.5	Mid Term II, Quiz & End Term
37.		Replacement Algorithms		Lecture	1301.4 & 1301.5	Mid Term II, Quiz & End Term
38.		Example of Mapping Techniques		Flipped Class	1301.4	Mid Term II, Quiz & End Term
39.		Performance Considerations: Hit Rate & Miss Penalty, Caches on Processor Chip		Lecture	1301.4 & 1301.5	Mid Term II, Quiz & End Term
40.		Virtual Memories	Explain virtual memory concept and address translation mechanism	Lecture	1301.4 & 1301.6	Mid Term II, Quiz & End Term
41.		Address Translation		Lecture	1301.4	Mid Term II, Quiz & End Term
42.		Tutorial		Activity	1301.4	Mid Term II, Quiz & End Term

43.	Input / Output Organization (43-46 Lecture)	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
44.		Interrupt H/W, Enabling Disabling Interrupts		Lecture	1301.5	Quiz & End Term
45.		Handling Multiple Devices, Controlling Device Requests, Exceptions		Lecture	1301.5	Quiz & End Term
46.		Use of interrupts in Operating Systems, Direct Memory Access		Lecture	1301.5	Quiz & End Term
47.	Introduction to Parallel Processing (47-53 Lecture)	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
48.		Pipelining		Flipped Class	1301.5	Quiz & End Term
49.		Data Hazards		Lecture	1301.5	Quiz & End Term
50.		Instruction Scheduling: Static and Dynamic		Lecture	1301.5 & 1301.6	Quiz & End Term
51.		Control Hazard		Lecture	1301.5	Quiz & End Term
52.		Branch Prediction		Lecture	1301.5	Quiz & End Term
53.		Tutorial		Activity	1301.5	Quiz & End Term

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
[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	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	1	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 Information Technology

Department of Information Technology
Course Hand-out

Switching Theory & Logic Design| CS 1302 | Credits 4 | 3 1 0 4

Session: July 2019 – Nov 2019 | Faculty: Ravinder Kumar, Kavita | Class: B.Tech. IT (III Sem)

A. Introduction: This course allows students to obtain a basic level of Digital Electronics knowledge and set the stage to perform analysis and design of complex digital electronic circuits. Students will learn combinational and sequential circuit design techniques, which will enable them to analyze digital systems in terms of state machines.

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

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

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

[CS1302.3]: Be able to design and analyze small combinational circuits and to use standard combinational functions/building blocks to build larger more complex circuits.

[CS1302.4]: Be able to design, analyseand evaluate small sequential circuits and devices and to use standard sequential functions/building blocks to build larger more complex circuits.

[CS1302.5]: Be able to 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

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 (Closed Book)	15
	Sessional Exam II (Closed Book)	15
	In class Quizzes and Assignments (video assignments/software simulation assignments)	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

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. Brown , Z. Vranesic, "*Fundamentals of Digital Logic with VHDL Design*", TMH, 2000.
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. J. Bhasker, *"A VHDL Primer"*, PHI Pvt. Ltd., 3rd Ed., 2005.

A. Lecture Plan

Lecture No.	Topic(s) to be covered	Mode of Delivery	Session Outcome	Corresponding CO	Mode of Assessing the Outcome
1	Number System: Binary, Decimal, Octal ,Hexadecimal	Lecture	To acquaint and refresh fundamentals of number system	1302.1	Class Quiz Mid Term I End Term
2	1's and 2's Complements and 9's and 10's Complements	Lecture	To recall number system complements and to describe their need.	1302.1	Class Quiz Mid Term I End Term
3	Binary Coded Decimal (BCD): BCD Addition and Subtraction	Lecture	To identify different formats of representing binary numbers and corresponding arithmetic operations	1302.1	Class Quiz Mid Term I End Term
4	Introduction, Development of Boolean Algebra	Lecture	To explain and recall Boolean theorems and algebra.	1302.2	Class Quiz Mid Term I End Term
5	Boolean Logic Operation: Logical AND, Logical OR and Logical Complementation(Inversion)	Lecture	To recall basic boolean logics	1302.2	In Class Quiz End Term
6	Boolean Addition, Boolean Multiplication, Properties of Boolean Algebra and Principle of Duality.	Lecture	To understand Boolean arithmetic	1302.2	Class Quiz Mid Term I End Term
7	Demorgan's Theorems, Minimization of Boolean expression using algebraic method	Lecture	To understand minimization of boolean expression using Boolean theorems	1302.2	Class Quiz Mid Term I End term
8	Sum of Products and Product of Sums : Minterm, Maxterm	Lecture	Introduction to different representations of Boolean expressions.	1302.2	Home Assignment Class Quiz Mid Term I End Term
9	Deriving Sum of Products	Lecture	Introduction to different	1302.2	Class Quiz

	(SOP) Expressions from a Truth Table, Deriving Product of Sum (POS) Expressions from a Truth Table		representations of Boolean expressions.		Mid Term I End Term
10	Karnaugh Map :Two-variable map, Three-variable map	Lecture	Understanding design principles of K-map to minimize Boolean expression	1302.1,1302.2	Class Quiz Mid Term I End Term
11	Four-variable map	Lecture	Understanding design principles of K-map to minimize Boolean expression	1302.1,1302.2	Class Quiz End Term
12	Five- variable map	Lecture	Understanding design principles of K-map to minimize Boolean expression	1302.1,1302.2	Class Quiz Mid Term I End Term
13	Quine-McCluskey or Tabular Method of Minimization of Logic Functions	Lecture	Understanding design principles of Tabular method to minimize Boolean expression	1302.1,1302.2	Class Quiz Mid Term I End Term
14	Examples of Tabular Method	Lecture	Understanding design principles of Tabular method to minimize Boolean expression	1302.1,1302.2	Class Quiz Mid Term I End Term
15	Examples of Tabular Method	Lecture	Understanding design principles of Tabular method to minimize Boolean expression	1302.1,1302.2	Class Quiz Mid Term I End Term
16	Logic Gates: OR, AND, NOT, NAND, NOR	Lecture	To recall basic logic gates	1302.1,1302.2	Class Quiz End Term Mid Term II
17	Universal Gates: Realisation of logic function using NAND gates	Lecture	To recall universal logic gates	1302.1,1302.2	Class Quiz End Term Mid Term II
18	Realisation of logic function using NOR gates	Lecture	To understand realization of logic functions using universal gates	1302.1,1302.2	Class Quiz End Term Mid Term II
19	Exclusive-OR (Ex-OR) Gate, Exclusive-NOR (Ex-NOR) Gate	Lecture	To recall other logic gates	1302.3	Class Quiz End Term Mid Term II

20	Arithmetic Circuits: Half Adder, Full Adder , K-Map Simplification	Lecture	To design and implement combinational circuits	1302.3	Class Quiz End Term Mid Term II
21	Half Subtractor , Full Subtractor	Lecture	To design and implement combinational circuits	1302.3	Class Quiz End term Mid Term II
22	4-bit Parallel Adder/Subtractor	Lecture	To design and implement combinational circuits	1302.3	Class Quiz Mid Term II
23	Fast Adder	Lecture	To design and implement combinational circuits	1302.3	Class Quiz Mid Term II End Term
24	BCD Adder	Lecture	To design and implement combinational circuits	1302.3	Class Quiz Mid Term II End Term
25	Binary Multiplier	Lecture	To design and implement combinational circuits	1302.3	Class Quiz Mid Term II End Term
26	Combinational Circuits: Multiplexers – Basic Four input Multiplexer	Lecture	To design and implement combinational circuits	1302.3	Class Quiz End Term Mid Term II
27	Implementation of Boolean Expression using Multiplexers	Lecture	To design and implement combinational circuits	1302.3	Class Quiz End Term Mid Term II
28	Demultiplexers : 1-to-4 Demultiplexer, 1-to-8 Demultiplexer,	Lecture	Understand integration of IoT in safety application	1302.3	Class Quiz End Term Mid Term II
29	Decoders: Basic Binary Decoder, 3-to-8 Decoder	Lecture	To design and implement combinational circuits	1302.3	Class Quiz End Term
30	4-to-16 Decoder	Lecture	To design and implement combinational circuits	1302.3	Class Quiz End Term
31	Encoders: Octal-to-Binary Encoder	Lecture	To design and implement combinational circuits	1302.3	Class Quiz End Term
32	Decimal-to-BCD Encoder	Lecture	To design and implement combinational circuits	1302.3	NA

33	Code Converters: BCD-to-Binary Converters	Lecture	To design and implement combinational circuits	1302.3	In Class Quiz (Not Accounted)
34	Binary-to-Gray Code Converters	Lecture	To design and implement combinational circuits	1302.3	In Class Quiz End Term
35	Gray Code-to-Binary Converters	Lecture	To design and implement combinational circuits	1302.3	Home Assignment End Term
36	Flip-Flops: Latches	Lecture	To understand basic sequential elements	1302.4	In Class Quiz End Term
37	S-R Flip-Flop, D Flip-Flop	Lecture	To understand basic sequential elements	1302.4	Class Quiz End Term
38	J-K Flip-Flop, T Flip-Flop	Lecture	To understand basic sequential elements	1302.4	Class Quiz End term
39	Triggering of Flip-Flop: Level Triggering	Lecture	To understand basic sequential elements	1302.4	Home Assignment Class Quiz End Term
40	Edge Triggering	Lecture	To understand basic sequential elements	1302.4	Class Quiz End Term
41	Master Slave Flip-Flop	Lecture	To understand basic sequential elements	1302.4	Class Quiz End Term
42	Realisation of One Flip-Flop using other Flip-Flops.	Lecture	To design and implement sequential circuits	1302.4	Class Quiz End Term
43	Counters: Asynchronous (Ripple or Serial) Counter	Lecture	To design and implement sequential circuits	1302.4	Class Quiz End Term
44	Ripple Counter with Decoded Outputs	Lecture	To design and implement sequential circuits	1302.4	Class Quiz End Term
45	Ripple Counters with Modulus<2^n	Lecture	To design and implement sequential circuits	1302.4	Class Quiz End Term
46	Asynchronous Down Counter	Lecture	To design and implement sequential circuits	1302.4	Class Quiz End Term
47	Up-Down Counter	Lecture	To design and implement sequential circuits	1302.4	Class Quiz End Term
48	Design of Synchronous Counters	Lecture	To design and implement sequential circuits	1302.4	Class Quiz End Term
49	Registers: Shift Register	Lecture	To design and implement sequential circuits	1302.4	Class Quiz End Term
50	Shift Register Counters: Ring Counter	Lecture	To design and implement sequential circuits	1302.4	Class Quiz End Term

51	Johnson Counter	Lecture	To design and implement sequential circuits	1302.4	Class Quiz End Term
52	Overview of semiconductor diode:BJT, MOSFET,	Lecture	To understand transistor basics for VLSI applications	1302.5	Class Quiz End Term
53	TTL–standard, High speed, low-power, low-power schottky	Lecture	To understand logic families	1302.5	Class Quiz End Term
54	CMOS logic-NAND, NOR	Lecture	To design and implement CMOS logic gates	1302.5	Class Quiz End Term

B. 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	PSO 4
[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	2									3	3	3	3	
[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	3	3	3	
[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	2								3	3		3	
[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		3	
[CS 1302.5]	Be able to understand working and use of logic families like BJT, MOSFET etc.												3	3		3	

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
Data Structures | CS1303 | 4 Credits | 3 1 0 4
Session: July 19 – Nov 19 | Faculty: Dr. Anju Yadav, Virender Dehru, Rohit K Gupta |
Class: B. Tech IT (III Sem)

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

[CS1303.1]. explain basic concepts of various data structures

[CS1303.2]. describe how arrays, linked lists, stacks, queues, trees and graphs a

[CS1303.3]. 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

[CS1303.4]. 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]: 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
	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	Major Topics	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode Of Assessing CO
1.	**Introduction**	Introduction to data structures, Algorithm Specifications, How to Write Algorithms	define data structure and list various data structure.	Lecture	1303.1	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	1303.1 1303.1	Class Quiz Home Assignments I Sessional End Term
3.	**Arrays**	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	1303.1 1303.2	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	1303.2	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	Lecture	1303.1 1303.2	Class Quiz Home Assignments

		Matrices, Row Major and Column Major Representation	writing programs			I Sessional 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	1303.2 1303.3	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	1303.1 1303.2	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	1303.1 1303.2	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	1303.3	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	1303.3	Class Quiz Home Assignments I Sessional End Term
11.	**Linked List**	Linked List : Introduction, Basic Terminologies, Advantages over Arrays, Applications, Structures in 'C', Example Programs on Structures and pointer to Structure	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	1303.1 1303.2	Class Quiz Home Assignments I Sessional End Term

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	1303.1 1303.2	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	1303.1 1303.2	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	1303.1 1303.2	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	1303.1 1303.2	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	1303.3	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	1303.3	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	1303.3	Class Quiz Home Assignments I Sessional

						End Term
19.	**Stacks**	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	1303.1 1303.3	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	1303.1 1303.2	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	1303.3	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	1303.3	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	1303.3	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	1303.3	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	Tutorial	1303.3	Class Quiz Home Assignments

			problem			II Sessional End Term
26.	**Queues**	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	1303.1 1303.2	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	1303.1 1303.2	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	1303.1 1303.2	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	1303.3	Class Quiz Home Assignments II Sessional End Term
30.	**Trees**	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	1303.1 1303.2	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	1303.2	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	1303.2	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	1303.1 1303.2	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	1303.1 1303.2	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	1303.2	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	1303.1 1303.2	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	1303.1 1303.2	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	1303.3	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	1303.3	Class Quiz Home Assignments End Term
40.	**Graphs**	Graphs : Introduction, Basic	describe representation of graph in term of	Lecture	1303.1	Class Quiz

		Terminology, Applications, Representation of Graphs : Adjacency Matrix Representation	adjacency matrix with their complexity		1303.2	Home Assignments End Term
41.		Representation of Graphs : Adjacency List Representation	describe representation of graph in term of adjacency list with their complexity	Lecture	1303.1 1303.2	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	1303.2	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	1303.2	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	1303.2	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	1303.3	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	1303.3	Class Quiz Home Assignments End Term
47.	**Searching & Sorting**	Sorting : Introduction, Bubble Sort, Insertion Sort	describe the concept of sorting with various sorting algorithm	Lecture	1303.1	Class Quiz Home Assignments End Term
48.		Sorting (Continued) : Quick Sort, Merge Sort	describe the application of sorting such as medical monitoring	Lecture	1303.1 1303.4	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	1303.1 1303.4	Class Quiz Home Assignments End Term
50.		Hashing : Introduction, Applications, Hash Functions	describe different hashing techniques/functions	Lecture	1303.1 1303.2 1303.4	Class Quiz Home Assignments End Term
51.		Hash Collisions, Collision Resolution : Open Addressing, Chaining	describe different collision resolving techniques with examples	Lecture	1303.1 1303.2	Class Quiz Home Assignments End Term
52.		Problems solving by students on soring and its application	develop program for searching and sorting	Tutorial	1303.3	Home Assignments 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
[CS1303.1]	explain basic concepts of various data structures	3	2										2	3		
[CS1303.2]	describe how arrays, linked lists, stacks, queues, trees and graphs are represented in memory and their operations		1	2									2		2	2
[CS1303.3]	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		1	2									2		2	2
[CS1303.4]	describe and analyze various sorting algorithms like bubble, selection ,insertion, merge sort, heap sort and quick sort		1	2									2	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

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

Session: July-November, 2019

Faculty: Mr. Gaurav Aggarwal (Course Co-ordinator), Mr. Shashank Sharma, Mr. Anurag Bhatnagar

Class: B.Tech. IT

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 aidind 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 analyse 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 Information Technology will empowers 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)	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 Ha ndling and GUI Programming:** Events, action listener, swing package;

F. TEXT BOOKS

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

G. 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:

Lectures	Major Topics	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode Of Assessing CO
1.	History and Evolution and overview of java (1-7 Lecture)	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.	Data Types, Variables and Arrays (8-11 Lecture)	Primitive Types, Floating point, Characters,	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,	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.	Introduction to Classes (12-17 Lecture)	Class Fundamentals, Declaring Objects	Implementing class	Lecture	1304.2 & 1304.6	Mid Term I, Quiz & End
13.		Methods in Classes, returning values,	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.	Classes and its Methods(18-23 lecture)	Overloading Methods, Using Objects as parameters,	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.	I/O Basics (24-26 lecture)	Using Command line arguments ,I/O Basics,	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 (27-29 Lecture)	Inheritance Basics, Using Super, Creating	Understanding reusability	Lecture	1304.3	Mid Term II, Quiz & End
28.		Method overriding, Dynamic method dispatch,	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 and	Packages, Access protection, Importing packages,	Develop user defined packages	Lecture	1304.3	Mid Term II, Quiz & End

31.	**Interfaces (30-34 lecture)**	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.	**Exception Handling (35-38 lecture)**	Fundamentals, Exception types, Uncaught	How to handle error/ exception	Lecture	1304.2 & 1304.6	Mid Term II, Quiz & End
36.		Using try and catch, multiple catch clauses,	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.	**Multithreaded Programming (39-42 lecture)**	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	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.	**String Handling (43-45 lecture)**	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.	**Generics Class(46-49 lecture)**	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 and Event Handling (50-52 Lecture**	GUI lifecycle, Events, Events listener, adapter	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

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]	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**	**-**	**-**
[CS1304.2]	Learn and apply the concepts of encapsulation and abstraction using class, objects and interfaces.	**2**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**1**	**2**	**-**	**-**
[CS1304.3]	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**	**-**	**-**
[CS1304.4]	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**	**1**	**-**
[CS1304.5]	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**	**-**	**-**
[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**	**-**

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

Data Structures Lab | CS1331 | 1 Credit | 0 0 2 1

Session: July 19 – Nov 19 | Faculty: Dr. Anju Yadav, Virender Dehru, Rohit Kumar Gupta | Class: B. Tech IT (III Sem)

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

[CS1331.1]. explain basic concepts of various data structures

[CS1331.2]. describe how arrays, linked lists, stacks, queues, trees and graphs are represented in memory and their operations

[CS1331.3]. select and/or apply appropriate data structures to solve problems.

[CS1331.4]. 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]: 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)	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	Major Topics	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode Of Assessing CO
1.	**Arrays**	Programs based on 1-D array operations	describe and implement various operations on 1-D array	Lab	1331.1 1331.3	Internal Evaluation Home Assignments External Evaluation
2.		Programs based on 2-D array operations	describe and implement various operations on 2-D array	Lab	1331.1 1331.3	Internal Evaluation Home Assignments External Evaluation
3.		Programs based on 2-D array operations with pointer notations	describe and implement various operations on 2-D array using pointers and functions.	Lab	1331.1 1331.2	Internal Evaluation Home Assignments External Evaluation
4.	**Linked List**	Programs to implement singly linked-list list operations	describe and implement various operations on one way linked list	Lab	1331.2 1331.3	Internal Evaluation Home Assignments External Evaluation
5.		Programs to implement Circular Linked list and Doubly-linked list operations	describe and implement various operations on circular and two way linked list	Lab	1331.1 1331.2	Internal Evaluation Home Assignments External Evaluation
6.	**Stacks**	Programs to implement stack and its operations	describe and simulate stack and its operations	Lab	1331.2 1331.3	Internal Evaluation Home Assignments External Evaluation
7.		Programs based on implementation of stack	describe and implement various application programs on stack	Lab	1331.1 1331.2	Internal Evaluation Home Assignments External Evaluation
8.	**Queue**	Programs based on implementation of queue and	describe and implement various application programs on queue, and	Lab	1331.2 1331.3	Internal Evaluation Home Assignments

		its operations	priority queue			External Evaluation
9.	**Tree**	Programs to implement tree and its operations	describe and implement various operations on Binary search tree	Lab	1331.1 1331.2 1331.3	Internal Evaluation Home Assignments External Evaluation
10.		Programs based on implementation of trees	describe and implement various operations on Binary search tree	Lab	1331.3	Internal Evaluation Home Assignments External Evaluation
11.	**Graph**	Programs to implement graph and its operations	describe and implement various operations on graph	Lab	1331.1 1331.2	Internal Evaluation Home Assignments External Evaluation
12.		Programs based on implementation of graphs	describe and implement programs on application of graph	Lab	1331.2 1331.3	Internal Evaluation Home Assignments External Evaluation
13.	**Sorting and Searching**	Programs to perform sorting using different sorting techniques over data	describe and implement various sorting and searching techniques	Lab	1331.2 1331.4	Internal Evaluation Home Assignments External Evaluation

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
[CS1331.1]	explain basic concepts of various data structures	3	2										2	3		
[CS1331.2]	describe how arrays, linked lists, stacks, queues, trees and graphs are represented in memory and their operations		1	2									2		2	2
[CS1331.3]	select and/or apply appropriate data structures to solve problems.		1	2									2		2	2
[CS1331.4]	Implement various sorting and searching algorithms		1	2									2	2		1

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

MANIPAL UNIVERSITY
JAIPUR

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Department of Information Technology

Course Hand-out

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

Session: July-November, 2019

Faculty: Mr. Gaurav Aggarwal (Course Co-ordinator), Mr. Shashank Sharma, Mr. Anurag Bhatnagar

Class: B.Tech. IT

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;

F. TEXT BOOKS

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

G. 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 IT

DEPARTMENT OF INFORMATION TECHNOLOGY

Course Hand-out

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

Session: Jan 20-May 20 | Faculty: Rohit Kumar Gupta, Vinita Soni, Dr Prakash C Sharma | Class: B. Tech. IV SEM

A. Introduction: This course is offered by Dept. of Information Technology 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:

[CS1401.1]. Describe the objectives, structure, functionality and types of operating systems.
[CS1401.2]. Write system programs using file and process system calls and PThread API.
[CS1401.3]. Compare various algorithms used for process scheduling.
[CS1401.4]. Describe concepts related to concurrency and achieve the same for cooperating processes, Apply
various deadlock handling strategies to solve resource allocation problems.
[CS1401.5]. Evaluate the performance of different memory management techniques and page replacement algorithms.
[CS1401.6]. 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 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]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 (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.

F. TEXT BOOKS

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

G. 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.

I. 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	**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
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
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

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
[CS 1401.1]	Describe the objectives, structure, functionality and types of operating systems.	2	1	1		1							2	1	1	1
[CS 1401.2]	Write 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 Information Technology

DEPARTMENT OF INFORMATION TECHNOLOGY

Course Hand-out

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

Session: Jan 2020 – May 2020 | Faculty: Mr. Shashank Sharma, Mr. Virender, Mr. Krishna Kumar| Class: B.Tech. IV Semester

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)

[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 (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. TEXTBOOKS

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 ideal data processing system.	Classify, Compare & recall different file-based system, Data Model.	PPT, Lecture, Class Notes	1402.1	N. A.
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,	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

	CARTESIAN PRODUCT (CROSS PRODUCT) Operations.				
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	Interpret SQL and apply the techniques and rules in different problems	PPT, Lecture, Class Notes	1402.3	Mid Term II, Quiz & End Term

	SQL.				
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	Understand and summarize concurrency control techniques.	PPT, Lecture, Class Notes	1402.5	Quiz & End Term

	(Binary Lock, Shared/Exclusive Lock).				
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, Clustering, and Secondary).	Explain different indexing techniques	PPT, Lecture, Class Notes	1402.6	Quiz & End Term
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
[CS 1402.1]:	Classify, Compare & recall different file-based system, Data Model	1												1		
[CS 1402.2]:	Understand and design Entity Relationship Model and illustrate the concept of cardinality, mapping and various constraints	2	2	2	2	2					2			2	2	
[CS 1402.3]:	Interpret different query language SQL, Relation Algebra, calculus and apply the techniques and rules in different problems	2		1	2	2								2	2	
[CS 1402.4]:	Understand different normalization technique for optimizing database and analyse database design	2		2			2							2	2	
[CS 1402.5]:	Understand and summarize transaction processing, concurrency and recovery technique.	2	2	1		2	1							2	2	
[CS 1402.6]:	Explain different database storage structure and access technique	1		1		1								2		1

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

MANIPAL UNIVERSITY
JAIPUR

SCHOOL OF COMPUTING & INFORMATION TECHNOLOGY

DEPARTMENT OF INFORMATION TECHNOLOGY
COURSE HAND-OUT
Microprocessor and Microcontroller | CS 1403 | 3 Credit | 3 0 0 3

Session: Jan ’2020 – May ’2020 | Faculty: Mr. Ankit Mundra, Dr. Vivek Kumar Verma

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.

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:

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 (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.

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 INFORMATION TECHNOLOGY

Course Hand-out

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

Session: Jan 20-May 20 | Faculty: Rohit Kumar Gupta, Vinita Soni, Dr Prakash C Sharma | 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 also 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:

[CS1432.1]: Explain basic Unix commands and write shell Scripts.
[CS1432.2]: Write system programs using file and process system calls and PThread API.
[CS1432.3]: Compare various algorithms used for process scheduling.
[CS1432.4]: Describe concepts related to concurrency and achieve the same for cooperating processes, Apply various deadlock handling strategies to solve resource allocation problems.
[CS1432.5]: 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.

[PO.3]. Design/development of solutions: Upon analysing, the 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 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.

[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] 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)	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

F. TEXT BOOKS

T1. Das, S., Unix Concepts and Applications, (4e), Tata McGraw-Hill Publications, 2017.
T2. Silberschatz, A. and Galvin, P. B., Operating System Concepts, (8e), International student version, John Wiley & Sons, 2009.

G. REFERENCE BOOKS

R1. Blum, R., and Bresnahan, C., Linux Command Line and Shell Scripting Bible, (3(e), Wiley india Pvt. Ltd, 2015.
R2. Maurice J. Bach, "The Design of the UNIX Operating System", Pearson Education

H. 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 Script**	Define basic terminology related to OS. List and demonstrate various basic Unix and shell script commands. Illustrate use of Unix and Shell scripts commands in writing shell scipts.	Lecture Demonstration at system	CS1432.1	Continuous Evaluation End Term Examination
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) Illustrate Inter-Process communication using pipes. Illustrate Zombie and Orphan Process.	Lecture Demonstration at system	CS1432.2	Continuous Evaluation End Term Examination
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 Illustration of memory allocation strategies: First Fit, Best Fit, Next Fit and Worst Fit	Lecture Demonstration at system	CS1432.5	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	
[CS1432.1]:	Explain basic Unix commands and write shell Scripts.	1	1	2	2	1	1		1	1		1		1	1	1	
[CS1432.2]:	Write system programs using file and process system calls and PThread API.	1	1	1										1			
[CS1432.3]:	Compare various algorithms used for process scheduling.	1	1	1										1			
[CS1432.4]:	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		
[CS1432.5]:	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

School of Computing and IT

DEPARTMENT OF INFORMATION TECHNOLOGY

Course Hand-out

Relational Database Management Systems Lab | CS 1431 | 1 Credit | 0 0 2 1

Session: Jan 20-May 20 | Faculty: Mr. Shashank Sharma, Mr. Virender, Mr. Krishna Kumar | Class: B. Tech. IV SEM

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

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] 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)	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	Corresponding 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

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
[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	1	1	2	1	1						1		1			

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

MANIPAL UNIVERSITY
JAIPUR

SCHOOL OF COMPUTING & INFORMATION TECHNOLOGY

DEPARTMENT OF INFORMATION TECHNOLOGY
COURSE HAND-OUT
Microprocessor and Microcontroller Lab | CS 1433 | 2 Credit | 0 1 2 2

Session: Jan ’2020 – May ’2020 | Faculty: Mr. Ankit Mundra, Dr. Vivek Kumar Verma

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)

At the end of the B.Tech IT program, the student:

PSO1. To apply creativity in support of the design, simulation, implementation and inference of existing and advanced technologies.

PSO2. To participate & suITed 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)	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.

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.

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-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
Design & Analysis of Algorithm | CS1501| 4 Credits | 4 0 0 3
Session: July 19 – Nov 19 | Dr. Pratistha Mathur, Dr. Ashish Jain & Dr. N. N. Das | Class: B.Tech V IT

A. Introduction: This course aims to discuss techniques for designing efficient algorithms and also to measure their complexity and performance. The course is intended to provide the students the experience in program algorithm design and to emphasize both the practical as well as the mathematical aspects of program efficiency including the mentioned points.

(i) Analyse the asymptotic performance of algorithms.
(ii) Write rigorous correctness proofs for algorithms.
(iii) Demonstrate a familiarity with major algorithms and data structures.
(iv) Apply important algorithmic design paradigms and methods of analysis.
(v) Synthesize efficient algorithms in common engineering design situations.

B. Course Outcomes: After completion of this course student will be able to:

[CS1501.1] Analyse worst-case running times of algorithms using asymptotic analysis.
[CS1501.2] Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm.
[CS1501.3] Design dynamic-programming algorithms, and analyse them to enhance entrepreneurship skills.
[CS1501.4] Synthesize efficient greedy algorithms in common engineering design situations to enhance employment skills.
[CS1501.5] 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] 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]: 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. 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.**

Pre-requisite(s): Programming in C [CS 1101] and Data Structures [CS 1301]

E. 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.

F. Reference Book:

R1. A. V. Aho, J. E. Hopcroft and J. D. Ullman, "*The Design and Analysis of Computer Algorithms"*, 1st Edition, Pearson Education, 1999.

G. Lecture Plan:

Lec #	TOPICS	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1.	Introduction to Algorithms, Specification of Algorithm, Complexity	Acquaint to the subject, requirement of the subjects and recall the concepts related to algorithms	Slides / Black Board	1501.1	Quiz 1 and Sessional-I and End-Sem
2.	Asymptotic Notation- Analysis of Algorithm,	Define Asymptotic notation and understand its significance	Slides / Black Board	1501.1	Quiz 1 and Sessional-I and End-Sem
3.	Time & Space Complexity – Hands-on	Practice Complexity analysis on standard algorithms	Slides / Black Board	1501.1	Quiz 1 and Sessional I and End-Sem
4.	Insertion Sort and Analysis, QA-Discussions	Recall Insertion sort algorithm, Analysis of algo using step count method and representation in asymptotic notation	Slides / Black Board	1501.1	Quiz 1 and Sessional-I and End-Sem
5.	Selection Sort and Bubble Sort Analysis, QA-Discussions	Practice step count method on selection and bubble sort	Slides / Black Board	1501.1	Quiz 1 and Sessional-I and End-Sem
6.	Divide and Conquer: Merge Sort and Analysis, QA-Discussions	Describe the divide-and-conquer paradigm using merge sort and Analyse its time and space complexity	Slides / Black Board	1501.2	Quiz 1 and Sessional-I and End-Sem

7.	Quick Sort and Analysis,	Design quick sort algorithm and analyse it	Slides / Black Board	1501.2	Quiz 1 and Sessional-I and End-Sem
8.	Master Theorem and its cases	Define master theorem for a quick analysis of recursive algorithm	Slides / Black Board	1501.2	Quiz 2 and Sessional-I and End-Sem
9.	Randomized Quick sort Analysis	Describe Randomization- a different design paradigm and its effect on complexity	Slides / Black Board	1501.2	Quiz 2 and Sessional-I and End-Sem
10.	Heap Sort - Insertion, Deletion – Analysis	Describe heap data structure and use of it in sorting.	Slides / Black Board	1501.2	Quiz 2 and Sessional-I and End-Sem
11.	Heap Sort- Priority Queue	Apply Heap sort for maintain priority queue	Slides / Black Board	1501.2	Quiz 2 and Sessional-I and End-Sem
12.	Heap - Insertion, Deletion – Analysis	Describe other operation on Heap and analyse	Slides / Black Board	1501.2	Quiz 2 and Sessional-I and End-Sem
13.	Strassen's Matrix Multiplication	Apply dive and conquer paradigm on matrix multiplication and introduction to different algo strassesn's method and compare time complexity	Slides / Black Board	1501.2	Quiz 2 and Sessional-I and End-Sem
14.	Greedy Paradigm - Introduction, Coin Change Problem	Describe greedy paradigm of algorithm design and understand concept with example	Slides / Black Board	1501.4	Quiz 3 and Sessional-I and End-Sem
15.	Job Sequencing with deadline, Interval Scheduling Problem (Given as Assignment)	Devise algorithm using Greedy paradigm	Slides / Black Board	1501.4	Quiz 3 and Sessional-I and End-Sem
16.	Knapsack-problem,	Define knapsack problem, device algorithm using Greedy paradigm	Slides / Black Board	1501.4	Quiz 3 and Sessional-I and End-Sem
17.	Optimal Merge tape, Huffman Encoding	Synthesize algorithm using greedy paradigm anf analyse it	Slides / Black Board	1501.4	Quiz 3 and Sessional-I and End-Sem

18.	Spanning Trees - MST	Define Problem Minimum spanning tree and its usage	Slides / Black Board	1501.4	Quiz 3 and Sessional-1 and End-Sem
19.	Prim's, Algorithm	Synthesize algorithm using prim's method based on greedy paradigm and analyse it	Slides / Black Board	1501.4	Quiz 3 and Sessional-2 and End-Sem
20.	Kruskal's Algorithm	Synthesize algorithm using Kruskal's method based on greedy paradigm and analyse it	Slides / Black Board	1501.4	Quiz 3 and Sessional-2 and End-Sem
21.	Dijkstra's Algorithm-SSSP	Define Single sourse shortest path problem. Synthesize algorithm using Dijkstra's method based on greedy paradigm and analyse it	Slides / Black Board	1501.4	Quiz 3 and Sessional-2 and End-Sem
22.	Graph Search Algorithm - BFS/ DFS	Explain graph search algorithm and their analysis	Slides / Black Board	1501.4	Quiz 4 and Sessional-2 and End-Sem
23.	Topological Sort,	Understand the need of topological sort method and its algorithm	Slides / Black Board	1501.4	Quiz 4 and Sessional-2 and End-Sem
24.	Bellman Ford Algorithm	Understand Bellman ford algorithm and its merit and demerit	Slides / Black Board	1501.4	Quiz 4 and Sessional-2 and End-Sem
25.	Connected Components, Bi-connected Components	Understand Biconnected components, concept and algo to find articulation points	Slides / Black Board	1501.4	Quiz 4 and Sessional-2 and End-Sem
26.	Introduction to Dynamic Programming-	Describe the dynamic-programming paradigm	Slides / Black Board	1501.3	Quiz 5 and Sessional-2 and End-Sem
27.	Top Down Fibonacci, Binomial Coefficient	explain when an algorithmic design situation calls for DP. Recite algorithms that employ this paradigm. Synthesize dynamic-	Slides / Black Board	1501.3	Quiz 5 and Sessional-2 and End-Sem

		programming algorithms, and analyze them.			
28.	Bottom up Binomial Coefficient, Dynamic Knapsack,	Recite algorithm for Dynamic Knapsack that employ this paradigm. Synthesize dynamic-programming algorithms, and analyze them.	Slides / Black Board	1501.3	Quiz 5 and Sessional-2 and End-Sem
29.	Longest Integer Sequence, Longest Common Subsequence	Recite algorithms that employ this paradigm. Synthesize dynamic-programming algorithms, and analyze them.	Slides / Black Board	1501.3	Quiz 5 and Sessional-2 and End-Sem
30.	Multi-Stage Graph	Recite algorithms that employ this paradigm. Synthesize dynamic-programming algorithms, and analyze them.	Slides / Black Board	1501.3	Quiz 5 and Sessional-2 and End-Sem
31.	Floyd Warshal Algorithm – All pair of shortest path	Recite algorithms that employ this paradigm. Synthesize dynamic-programming algorithms, and analyze them.	Slides / Black Board	1501.3	Quiz 5 and Sessional-2 and End-Sem
32.	Matrix Chain Multiplication	Recite algorithms that employ this paradigm. Synthesize dynamic-programming algorithms, and analyze them.	Slides / Black Board	1501.3	Quiz 6 and Sessional-2 and End-Sem
33.	TSP- DP method	Recite algorithms that employ this paradigm. Synthesize dynamic-programming algorithms, and analyze them.	Slides / Black Board	1501.3	Quiz 6 and Sessional-2 and End-Sem

34.	OBST-Optimal Binary Search Tree	Recite algorithms that employ this paradigm. Synthesize dynamic-programming algorithms, and analyze them.	Slides / Black Board	1501.3	Quiz 6 and Sessional-2 and End-Sem
35.	Backtracking Intro – Problems	Describe Concept of Backtracking and its need	Slides / Black Board	1501.3	Quiz 6 and Sessional-2 and End-Sem
36.	Graph Coloring, M-Graph Coloring	Recite algorithms that employ this paradigm. Synthesize backtracking algorithms, and analyze them.	Slides / Black Board	1501.5	Quiz 6 and Sessional-2 and End-Sem
37.	Sum of Subset Problem	Recite algorithms that employ this paradigm. Synthesize backtracking algorithms, and analyze them.	Slides / Black Board	1501.5	Quiz 6 and End-Sem
38.	N-Queen Problem	Recite algorithms that employ this paradigm. Synthesize backtracking algorithms, and analyze them.	Slides / Black Board	1501.5	Quiz 6 and End-Sem
39.	Sudoku Game - Design & Implementation (Given as an assignment)	Recite algorithms that employ this paradigm. Synthesize backtracking algorithms, and analyze them.	Slides / Black Board	1501.5	Quiz 6 and End-Sem
40.	Branch & Bound – Knapsack	Describe Branch and Bound Algorithm paradigm	Slides / Black Board	1501.5	Quiz 6 and End-Sem
41.	Branch & Bound - Job Assignment	Recite algorithms that employ this paradigm. Solve problem using branch and	Slides / Black Board	1501.5	End-Sem

		bound algorithms, and analyze them.			
42.	15 Puzzle Problem (Given as an assignment)	Recite algorithms that employ this paradigm. Solve problem using branch and bound algorithms, and analyze them.	Slides / Black Board	1501.5	End-Sem
43.	Branch & Bound – TSP	Recite algorithms that employ this paradigm. Solve problem using branch and bound algorithms, and analyze them.	Slides / Black Board	1501.5	End-Sem
44.	String Matching – Meaning and Application	Describe concept of string Matching .	Slides / Black Board	1501.5	End-Sem
45.	Naïve String Matching, Rabin Karp Algorithm	Synthesize effiencient method using Rabin Karp algo	Slides / Black Board	1501.5	End-Sem
46.	Knuth-Morris-Pratt (KMP) Algorithm	Understand KMP algo and analyse it	Slides / Black Board	1501.5	End-Sem
47.	Randomization & Approximation Algorithm	Understand concept of Randomization and approximation and their impact on time complexity	Slides / Black Board	1501.5	End-Sem
48.	Randomization & Approximation Algorithm	Understand concept of Randomization and approximation and their impact on time complexity	Slides / Black Board	1501.5	End-Sem

H. Course Evaluation:

Criteria	Description	Date	Maximum Marks
	Sessional Exam I (Closed Book)	Sept 5 – Sept 7, 2019	15

Internal Assessment (Summative)	Sessional Exam II (Closed Book)	Nov 4 –Nov 6, 2019	15
	Quizzes and Assignments (Accumulated and Averaged)	Regularly	30
End Term Exam (Summative)	End Term Exam (Closed Book)	Nov 29 – Dec 12, 2019	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.		

I. **Make-up Policy:** No–makeup will be entertained. However, special sanction can be made based strictly on the merit of the case.

J. **Chamber Consultation:** Individual Instructor Will Announce Separately in his/her Assigned Section

K. **Notice:** All notices for this course will be displayed at the **notice board** only.

L. **Consultancy Hours:** *To be Announced in Class*

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

Course Out-Comes	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO 2	PSO 3
[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 improve employment skills.			2						1	2			1		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

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: B.Tech 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

[CS1505.1]. Understand alphabet, strings, language and build regular expression and applying these concepts to construct finite automata.

[CS1505.2]. Compare the characteristics of different types of formal languages and grammars as mentioned in Chomsky Hierarchy and to build push down automata.

[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.

[CS1505.4]. Inspect the performance of each phase of a compiler and compare the working principles of different types of parsers.

[CS1505.5]. 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]: 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
	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
[CS 1505.1]	Understand alphabet, strings, language and build regular expression and applying these concepts to construct finite automata.	3	3	3	3		1		1				1	3	2	
[CS 1505.2]	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		
[CS 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.	3	3	3	3		2		1	1		1	1	3	2	1
[CS 1505.4]	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	3	
[CS 1505.5]	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	1	2	3

MANIPAL UNIVERSITY JAIPUR

School of Computing and IT, Dept. of Information Technology

Course Hand-out

Software Engineering & Project Management| **IT 1502** | 4 Credits | 3 1 0 4

Session: July 19 – Nov 19 | Faculty: Ms Kavita, Ginika Mahajan, Bhavna Saini | Class: B. Tech IT (V Sem)

A. Introduction: This course is offered by Dept. of Information Technology as a core course, targeting students who wish to pursue research and software development in industries or higher studies in the field of Software Engineering including Project Planning and Monitoring, Methodologies and standard Notations, Requirement gathering and Analysis, Principle of Software Architecture and Design, Software coding, Reusability, Principle of Software Testing, Re-engineering, Reverse Engineering, Software quality and Reliability, Implementation and Maintenance of software. Today current software industry-strengthen on object oriented programming languages, technologies and systems feature highly in the practical components, electives and projects of the course.

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

[IT 1502.1]	Describe basic concept related to software engineering Methods, tool, Process Model and use them in software project.
[IT 1502.2]	Apply different Estimation Techniques based on project Metrics, Measures and indicators.
[IT 1502.3]	Design software and architecture at different detail levels based on requirements for software projects.
[IT 1502.4]	Demonstrate the Testing methods and their procedures to implement in any project.
[IT 1502.5]	Assess maintenance of the software projects.

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 analyse 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]. **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

Program Specific Outcomes

[PSO.1]. Apply creativity in support of the design, simulation, implementation and inference of existing and advanced technologies.

[PSO.2]. Participate & succeed in IT oriented jobs/competitive examinations that offer inspiring & gratifying careers.

[PSO.3]. 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 (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

E. SYLLABUS

Introduction: Introduction to Software Engineering, Software Components Software Myths, Software Crises, Characteristic. Software Engineering Processes, Water Fall Model, Prototype Model, Spiral Model, Agile method SRS Document, IEEE Standards for SRS, Project Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO) and its types, Function point, Reusability, Object Points, The Early Design Model, Post Architecture Model, The Putnam Resource Allocation Model, Risk Management; **Architectural Design**, Low Level Design Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion. Measures; Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design, Coding Techniques, Case Study. UML diagrams with Case Study; **Metrics** Definition, Categories of Metrics, Token Count, Case Study. Testing objectives, Testing and debugging, Test metrics and measurements, Verification & Validation, Fault, Failure, Types of testing, Software defect tracking, Black box testing, Code coverage testing, White Box testing, Boundary value analysis, Equivalence partitioning, state/graph based testing, Model based testing and model checking, Case Study; **Maintenance** Need for Maintenance Preventive, Corrective and Perfective Maintenance, Cost of Maintenance Software Re-Engineering, Reverse Engineering. Product Quality, Process Quality, SEI capability maturity model, Verification and Validation, SQA Plans, Software Quality Frameworks, Bohem Quality Model, ISO 9000 Models.

F. TEXT BOOKS

T1. R. S. Pressman, "*Software Engineering: A Practitioners Approach*", McGraw Hill, 2009.
T2. R. Mall, "*Fundamentals of Software Engineering"*, PHI Publication, 2014.
T3. K. K. Aggarwal and Y. Singh, "*Software Engineering*", New Age International Publishers, 2008.
T4. P. Jalote, "*Software Engineering*", Wiley, 2010.

G. REFERENCE BOOKS

R1. C. Ghezzi, M. Jarayeri and D. Manodrioli, "*Fundamentals of Software Engineering*", PHI Publication, 2002.
R2. I. Sommerville, "*Software Engineering*", Addison Wesley, 2013.
R3. K aleh," *Software Engineering*", Cengage Learning, 2010.
R4. P. Fleeger, "*Software Engineering"*, Macmillan Publication, 2009.

H. Lecture Plan:

Lecture No.	Topics	Session outcome	Mode of delivery	Corresponding CO	Mode of Assessing the outcome
1	Introduction to Software Engineering,	To explain teachers expectations and understand student expectations	Lecture	NA	Mid Term 1 End Term Class Quiz
2	Software Components ,Software Myths,	Analyze types of software and myths associated with them.	Lecture	IT1502.1	Mid Term 1 End Term Class Quiz
3	Software Crises ,Characteristic	Analyze crises and properties.	Lecture	IT1502.1	Mid Term 1 End Term Class Quiz
4	Software Engineering Processes,	Explanation of software development process.	Lecture	IT1502.1	Mid Term 1 End Term Class Quiz
5	Water Fall Model, Prototype Model,	Choose between process Models	Lecture	IT1502.1	Mid Term 1 End Term Class Quiz
6	Spiral Model,	Define spiral model	Lecture	IT1502.1	Mid Term 1 End Term Class Quiz
7	Agile method, Scrum Method	Apprise Agile process models and its adaptive software development using Extreme programming	Lecture	IT1502.1	Mid Term 1 End Term Class Quiz
8	Analysis, Documentation	Illustrate methods of Requirement Engineering, Type of requirements	Lecture	IT1502.1	Mid Term 1 End Term Class Quiz
9	Review and Management of User Needs,	Analyse the requirements	Lecture	IT1502.1	Mid Term 1 End Term Class Quiz
10,11	Data Flow Diagrams,	Design Data flow diagram	Lecture	IT1502.1	Mid Term 1 End Term Class Quiz
12	Case Study on Data Flow Diagrams, Entity Relationship Diagrams	Develop DFD and ER diagram for case study.	Flipped class	IT1502.1	Mid Term 1 End Term Class Quiz

13	Case Study on Entity Relationship Diagrams, Decision Tables With Case Study	Develop ER diagram and decision tables with case study.	Flipped class	IT1502.1	Mid Term 1 End Term Class Quiz
14	SRS Document, IEEE Standards for SRS	Illustrate software requirements specifications	Lecture	IT1502.1	Mid Term 1 End Term Class Quiz
15	Tutorial- Case Study	SRS for project scenarios	Activity	IT1502.1	Mid Term 2 End Term Class Quiz
16	Project Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration	Evaluate the size of project, cost, efforts and duration using LOC Estimation	Lecture	IT1502.2	Mid Term 2 End Term Class Quiz
17	Basic Constructive Cost Models (COCOMO)	Apply Cost Estimation techniques in software projects	Lecture	IT1502.2	Mid Term 2 End Term Class Quiz
18	Intermediate Constructive Cost Models (COCOMO) and its types,	Effort Estimation- using COCOMO Model	Lecture	IT1502.2	Mid Term 2 End Term Class Quiz
19	Constructive Cost Models (COCOMO)-II)- Early Design Model , Post Architecture Model	Effort Estimation- using COCOMO Model	Lecture	IT1502.2	Mid Term 2 End Term Class Quiz
20	Tutorial - Case Study	Evaluate Cost for case study	Activity	IT1502.2	Mid Term 2 End Term Class Quiz
21	Effort Estimation using Number of Object Points ,Function Points	Apply Function Count method	Lecture	IT1502.2	Mid Term 2 End Term Class Quiz
22	The Putnam Resource Allocation Model- The Norden / Rayleigh Curve	Identify the resources using Putnam model	Lecture	IT1502.2	Mid Term 2 End Term Class Quiz
23	The Putnam Resource Allocation Model- Manpower Build up	Identify the resources and manpower using Putnam model	Lecture	IT1502.2	Mid Term 2 End Term Class Quiz
24	Tutorial - Case Study	Measure resource allocation for practice examples.	Activity	IT1502.2	Mid Term 2 End Term Class Quiz
25	Architectural Design, Low Level Design Modularization	Compare architectural design	Lecture	IT1502.3	Mid Term 2 End Term Class Quiz
26	Design Structure Charts, Pseudo Codes, Flow Charts	Develop structure chart, flow chart and pseudo codes.	Lecture	IT1502.3	Mid Term 2 End Term Class Quiz

27	Coupling and Cohesion Measures,	Explain Modularity approaches.	Lecture	IT1502.3	Mid Term 2 End Term Class Quiz
28,29	Function Oriented Design, Object Oriented Design	Distinguish software design approach	Lecture	IT1502.3	Mid Term 2 End Term Class Quiz
30	Top-Down and Bottom-Up Design, Coding Techniques	Compare design strategies	Lecture	IT1502.3	Mid Term 2 End Term Class Quiz
31, 32	UML diagram – Use Case diagram , Class diagram , Sequence diagram	Apply Unified modeling language and develop UML Diagrams	Lecture	IT1502.3	Mid Term 2 End Term Class Quiz
33,34	Activity diagram, Collaboration	Develop Activity diagram and collaboration diagram	Lecture	IT1502.3	Mid Term 2 End Term Class Quiz
35	State , Component	Develop State chart and component diagram	Lecture	IT1502.3	Mid Term 2 End Term Class Quiz
36	Package and deployment diagram	Develop package and deployment diagram	Lecture	IT1502.3	Mid Term 2 End Term Class Quiz
37	Tutorial - Case Study	Design case study based UML diagrams.	Activity	IT1502.3	End Term Class Quiz
38,39	Definition, Categories of Metrics, Token Count	Define matrix and types along with the size matrix.	Lecture	IT1502.2	End Term Class Quiz
40	Coupling Metrics	Measure the degree of independence among modules from coupling matrix	Lecture	IT1502.2	End Term Class Quiz
41	Cohesion Metrics	Measure the degree of independence with in the module from cohesion matrix	Lecture	IT1502.2	End Term Class Quiz
42,43	Web Engineering Project Metrics	Measure the web attributes.	Lecture	IT1502.2	End Term Class Quiz
44, 45	Black box testing, Code coverage testing, White Box Testing, Testing objectives	Experiment with functional Testing (black Box) and Experiment with Structural Testing (White box).	Lecture	IT1502.4	End Term Class Quiz
46	Testing and debugging , Test metrics and measurements,	Choose Debugging tools and techniques	Lecture	IT1502.4	End Term Class Quiz

47	Verification & Validation, Fault , Failure	Determine the terminologies	Lecture	IT1502.4	End Term Class Quiz
48	Need for Maintenance	Identify characteristics of software maintenance,	Lecture	IT1502.5	End Term Class Quiz Home assignment
49	Categories of Maintenance**:** Preventive,	Software maintenance processes model	Lecture	IT1502.5	End Term Class Quiz
50	Corrective and Perfective Maintenance	Software maintenance processes model and types	Lecture	IT1502.5	End Term End Term Class Quiz
Total	50 Lectures				

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
[IT1502.1]	Describe basic concept related to software engineering Methods, tool, Process Model and use them in software project.	2			3	1			1	1				1		1
[IT1502.2]	Apply different Estimation Techniques based on project Metrics, Measures and indicators.		2									1				2
[IT1502.3]	Design software and architecture at different detail levels based on requirements for software projects.				2						1		2	3	2	
[IT1502.4]	Demonstrate the Testing methods and their procedures to implement in any project.	2		3								2			2	
[IT1502.5]	Assess maintenance of the software projects.							1		2		3	2	1		

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Department of Information Technology

Data Communications | IT 1504 | 4 Credits | 3 1 0 4

Session: July 2019 – Dec 2019 | Faculty: Dr Anju Yadav, Krishna Kumar | Class: B.Tech V Semester

A. Introduction:

This course provides students with the fundamental concepts and techniques used for communicating data in efficient and reliable manner. The student will be able to gain practical understanding of relevant terminology and describe various encoding techniques, flow & error control mechanisms, 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

[IT1504.1]: 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.

[IT1504.2]: 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.

[IT1504.3]: 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.

[IT1504.4]: Discuss and distinguish between different types of multiplexing techniques and spread spectrum techniques.

[IT1504.5]: 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)

On successful completion of B.Tech. in Information Technology, the student:

PSO1. Should be able to apply creativity in support of the design, simulation, implementation and inference of existing and advanced technologies.

PSO2. Should be able to participate & succeed in IT oriented jobs/competitive examinations that offer inspiring & gratifying careers.

PSO3. Should be able 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 (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

T1. W. Stallings, "Data and Computer Communications", 9th Edition, Pearson Education, 2010

G. Reference Books

R1. B. Forouzan, "Data communication & networking" Fifth Edition. TMH, 2012.
R2. L. Peterson and T. Davie "*Computer Networks: A Systems Approach*" Fifth Edition, Morgan Kaufmann Publishers, 2012.
R3. R. Stevens, *"TCP/IP Illustrated*", Addison-Wesley Publication, 2011.

H. Lecture Plan

Lecture No.	Major Topics	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1.	Introduction to Data Communication	Data, Data Communication, Data Network, Internet	Classify, Compare & recall different data communication model	Lecture	NA	NA
2.		Need of Layered Protocol Architecture (OSI &TCP/IP)	Compare OSI & TCP/IP Model	Lecture	NA	NA
3.		TCPIP - Layers and its Functioning, *PO* and *PSO* discussion	Classify and Compare different Data communication Model.	Lecture & Activity	NA	NA
4.	Data Transmission: Concepts and Terminology	Concepts and Terminology – Simplex, Half-Duplex, Full-Duplex, Frequency, Bandwidth	Classify and Compare 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	Understand time domain and frequency domain concepts	Lecture & Problem Solving Practice	[1504.1]	Class Quiz Mid Term - I End Term

6.	Analog and Digital Data Transmission	Analog and Digital Data and Signals,	Understand the transmission of digital & analog signals over different types of transmission media	Lecture	[1504.1]	Class Quiz Mid Term - I End Term
7.		Analog and Digital Transmission	Understand the transmission of digital & analog signals over different types of transmission media	Lecture	[1504.1]	Class Quiz Mid Term - I End Term
8.	Transmission Impairments	Attenuation, Delay Distortion, Noise	Understand the concepts of the effects of various transmission impairments on analog & digital transmission.	Lecture & Problem Solving Practice	[1504.1]	Class Quiz Mid Term - I End Term
9.	Channel Capacity	Data Rate and Nyquist Bandwidth	Understand the Data Rate and Nyquist Bandwidth	Lecture	[1504.2]	Class Quiz Mid Term - I End Term
10.		Shannon Capacity Formula	Understand the Shannon Capacity Formula	Lecture & Problem Solving Practice	[1504.2]	Class Quiz Mid Term - I End Term

11.	Transmission Media: Guided Transmission Media	Twisted Pair & CAT Types	Understand types of transmission Media	Lecture & Activity	[1504.2]	Class Quiz Mid Term - I End Term
12.		Coaxial Cable, Optical Fiber	Understand properties of Coaxial cable and optical fiber	Lecture	[1504.2]	Class Quiz Mid Term - I End Term
13.	Wireless Transmission	Antennas , Terrestrial Microwave	Understand antennas and terrestrial microwave	Lecture	[1504.2]	Class Quiz Mid Term - I End Term
14.		Satellite Microwave, Broadcast Radio, Infrared	Understand Microwave and infrared	Lecture & Problem Solving Practice	[1504.2]	Class Quiz Mid Term - I End Term
15.	Wireless Propagation	Ground Wave Propagation, Sky Wave Propagation	Understand the Ground Wave Propagation, Sky Wave Propagation	Lecture & Activity	[1504.2]	Class Quiz Mid Term - I End Term
16.		Line-of-Sight Propagation	Understand the line–of-sight propagation	Lecture & Problem Solving Practice	[1504.2]	Class Quiz Mid Term - I End Term

17.	Line-of-sight Propagation	Free Space Loss	Understand free space loss	Lecture & Problem Solving Practice	[1504.2]	Class Quiz Mid Term - I End Term
18.		Atmospheric Absorption, Multipath, Refraction	Understand atmospheric Absorption, Multipath ,Refraction	Lecture	[1504.2]	Class Quiz Mid Term - I End Term
19.	Signal Encoding Techniques: Digital-To-Digital Conversion	Analog and Digital Signals, Line Coding Schemes: Unipolar, Polar	Understand the principles of signal encoding techniques used for digital data to digital signal conversion and analog data to digital signal conversion and compare them.	Lecture & Problem Solving Practice	[1504.2]	Class Quiz Mid Term - I End Term
20.		NRZ & Bipolar – AMI	Understand the principles of signal encoding techniques used for digital data to digital signal conversion and analog data to digital signal conversion and compare them.	Lecture & Problem Solving Practice	[1504.2]	Class Quiz Mid Term - I End Term

21.		Biphase – Manchester & Differential Manchester	Understand the principles of signal encoding techniques used for digital data to digital signal conversion and analog data to digital signal conversion and compare them.	Lecture & Problem Solving Practice	[1504.2]	Class Quiz Mid Term - I End Term
22.		Modulation Rate and Scrambling Techniques	Understand modulation rate and scrambling technique	Lecture & Problem Solving Practice	[1504.2]	Class Quiz Mid Term - I End Term
23.	Digital Data – Analog Signal	ASK & FSK	Understand ASK & FSK	Lecture	[1504.2]	Class Quiz Mid Term - I End Term
24.		PSK – BPSK	Understand PSK-BPSK	Lecture	[1504.2]	Class Quiz Mid Term - I End Term

25.		MFSK	Understand the MFSK	Lecture	[1504.2]	Class Quiz Mid Term - I End Term
26.		QAM	Understand QAM	Lecture	[1504.2]	Class Quiz Mid Term - I End Term
27.	Analog-To-Digital Conversion	Pulse Code Modulation	Understand the concept of PCM for analog to digital data conversion	Lecture & Problem Solving Practice	[1504.2]	Class Quiz Mid Term - I End Term
28.		Delta Modulation	Understand the concept of DM for analog to digital data conversion	Lecture	[1504.2]	Class Quiz Mid Term - I End Term
29.	Digital Data Communication Techniques	Asynchronous and Synchronous Transmission	Understand Asynchronous and Synchronous Transmission	Lecture	[1504.3]	Class Quiz Mid Term - I End Term
30.		Type of Error, Redundancy, Detection Vs Correction	Understand the types of error	Lecture	[1504.3]	Class Quiz Mid Term - II End Term

31.		Cyclic Redundancy Check	Understand the concepts of CRC and interprets how to calculate the CRC	Lecture	[1504.3]	Class Quiz Mid Term - II End Term
32.		Polynomials & CRC Architecture	Understand the concepts of CRC and interprets how to calculate the CRC	Lecture & Problem Solving Practice	[1504.3]	Class Quiz Mid Term - II End Term
33.		Error Correction and Block Code Principle	Understand concepts of Block Code	Lecture & Problem Solving Practice	[1504.3]	Class Quiz Mid Term - II End Term
34.		Line Configurations	Understand the process of Line Configuration	Lecture	[1504.3]	Class Quiz Mid Term - II End Term
35.	Data Link Control Protocols	Framing	Understand different methods of Framing	Lecture	[1504.3]	Class Quiz Mid Term - II End Term
36.		Flow Control - Stop-and-Wait Protocol	Understand Flow Control and Stop and Wait Protocol	Lecture & Problem Solving Practice	[1504.3]	Class Quiz Mid Term - II End Term

37.		Sliding Window	Understand Sliding window protocol	Lecture & Problem Solving Practice	[1504.3]	Class Quiz Mid Term - II End Term
38.		Error Control: Stop-and-Wait ARQ	Understand concepts of Error Control	Lecture & Problem Solving Practice	[1504.3]	Class Quiz Mid Term - II End Term
39.		Go-Back-N ARQ	Understand Go-Back-N ARQ protocol	Lecture & Problem Solving Practice	[1504.3]	Class Quiz Mid Term - II End Term
40.		Selective Repeat ARQ	Understand Selective Repeat ARQ protocol	Lecture & Problem Solving Practice	[1504.3]	Class Quiz Mid Term - II End Term
41.		High-Level Data Link Control (HDLC)	Understand the format of High-Level Data Link Control (HDLC)	Lecture	[1504.3]	Class Quiz Mid Term - II End Term
42.	Multiplexing	Introduction to Multiplexing	Understand Multiplexing	Lecture	[1504.4]	Class Quiz Mid Term - II End Term

43.		Frequency Division Multiplexing (FDM)	Understand Frequency Division Multiplexing (FDM)	Lecture	[1504.4]	Class Quiz Mid Term - II End Term
44.		Time-Division Multiplexing (TDM)	Understand the Time-Division Multiplexing (TDM)	Lecture & Activity	[1504.4]	Class Quiz Mid Term - II End Term
45.	Spread Spectrum	The Concept of Spread Spectrum	Understand different strategies of Spread Spectrum	Lecture	[1504.4]	Class Quiz Mid Term - II End Term
46.		Frequency Hopping Spread Spectrum (FHSS)	Understand Frequency Hopping Spread Spectrum (FHSS)	Lecture	[1504.4]	Class Quiz Mid Term - II End Term
47.		Slow and Fast FHSS	Understand the Slow and Fast FHSS	Lecture & Problem Solving Practice	[1504.4]	Class Quiz Mid Term - II End Term
48.		Direct Sequence Spread Spectrum (DSSS)	Understand and Direct Sequence Spread Spectrum (DSSS)	Lecture & Problem Solving Practice	[1504.4]	Class Quiz Mid Term - II End Term

49.		Performance Consideration – FHSS and DSSS	Understand and summarize the Performance Consideration – FHSS and DSSS	Lecture	[1504.4]	End Term
50.		Code Division Multiple Access (CDMA)	Understand the Code Division Multiple Access (CDMA)	Lecture & Problem Solving Practice	[1504.4]	End Term
51.	Cellular Wireless Communication Techniques	Introduction, Generations: 1G, 2G, 3G,	Understand the concept of 1G, 2G, 3G,	Lecture	[1504.5]	End Term
52.		4G, and 5G	Understand the concept of 4G, 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	
[IT1504.1]	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	2	1		
[IT1504.2]	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	1		
[IT1504.3]	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	
[IT1504.4]	Distinguish between different types of multiplexing techniques and spread spectrum techniques.	2								1	2			2	1		
[IT1504.5]	Identify and compare various generations of wireless cellular networks.	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 Engg.

Course Hand-out

Design & Analysis of Algorithm Lab | CS1530 | 1 Credit | 0 0 2 1

sion: July 19 – Nov 19 | Dr. Pratistha Mathur, Dr. Ashish Jain & Dr. N. N. Das | Class: B.Tech V

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

[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. Program Specific Outcomes (PSOs)

At the end of the B Tech CSE 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.

E. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Continuous Assessments	70
External Exam(Summative)	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.	

F. SYLLABUS

Review of Algorithm and write a programs on Sorting Method, Greedy approach, Dynamic programming, Trees, Graphs, Branch & Bound using C language.

G. 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.

H. Reference Book:

R1. A. V. Aho, J. E. Hopcroft and J. D. Ullman, "*The Design and Analysis of Computer Algorithms*", 1st Edition, Pearson Education, 1999.

.

H.LAB PLAN

Lec No	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Assessing the Outcome
a)	**Searching**	Programs based on Iterative Binary Search	Lab	CS1530.1 CS1530.3	Internal Evaluation Home Assignments External Evaluation
b)		Programs based on Recursive Binary Search	Lab	CS1530.1 CS1530.3	Internal Evaluation Home Assignments External Evaluation
c)	**Sorting**	Programs to implement Insertion Sort	Lab	CS1530.1 CS1530.3	Internal Evaluation Home Assignments External Evaluation
d)		Programs to implement Selection Sort	Lab	CS1530.1 CS1530.3	Internal Evaluation Home Assignments External Evaluation
e)		Programs to implement Merge Sort	Lab	CS1530.1 CS1530.3	Internal Evaluation Home Assignments External Evaluation
f)		Programs to implement Quick Sort	Lab	CS1530.1 CS1530.3	Internal Evaluation Home Assignments External Evaluation
g)	Heap	HeapSort –	Lab	CS1530.1 CS1530.3	Internal Evaluation Home Assignments External Evaluation
h)		Programs based on Priority Queue	Lab	CS1530.1 CS1530.3	Internal Evaluation Home Assignments

					External Evaluation
i)	**Greedy method**	Programs to implement knapsack problem using greedy method.	Lab	CS1530.4	Internal Evaluation Home Assignments External Evaluation
j)		Programs to implement the single source shortest path problem using greedy method. (Dijkstra's).	Lab	CS1530.4	Internal Evaluation Home Assignments External Evaluation
k)	**Spanning Trees**	Kruskal's	Lab	CS1530.4 CS1530.2	Internal Evaluation Home Assignments External Evaluation
l)	**Graph**	Programs to implement following algorithms: Breadth first search Depth first search	Lab	CS1530.4 CS1530.2	Internal Evaluation Home Assignments External Evaluation
m)	**Dynamic Programming**	Write a implement algorithms:	Lab	CS1530.4	Internal Evaluation Home Assignments External Evaluation
n)		Write a program to implement longest integer sequence LIS.	Lab	CS1530.4	Internal Evaluation Home Assignments External Evaluation
o)		Write a program to implement longest common subsequence LCS.	Lab	CS1530.4	Internal Evaluation Home Assignments External Evaluation

p)		Write a program to implement Binomial Coefficient using Dynamic Programming.	Lab	CS1530.4	Internal Evaluation Home Assignments External Evaluation
q)		Write a program for solving travelling sales person problem using dynamic programming.	Lab	CS1530.4	Internal Evaluation Home Assignments External Evaluation
r)	**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. program that implements back tracking algorithm to solve the problem i.e., place eight non-attacking queens on the board.	Lab	CS1530.2	Internal Evaluation Home Assignments External Evaluation
s)	**Randomization**	Write a program to implement Randomized Quick sort.	Lab	CS1530.2	Internal Evaluation Home Assignments External Evaluation
t)		Write a program to implement Graph Coloring Problem.	Lab	CS1530.2	Internal Evaluation Home Assignments External Evaluation

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

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	PSO4
[CS1530.1	Explain basic concepts of various Algorithms and their Complexity.	2	1										1			1	
[CS1530.2]		1	2	3		1	1						1		1	2	2
[CS1530.3]	Describe and analyze various Notations, Recurrences and DAC approach, also used in sorting algorithms like merge sort, heap sort and quick sort etc and analyses of different cases.	1	3	2		1	2						2		1	2	2
[CS1530.4]	Analyze the applications of Greedy, Dynamic and Graph based techniques to solve given problems.	1	3	3	2	1	1								1	3	3

MANIPAL UNIVERSITY JAIPUR

School of Computing and IT

Department of Information Technology

Course Hand-Out

Software Engineering & Project Management Lab| IT1532 | Credit 1| 0 0 2 1

Session: July 19 - Nov 19 | Faculty: Ms Kavita, Ginika Mahajan, Bhavna Saini | Class: B.Tech IT (V Sem)

A. Introduction: The course if offered by Information technology Department, in this lab students will practice the software development life cycle phases including project management, requirements engineering, systems modelling, software design, prototyping, and testing using CASE tools within a team work environment. UML notation is covered in this lab as the modelling language for analysis and design.

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

[IT1532.1]	Discuss the software life cycle phases including project management, requirements engineering, software design, prototyping and testing.
[IT1532.2]	Apply Data Flow Diagram Model levels and Entity relationship diagram.
[IT1532.3]	Illustrate software design based on the software requirement specification.
[IT1532.4]	Design Software manual and automated test cases.

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**: Design 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**: 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, responsibilities and norms of the engineering practice.

[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] 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)	Continuous evaluation	70
End Term Exam (Summative)	End Term Practical 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

Design Strategies, 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, SQA plans.

F. Text Books

T1. R. S. Pressman, "Software Engineering: A Practitioners Approach", McGraw Hill, 2009.

G. References

R1. R. Mall, "Fundamentals of Software Engineering", PHI Publication, 2014.
R2. K. K. Aggarwal and Y. Singh, "Software Engineering", New Age International Publishers, 2008.

H. Lab Plan

Lab No.	Topics	Session Outcome	Mode Of Delivery	Corresponding Co	Mode Of Assessing The Outcome
1	Prepare Software Requirement Specification	Generate the requirement Specification Of Assigned Project.	Lab	IT1532.1	Internal Evaluation Home Assignment External Evaluation
2	Rational Rose introduction for UML diagrams	Use Rational Rose Tool To Design The UML Diagram.	Lab	IT1532.1	Internal Evaluation Home Assignment External Evaluation
3	DFD Model (Level 0, Level 1 and ER Diagram)	Apply Data Flow Diagram Based On Requirement Engineering Of Project	Lab	IT1532.2	Internal Evaluation Home Assignment External Evaluation
4	Use Case Diagram	Construct use Case Events In Use Case Diagram in Rational Rose.	Lab	IT1532.3	Internal Evaluation Home Assignment External Evaluation
5	Class Diagram	Construct class diagram In Rational Rose.	Lab	IT1532.3 IT1532.4	Internal Evaluation Home Assignment External Evaluation
6	Sequence Diagram	Design Sequence Diagram In Rational Rose.	Lab	IT1532.3 IT1532.4	Internal Evaluation Home Assignment External Evaluation
7	Activity Diagram	Develop Activity Diagram In Rational Rose.	Lab	IT1532.3 IT1532.4	Internal Evaluation Home Assignment External Evaluation
8	Collaboration Diagram/ Communication Diagram	Construct Collaboration Diagram/ Communication Diagram In Rational Rose.	Lab	IT1532.3 IT1532.4	Internal Evaluation Home Assignment External Evaluation

9	State Diagram And Interaction Diagram	Design State Diagram And Interaction Diagram In Rational Rose.	Lab	IT1532.3 IT1532.4	Internal Evaluation Home Assignment External Evaluation
10	Component Diagram And Deployment Diagram	Develop Component Diagram And Deployment Diagram In Rational Rose.	Lab	IT1532.3 IT1532.4	Internal Evaluation Home Assignment External Evaluation
11	Case Study On UML Diagram	Construct UML Diagram for different Projects	Lab	IT1532.3	Internal Evaluation Home Assignment External Evaluation
12	Test Cases	create Test Case And Apply On Software Code To Verify And Validate It	Lab	IT1532.5	Internal Evaluation Home Assignment External Evaluation
13	Manual Testing, Automated Testing	Create Test Case And Apply Manually Or Through Tool To Test The Software	Lab	IT1532.5	Internal Evaluation Home Assignment 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
[IT1532.1]:	Discuss the software life cycle phases including project management, requirements engineering, software design, prototyping and testing.	3	2						1	2	2	1			1	
[IT1532.2]:	Apply Data Flow Diagram Model levels and Entity relationship diagram.	1		3										3		
[IT1532.3]:	Illustrate software design based on the software requirement specification.		2	3		2					2	1		2		
[IT1532.4]:	Design Software manual and automated test cases.	3			1					2					2	2

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

Python Programming | IT 1552 | 3 Credits | 3 0 0 3

Session: July 19 – Dec 19 | Faculty: Dr. D. P. Sharma, Jaya Krishna R, Priyank Singh Hada, Dr. Geeta Rani, Anurag Bhatnagar |
Class: B.Tech V Semester Dep. Elective

A. Introduction: This course is offered by Dept. of Information Technology as a department elective, targeting students who wish to pursue research & development in industries or higher studies in field of Information Technology, including Python programming, numpy, pandas, matplotlib, scipy libraries and gives an introductory level to advanced level knowledge on implementation of data structures as well as data analytics. Students are expected to have background knowledge on problem solving techniques and object oriented concepts for a better learning.

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

[IT1552.1]. Acquire basic programming skills of Python programming.
[IT1552.2]. Illustrate the concept of file handling and exception handling.
[IT1552.3]. Implement the concept of re-usability in python.
[IT1552.4]. Understand and Implement the concept of analytics using python libraries like numpy, Pandas, scipy.
[IT1552.5]. Enhance skills required for employability or entrepreneurship.

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]: 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 (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.	
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

Python Concepts: Introduction to Python, Variables, Keywords, Identifiers, Literals, Operators, Comments; **Control Statement:** if, if else, else if, nested if, for loop, while loop, break, continue, pass; **Python OOPs**: OOPs Concepts, Object, Class, Constructors, Inheritance; **Data structures:** List, Tuple, Set, Dictionary; **Functions:** Functions overview, lambda function, Recursive functions, map, filter and reduce; **File and Exception handling:** Create a file, read and write operation with file, Introduction to Exceptions & Errors, Handling exceptions using try-except-else-finally; **Numpy:** Introduction to Numpy, indexing and Boolean indexing, Data types and Operations; **Pandas:** Pandas and its features, Creating Series and Data Frame with data inputs; **Matplotlib**: Matplotlib and its data visualization features, types of plots; **SciPy:** Introduction, characteristics and sub-packages of SciPy.

F. Text Books

T.1 W. McKinney, "*Python for Data Analysis: Data Wrangling with Pandas, NumPy, and Ipython*", Second Edition, O'Reilly, 2017.

T.2 A. Martelli, "*Python in a Nutshell*", Second Edition, O' Reilly, 2012.

T.3 J. Georzen, T. Bower, B. Rhodes, "*Foundations of Python Network Programming: The comprehensive guide to building network applications with Python*", Second Edition, Academic Press, 2010.

G. Reference Books

R.1 A. Geron, "*Hands-On Machine Learning with Scikit-Learn and Tensor Flow: Concepts, Tools, and Techniques to Build Intelligent Systems*", First Edition, O'Reilly, 2017.

R.2 D. M. Beazley, *"Python Essential Reference"*, Second Edition, Amazon Books, 2010.

H. Lecture Plan:

Lec No	**Topics**	**Mode of Delivery**	**Session Outcome**	**Corresponding CO**	**Mode of Assessing the Outcome**
1,2,3	Introduction to Python: Identifiers ,Variables, Keywords, Data types Literals, Operators, Comments	Lecture	Able to know Identifiers ,Variables, Keywords, Data types Literals, Operators, Comments	1552.1	Mid term I
		Lecture		1552.1	In Class Quiz (Not Accounted)
		Lecture		1552.1	In Class Quiz End Term
4	Control Statements: if, if else, else if, nested if, Reading and Writing on Console	Lecture	How to make Control Statements, read and display on screen	1552.1	Home Assignment End Term Mid Term I
5,6	Control Statements: for loop, while loop, break, continue, pass	Lecture	How iterators work	1552.1	In Class Quiz End Term Mid Term I
7	Strings	Lecture	Know about strings and their operations	1552.1	In Class Quiz Mid Term I End Term
8,9	List, Tuple	Lecture	Know about list, tuple and their operations	1552.3	Class Quiz Mid Term I End Term
10,11	Set, Dictionary(Mapping)	Lecture	Know about set, dictonary and their operations	1552.3	Class Quiz Mid Term I End term
12,13	Functions overview, lambda function, Recursive functions	Lecture	How to create functions and their usage	1552.1, 1552.3	Class Quiz End Term
14,15	Map, filter and reduce functions	Lecture	How to apply these functions	1552.1, 1552.3	Class Quiz Mid Term I End Term
16	OOPs Concepts	Lecture	Learn concepts of OOP	1552.2, 1552.5	Home Assignment Class Quiz Mid Term I End Term
17	Object, Class, Constructors	Lecture	Learn concepts of OOP	1552.2, 1552.5	Class Quiz Mid Term I End Term

18	Inheritance	Lecture	Learn concepts of OOP	1552.2, 1552.5	Class Quiz Mid Term I End Term
19,20	**File Handling:** Create a file, read and write operation with file	Lecture	Able to create a file and its operations	1552.4	Class Quiz Mid Term II End Term
21,22	**Exception Handling:** Introduction to Exceptions & Errors, Handling exceptions using try-except-else-finally	Lecture	Able to create exceptions and handle exceptions	1552.4	Class Quiz Mid Term II End Term
23,24,25	**Numpy:** Introduction to Numpy, indexing and Boolean indexing, Data types and Operations	Lecture	Apply and use Numpy framework for scientific calculations	1552.6	Class Quiz Mid Term II End Term
26,27,28	**Pandas:** Pandas and its features, Creating Series and Data Frame with data inputs	Lecture	Apply and use Pandas framework for scientific computations	1552.6	Class Quiz End Term
29, 30,31	**Matplotlib**: Matplotlib and its data visualization features, types of plots	Lecture	Apply and use Matplotlib framework for drawing charts	1552.6	Class Quiz End Term
32, 33,34	**SciPy:** Introduction, characteristics and sub-packages of SciPy	Lecture	Apply and use Scipy framework for scientific computations	1552.6	Class Quiz End Term
35, 36	Tutorial on various concepts	Lecture	Apply concepts in realtime problem solving	1552.6	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
[IT1552.1]	Acquire basic programming skills of Python programming.	1	3	1										1		
[IT1552.2]]	Illustrate the concept of file handling and exception handling.		1	3									1			
[IT1552.3]	Implement the concept of re-usability in python.		1	2	1										1	
[IT1552.4]	Understand and Implement the concept of analytics using python libraries like numpy, Pandas, scipy.			1						2	1	1			1	
[IT1552.5]	Enhance skills required for employability or entrepreneurship.			3	2										2	

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

Introduction to Python Programming | IT 1591 | 3 Credits | 3 0 0 3

Session: July 19 – Nov 19 | Faculty: Mr. Shashank Sharma | Class: B.Tech Open Elective (V/ VII Sem)

A. Introduction: This course is offered by Dept. of Information Technology as an Open elective, targeting students who wish to pursue research & development in industries or higher studies in field of Information Technology, including Python programming, numpy, pandas, matplotlib, scipy libraries and gives an introductory level to advanced level knowledge on implementation of data structures as well as data analytics. Students are expected to have background knowledge on problem solving techniques and object oriented concepts for a better learning.

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

[IT1552.1]. Synthesis of concepts and control structures of python.
[IT1552.2]. Deep analysis of object oriented concepts.
[IT1552.3]. Interpret and illustrate data structures like list, tuple, set in python.
[IT1552.4]. Illustrate the concept of file handling and exception handling.
[IT1552.5]. Implement the concept of re-usability by means of functions as well as objects in python.
[IT1552.6]. Synthesize and Implement the concept of analytics using python libraries like numpy, scipy.

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]: 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
	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

Python Concepts: Introduction to Python, Variables, Keywords, Identifiers, Literals, Operators, Comments; **Control Statement:** if, if else, else if, nested if, for loop, while loop, break, continue, pass; **Python OOPs**: OOPs Concepts, Object, Class, Constructors, Inheritance; **Data structures:** List, Tuple, Set, Dictionary; **Functions:** Functions overview, lambda function, Recursive functions, map, filter and reduce; **File and Exception handling:** Create a file, read and write operation with file, Introduction to Exceptions & Errors, Handling exceptions using try-except-else-finally; **Numpy:** Introduction to Numpy, indexing and Boolean indexing, Data types and Operations; **Pandas:** Pandas and its features, Creating Series and Data Frame with data inputs; **Matplotlib**: Matplotlib and its data visualization features, types of plots; **SciPy:** Introduction, characteristics and sub-packages of SciPy.

F. Text Books

T.1 W. McKinney, "*Python for Data Analysis: Data Wrangling with Pandas, NumPy, and Ipython*", Second Edition, O'Reilly, 2017.

T.2 A. Martelli, "*Python in a Nutshell*", Second Edition, O' Reilly, 2012.

T.3 J. Georzen, T. Bower, B. Rhodes, "*Foundations of Python Network Programming: The comprehensive guide to building network applications with Python*", Second Edition, Academic Press, 2010.

G. Reference Books

R.1 A. Geron, "*Hands-On Machine Learning with Scikit-Learn and Tensor Flow: Concepts, Tools, and Techniques to Build Intelligent Systems*", First Edition, O'Reilly, 2017.

R.2 D. M. Beazley, *"Python Essential Reference"*, Second Edition, Amazon Books, 2010.

H. Lecture Plan:

Lec No	**Topics**	**Session Outcome**	**Mode of Delivery**	**Corresponding CO**	**Mode of Assessing the Outcome**
1	Introduction	To acquaint and clear teacher expectations and understand student expectations	Lecture	1591.1	Mid term I
2	Python Variables, Keywords, Identifiers	Make student familiarize with python fundamentals	Lecture	1591.1	In Class Quiz (Not Accounted)
3	Literals, Operators, Comments	Make student familiarize with python structure	Lecture	1591.1	In Class Quiz End Term
4	Control Statements: if, if else, else if, nested if	Understanding of control structures	Lecture	1591.1	Home Assignment End Term
5,6,7	Control Statements: for loop, while loop, break, continue, pass	Recall the iterating structures	Lecture	1591.1	In Class Quiz End Term
8,9	List, Tuple	Introduce new data structures of python	Lecture	1591.3	Class Quiz Mid Term I End Term
10,11	Set, Dictionary(Mapping)	Introduce new data structures of python	Lecture	1591.3	Class Quiz Mid Term I End term
12	OOPs Concepts	Recall the OOP concepts	Lecture	1591.2, 1591.5	Home Assignment Class Quiz Mid Term I End Term
13	Object, Class, Constructors	Understanding of OOP's in python and how to use these structres	Lecture	1591.2, 1591.5	Class Quiz Mid Term I End Term
14,15	Inheritance	Infer the concept of inheritance and its usage	Lecture	1591.2, 1591.5	Class Quiz Mid Term I End Term
16,17	Functions overview, lambda function, Recursive functions	Recall the concept along with their usage criteria	Lecture	1591.1, 1591.3	Class Quiz End Term

18,19	Map, filter and reduce functions	Understanding of these functions along with their application area	Lecture	1591.1, 1591.3	Class Quiz Mid Term II End Term
20,21	**File Handling:** Create a file, read and write operation with file	Describe the file handling along with its usage	Lecture	1591.4	Class Quiz Mid Term II End Term
22,23	**Exception Handling:** Introduction to Exceptions & Errors, Handling exceptions using try-except-else-finally	Explain the working of exception handling along with their implementation	Lecture	1591.4	Class Quiz Mid Term II End Term
24,25,26	**Numpy:** Introduction to Numpy, indexing and Boolean indexing, Data types and Operations	Understanding of Panda along with its need and use with their implementation	Lecture	1591.6	Class Quiz Mid Term II End Term
27,28,29	**Pandas:** Pandas and its features, Creating Series and Data Frame with data inputs	Make student understand the need and use of Pandas along with their implementation	Lecture	1591.6	Class Quiz End Term
30,31,32	**Matplotlib**: Matplotlib and its data visualization features, types of plots	Infer the concept and how it is used for visualization in Data Science and Machine Learning domain	Lecture	1591.6	Class Quiz End Term
33,34,35	**SciPy:** Introduction, characteristics and sub-packages of SciPy	Make student understand the need and use of Scipy along with their implementation	Lecture	1591.6	Class Quiz End Term
36	Tutorial on various concepts	Make student familiarize with real world problems	Lecture	1591.6	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
[IT1591.1]	Understand concepts and control structures of python.	1	3	1										1		
[IT1591.2]	Describe a deep knowledge of object oriented concepts.		1	3									1			
[IT1591.3]	Interpret and illustrate data structures like list, tuple, set in python.		1	2	1										1	
[IT1591.4]	Illustrate the concept of file handling and exception handling.			1						2	1	1			1	
[IT1591.5]	Implement the concept of re-usability by means of functions as well as objects in python.			3	2										2	
[IT1591.6]	Understand and Implement the concept of analytics using python libraries like numpy, scipy.	2	2	2	2	1								2	3	

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

Computer Networks | CS 1602 | 4 Credits | 3104

Session: Jan 2020 – June 2020 | Faculty: Dr. Narendra Singh Yadav | Class: B.Tech VI Semester

Introduction: The main objective of this course is to familiarize students with computer networks of today which are based on the TCP/IP model and its layered structure.

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

[CS1602.1]: Understand and learn basic concept of TCP/IP model, IPV4, class full addressing, sub netting and classless addressing.
[CS1602.2]: Analysis and Implement the Routing and its types.
[CS1602.3] Demonstrate the Internet control protocols, IPV6 transitions.
[CS1602.4]: Analyse the Transport Layer and Its protocols, congestion control.
[CS1602.5]: Describe the Application Layer, its protocols and Network Security.

B. Program 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

[PSO1]. 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.

[PSO2]. Will be able to nail down the issues prevalent in the field of Computer and Communication Engineering.

[PSO3]. Will be able to identify the existing open problems in the field of computing and propose the best possible solutions.

[PSO4]. 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.

C. 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.	

D. SYLLABUS

Network Layer: Network layer design issues, routing algorithms, congestion control algorithms, Quality of service, MPLS. Classfull addressing, Sub-netting, Classless addressing, variable length

blocks, address allocation; Protocols: ARP & DHCP: Introduction, Packet Format, message types, IPV4 header format, fragmentation, options, checksum. ICMP: Message format, message types. Dynamic routing protocols: RIP, OSPF & BGP, Multicasting Protocol;
Transport Layer: Transport services, state diagram, Elements of Transport Protocols: addressing, Connection establishment, connection release, Error control and Flow Control, Multiplexing, Congestion Control: Bandwidth allocation, regulating the sending rate, UDP: UDP header, TCP: TCP service model, TCP segment header, TCP connection establishment, TCP connection release, TCP window management, Timer management; Application Layer: DNS: Name space, domain resource records, Electronic Mail: SMTP, POP, IMAP, MIME, HTTP, HTTPS, SNMP; Network Security: Security Goals, Attacks, Attack prevention techniques, Firewall, IDS, DMZ, IPsec.

TEXT BOOKS:

T1. A S Tanenbaum, Computer Networks, 5th Ed., Pearson, 2010.
T2. B.A. Forouzan, TCP/IP Protocol Suite, 4th Ed., TMH, 2010.

REFERENCE BOOK:

R1. W.R. Stevens, TCP/IP illustrated, Volume 1: The Protocols, 2nd Ed., Addison-Wesley, 2015.
R2. D E. Comer, Internetworking with TCP/IP Principles, Protocols and Architecture, 6th Ed., Pearson , 2013.

E. Lecture Plan:

lecture	Major Topics	Topics	Session Outcome	Corresponding CO	Mode of delivery
1	Introduction	Introduction of course	Understanding of course, objectives, evaluation		lecture
2	Network Layer	Store-and-Forward Packet Switching, Services Provided to the Transport Layer	Understanding of packet switching and services provided to transport layer	1602.1	lecture
3		Implementation of Connectionless Service, Implementation of Connection-Oriented Service	learn implementation of connectionless and conection oriented service	1602.1	lecture
4		Characteristics and Types, The Optimality Principle	Understanding of types and characteristics of routing pritocols and optimality principle	1602.2	lecture
5		Shortest Path Routing, Flooding	Understanding of shortest path routing algorithm	1602.2	lecture
6		Distance Vector Routing,	Understanding of distance vectror routing algorithm	1602.2	lecture
7		Link State Routing, Hierarchical Routing,	Understanding of link state routing protocol and Hierarchical routing	1602.2	lecture
8		IP Addresses, Classfull addressing, Classless addressing	Knowledge of IP Address	1602.2	lecture

9		Subnetting	Understanding of need of subnetting	1602.2	lecture
10		Subnetting	Understanding implementation of subnetting	1602.2	lecture
11		CIDR—Classless InterDomain Routing	Understanding of CIDR	1602.3	lecture
12		NAT—Network Address Translation	Learn Network address translation	1602.3	lecture
13		DHCP, ARP, RARP	Understanding of network protocols	1602.3	lecture
14		ICMP, IPV4 header format	Understanding of network protocols	1602.3	lecture
15		Fragmentation	Learn concept of fragmentation	1602.2	lecture
16		RIP, OSPF, BGP	Understanding of dynamic routing protocols	1602.2	lecture
17		RIP, OSPF, BGP	Understanding of dynamic routing protocols	1602.2	lecture
18		General Principles of Congestion Control, Congestion Prevention Policies	Understanding of congestion principles and prevention	1602.1	lecture
19		Congestion Control in Virtual-Circuit Subnets	Understanding of congestion control in virtual circuit subnets	1602.1	lecture
20		Congestion Control in Datagram Subnets	Understanding of congestion control in Datagram subnets	1602.1	lecture
21		Requirements	Understanding of Quality of Service requirements	1602.1	lecture
22		Techniques for Achieving Good Quality of Service	Understanding of Techniques for achieving good QoS	1602.1	lecture
23		Techniques for Achieving Good Quality of Service	Understanding of Techniques for achieving good QoS	1602.2	lecture
		First Sessional Examination			
24	Transport Layer	Introduction to Transport Layer, Transport Service Primitives	Understanding of transport layer and service primitives	1602.4	lecture
25		Elements of Transport Protocols, Addressing,	Understanding of elements of transport protocols	1602.4	lecture
26		Connection Establishment, Connection Release	Understanding of connection establishment and release process	1602.4	lecture

27		Flow Control and Buffering	Understanding of flow control and buffering in transport layer	1602.4	lecture
28		Multiplexing	Understanding of Multiplexing in transport layer	1602.4	lecture
29		UDP,UDP Header	Understanding of UDP	1602.4	lecture
30		TCP Service Model, TCP Protocol	Understanding of TCP	1602.4	lecture
31		TCP Segment Header,	Understanding of TCP segment header	1602.4	lecture
32		TCP Connection Establishment, TCP Connection Release	Understanding of TCP connection establishment and release process	1602.4	lecture
33		TCP Transmission Policy, Window Management	Understanding of TCP transmission policy and window management	1602.4	lecture
34		Connection Control	Understanding of Conection control	1602.4	lecture
35		Timer Management	Understanding of timer management	1602.4	lecture
36	Application Layer	Introduction to Application Layer	Understanding of application layer	1602.5	lecture
37		DNS—The Domain Name System	Understanding of DNS	1602.5	lecture
38		SMTP, POP	Understanding of email	1602.5	lecture
39		IMAP, MIME	understanding of email	1602.5	lecture
40		HTTP	Understanding of web and protocol	1602.5	lecture
41		HTTPS	Understanding of secure web protocol	1602.5	lecture
42		SNMP	Understanding of network management protocol	1602.5	lecture
		Second Sessional			
43	Network Security	Security Goals and Attacks	Understanding of security goals and attacks	1602.5	lecture
44		Firewall	Understanding of firewalls	1602.5	lecture
45		Firewall	Understanding of firewalls	1602.5	lecture
46		IDS,DMZ	Understanding of intrusion detection system	1602.5	lecture
47		IPsec	Understanding of IP security	1602.5	lecture
48		IPsec	Understanding of IP security	1602.5	lecture

F. 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	PSO4
CS1602.1	Understand and learn basic concept of TCP/IP model, IPV4, class full addressing, sub netting and classless addressing.	2		3		3								3	1	2	
CS1602.2	Implement the Routing and its types			2										1	1	3	
CS1602.3	Demonstrate the Internet control protocols, IPV6 transitions.					1								1	1		
CS1602.4	Analyse the Transport Layer and Its protocols, congestion control.					1								1	1		1
CS1602.5	Describe the Application Layer, its protocols and Network Security.							2		2				1	1		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

Data Mining and Warehousing | IT 1603 | 4 Credits | 3 1 0 4

Session: Jan 2020 – May 2020 | Faculty: Dr. Akhilesh Kr. Sharma | Class: B.Tech VI Semester

A. Introduction: This course aims to discuss concepts and terminology associate with Statistics, Database Systems and machine learning. The course also discuss the pseudo code and data structures use in the multidimensional arrays for data mining tasks.

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

[IT1603.1]. Interpret the contribution of data warehousing and data mining to the decision-support level of organizations

[IT1603.2]. Categorize and carefully differentiate between situations for applying different data-mining techniques: frequent pattern mining, association, correlation, classification, prediction, and cluster and outlier analysis

[IT1603.3]. Design and implement systems for data mining

[IT1603.4]. Evaluate the performance of different data-mining algorithms

[IT1603.5]. Propose data-mining solutions for different 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]. 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 (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:

Data warehousing Components: Building a Data warehouse, Mapping Data Warehouse to a Multiprocessor Architecture, DBMS Schemas for Decision Support , Data Extraction, Data Clean-up, Data Transformation Tools, Metadata; **Business analysis :** Reporting and Query tools and Applications ,Tool Categories, The Need for Applications ,Congo's & Impromptu; Online Analytical Processing (OLAP); **Data mining:** Introduction Data, Types of Data, Data Mining Functionalities ,Interestingness of Patterns, Data Mining Systems , Data Mining, Integration of a Data Mining System with a Data Warehouse; **Pre-processing;** association rule mining and classification: Mining Frequent Patterns, Associations and Correlations Mining ,Mining Various Kinds of Association Rules , Correlation Analysis, Constraint Based Association Mining; **Classification and Prediction :** Basic Concepts , Decision Tree, Induction, Bayesian, Rule Based, Back propagation, Support Vector Machines Associative Classification, Lazy Learners, Prediction; **clustering and applications and trends in data mining:** Cluster Analysis, Types of Data, Categorization of Major Clustering Methods: K-means, Partitioning Methods , Hierarchical, Density Based, Grid Based, Model-Based Clustering- Web Mining, Text Mining, Spatial Mining, Case study on Data mining with data sets.

F. EXT BOOKS:

T1. A. Berson and S. J. Smith, "*Data Warehousing, Data Mining & OLAP*", Tata McGraw – Hill Edition, Tenth Reprint 2007.

T2. J.Han and M. Kambher, "*Data Mining Concepts and Techniques*", Second Edition, Elsevier, 2007.

G. REFERENCES BOOKS:

R1. P. N. Tan, M. Steinbach and V. Kumar, "*Introduction to Data Mining*", Person Education, 2007.

R2. K.P. Soman, S. Diwakar and V. Ajay, "*Insight into Data mining Theory and Practice*", Easter Economy Edition, Prentice Hall of India, 2006.

H. Lecture Plan:

Lec No	Main Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode Of Assessing CO
1.	Data Objects and Attribute Type	Learner will be able to learn Data Objects and Attribute.	Lecture	1603.1	Mid Term I, Quiz-1 & End Term
2.	Basic Statistical Description of Data	Learner will be able to learn and to basic Statistical Description.	Lecture	1603.1	Mid Term I, Quiz-1 & End Term
3.	Data Pre-processing	Learner will be able to learn data Pre-processing.	Lecture	1603.1	Mid Term I, Quiz-1 & End Term
4.	Data Cleaning and Data Integration	Learner will be able to learn Data Cleaning and Data Integration	Lecture	1603.1	Mid Term I, Quiz-1 & End Term

5.	Data Warehouse: Basic Concept	Learner will be able to learn Data Warehouse	Lecture	1603.1	Mid Term I, Quiz-2 & End Term
6.	Data Warehouse Modelling: Data Cube –Star Schema, Snow Flake Schema	Learner will be able to learn Data Warehouse Modelling Cube –Star Schema, Snow Flake Schema	Lecture	1603.1	Mid Term I, Quiz-2 & End Term
7.	Data Warehouse Modelling: Dimensions, Measures & OLAP operations	Learner will be able to learn Dimensions, Measures & OLAP	Lecture	1603.1	Mid Term I, Quiz-2 & End Term
8.	Data Warehouse Implementation: Indexing OLAP Data	Learner will be able to learn Indexing OLAP Data	Lecture	1603.1	Mid Term I, Quiz-2 & End Term
9.	Data Warehouse Implementation: Efficient Processing of OLAP queries	Learner will be able to learn Efficient Processing of OLAP queries	Lecture	1603.1	Mid Term I, Quiz-2 & End Term
10.	OLAP server Architecture	Learner will be able to learn OLAP server Architecture	Lecture	1603.1	Mid Term I, Quiz-2 & End Term
11.	Data Cube Technology: Cube Materialization and Tactics	Learner will be able to learn Cube Materialization and Tactics	Lecture	1603.1	Mid Term I, Quiz-2 & End Term
12.	Data Cube Computation: Multi-way Array, BUC & Star Cubing	Learner will be able to learn Multi-way Array, BUC & Star Cubing	Lecture	1603.1,1603.2	Mid Term I, Quiz-2 & End Term
13.	Frequent Item-set Mining Methods: Apriori Algorithm	Learner will be able to learn Apriori Algorithm	Lecture	1603.1,1603.2	Mid Term II, Quiz-3 & End Term
14.	Frequent Item-set Mining Methods: Generating Association Rules	Learner will be able to learn Generating Association Rules	Lecture	1603.1,1603.2	Mid Term II, Quiz-3 & End Term
15.	Frequent Item-set Mining Methods: Mining Frequent Item-sets	Learner will be able to learn Mining Frequent Item-sets	Lecture	1603.1,1603.2	Mid Term II, Quiz-3 & End Term

16.	Frequent Item-set Mining Methods: Mining Closed and Max Patterns	Learner will be able to learn Mining Closed and Max Patterns	Lecture	1603.1,1603.2	Mid Term II, Quiz-3 & End Term
17.	Classification: Approaches to Classification	Learner will be able to learn Approaches to Classification	Lecture	1603.2,1603.3	Mid Term II, Quiz-3 & End Term
18.	Decision Tree Induction	Learner will be able to learn Decision Tree Induction	Lecture	1603.3,1603.4	Mid Term II, Quiz-3 & End Term
19.	Decision Tree Induction	Learner will be able to learn Learner will be able to learn	Lecture	1603.3,1603.4	Mid Term II, Quiz-3 & End Term
20.	Bayes Classification Methods: Bayes Theorem	Learner will be able to learn Bayes Theorem	Lecture	1603.3,1603.4	Mid Term II, Quiz-3 & End Term
21.	Bayes Classification Methods: Naïve Bayesian Classification	Learner will be able to learn Naïve Bayesian Classification	Lecture	1603.3,1603.4	Mid Term II, Quiz-3 & End Term
22.	Techniques to Improve Classification Accuracy: Bagging	Learner will be able to learn Classification Accuracy & Bagging	Lecture	1603.3,1603.4	Mid Term II, Quiz-3 & End Term
23.	Boosting and Adaboost	Learner will be able to learn Boosting and Adaboost	Lecture	1603.3,1603.4	Mid Term II, Quiz-3 & End Term
24.	Random Forests	Learner will be able to learn Random Forests	Lecture	1603.3,1603.4	Mid Term II, Quiz-3 & End Term
25.	Bayesian Belief Network	Learner will be able to learn Bayesian Belief Network	Lecture	1603.3,1603.4	Mid Term II, Quiz-3 & End Term
26.	Classification by Back Propagation -I	Learner will be able to learn Back Propagation -I	Lecture	1603.3,1603.4	Mid Term II, Quiz-3 & End Term
27.	Classification by Back Propagation –II	Learner will be able to learn Back Propagation –II	Lecture	1603.4	Mid Term II, Quiz-3 & End Term
28.	Support Vector Machines	Learner will be able to learn Support Vector Machines	Lecture	1603.4	Quiz-4 & End Term
29.	Lazy Learners	Learner will be able to learn Lazy Learners	Lecture	1603.4	Quiz-4 & End Term
30.	Rough Set Approach	Learner will be able to learn Rough Set Approach	Lecture	1603.4	Quiz-4 & End Term
31.	Cluster Analysis	Learner will be able to learn Cluster Analysis	Lecture	1603.4,1603.5	Quiz-4 & End Term
32.	Partitioning Methods	Learner will be able to learn Partitioning Methods	Lecture	1603.4,1603.5	Quiz-4 & End Term

33.	Hierarchical Methods-I	Learner will be able to learn Hierarchical Methods-I	Lecture	1603.4,1603.5	Quiz-4 & End Term
34.	Hierarchical Methods-II	Learner will be able to learn Hierarchical Methods-II	Lecture	1603.4,1603.5	Quiz-4 & End Term
35.	Hierarchical Methods-III	Learner will be able to learn Hierarchical Methods-III	Lecture	1603.4,1603.5	Quiz-4 & End Term
36.	Density Based Methods-I	Learner will be able to learn Density Based Methods-I	Lecture	1603.4,1603.5	Quiz-4 & End Term
37.	Density Based Methods-II	Learner will be able to learn Density Based Methods-II	Lecture	1603.4,1603.5	Quiz-4 & End Term
38.	Grid Based Methods	Learner will be able to learn	Lecture	1603.4,1603.5	Quiz-4 & End Term
39.	Evaluation of Clustering	Learner will be able to learn	Lecture	1603.4,1603.5	Quiz-4 & End Term
40.	Web Mining, Text Mining	Learner will be able to learn	Lecture	1603.4,1603.5	Quiz-4 & End Term
41.	Spatial Mining	Learner will be able to learn Spatial Mining	Lecture	1603.4,1603.5	Quiz-4 & End Term
42.	Outliers and Outlier Analysis	Learner will be able to learn Outlier Analysis	Lecture	1603.4,1603.5	Quiz-4 & End Term
43.	Outliers Detection Methods	Learner will be able to learn Outliers Detection Methods	Lecture	1603.4,1603.5	Quiz-4 & End Term
44.	Proximity Based Approaches	Learner will be able to learn Proximity Based Approaches	Lecture	1603.4,1603.5	Quiz-4 & End Term
45.	Data Mining for Financial Data Analysis	Learner will be able to learn Financial Data Analysis	Lecture	1603.4,1603.5	Quiz-4 & End Term
46.	Data Mining for Intrusion	Learner will be able to learn Data Mining for Intrusion	Lecture	1603.4,1603.5	Quiz-4 & End Term
	Detection and Prevention				
47.	Data Mining for Visual and Audio Data	Learner will be able to learn Data Mining for Visual and Audio Data	Lecture	1603.4,1603.5	Quiz-4 & End Term
48.	Revision Class-I	Revision Class-I	Lecture	1603.4,1603.5	Quiz-4 & End Term
49.	Revision Class-II	Revision Class-II	Lecture	1603.4,1603.5	Quiz-4 & 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
[IT 1603.1]	Interpret the contribution of data warehousing and data mining to the decision-support level of organizations		3			2			2					3		
[IT 1603.2]	Categorize and carefully differentiate between situations for applying different data-mining techniques: frequent pattern mining, association, correlation, classification, prediction, and cluster and outlier analysis	3	2				1			1		2		2		2
[IT 1603.3]	Design and implement systems for data mining			3	1	2					1			2	1	3
[IT 1603.4]	Evaluate the performance of different data-mining algorithms						2		2	3				3	2	
[IT 1603.5]	Propose data-mining solutions for different applications			2						1	2			1		2

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

MANIPAL UNIVERSITY
JAIPUR

SCHOOL OF COMPUTING & INFORMATION TECHNOLOGY

DEPARTMENT OF INFORMATION TECHNOLOGY
COURSE HAND-OUT

Computer Networks Lab| CS 1631| 1 Credit | 0 0 2 1| Class: B.Tech VI

Session: Jan ’20 – May ’20 | Faculty: Dr. Narendra Singh Yadav, Dr. Arjun Singh, Dr.Anshuman Kalla, Dr. Yogesh Gupta, Dr. Sunita Singhal, Dr. Devershi Pallavi Bhatt, Dr. Deepak Sinwar, Mr. Yashpal Soni, Mr. Prashant Manuja, Mr. Rahul Saxena | Class: B.Tech. IIIrd Year VI Semester

A. Introduction:

To familiarize the students with the fundamental concepts of networking, connecting devices, implementation of routing, virtual LAN, NAT, DHCP, socket programming and network utilities.

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

[CS1631.1]: Demonstrate the concepts of packet tracer and network connecting devices.
[CS1631.2]: Demonstrate the concept of topology and configuration.
[CS1631.3]: Demonstrate the implementation of different protocols.
[CS1631.4]: Demonstrate the concepts NAT protocol configuration.
[CS1631.5]: Demonstrate the concept of socket programming.
[CS1631.6]: Demonstrate the usage different network utilities.

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 BTech IT program, the student:

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)	Continuous evaluation (20 for Performance, 10 Lab file, 20 Viva, 20 Project)	70
End Term Exam (Summative)	End Term Practical Exam (Performance and Viva)	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

Flow control protocols, error detection and correction techniques, Bit stuffing and character stuffing. Implementation of link state routing protocol, distance vector routing protocol and other routing protocols. TCP and UDP socket programming. Remote method invocation (RMI). Packet analyzer- Wireshark, Packet tracer

F. REFERENCES

R1. A S Tanenbaum,"Computer Networks", 5th Edition, Pearson, 2010.
R2. B.A. Forouzan, "TCP/IP Protocol Suite", 4th Edition, TMH, 2010.
R3. L. Laura Chappell, J. Aragon and G.Combs, "Troubleshooting with Wireshark: Locate the Source of performance Problems", Laura Chappell University, 2014.

G . Lab Plan

Lab No.	**Topics**	**Session Outcome**	**Mode of Delivery**	**Corresponding CO**	**Mode of Assessing the Outcome**
1	Introduction to Packet tracer and networking device components	Understand packet tracer, types of interface and networking devices.	Lecture Demonstration at system	CS1631.1	Continuous Evaluation End Term Examination
2	Router Mode, Switch/Router basic commands	Understand router and switch basic modes	Lecture Demonstration at system	CS1631.1 CS1631.2	Continuous Evaluation End Term Examination
3	Star Topology using HUB and Switch, IP configuration of end devices, show command, copy command, password setting, hostname setting	Understand topology creation and configuration	Lecture Demonstration at system	CS1631.2	Continuous Evaluation End Term Examination
4	DHCP configuration	Understand DHCP and configuration	Lecture Demonstration at system	CS1631.3	Continuous Evaluation End Term Examination
5-7	Configuration of Static Routing Protocol Configuration of RIPv1 and RIPv2. Configuration of OSPF and troubleshooting	Understand implementation of static and dynamic routing	Lecture Demonstration at system	CS1631.3	Continuous Evaluation End Term Examination
8	Configuration of VLAN and troubleshooting	Understand VLAN configuration and troubleshooting	Lecture Demonstration at system	CS1631.3	Continuous Evaluation End Term Examination
9	NAT Protocol Configuration and troubleshooting	Understand NAT and its configuration	Lecture Demonstration at system	CS1631.4	Continuous Evaluation End Term Examination
10-11	Socket Programming using UDP Socket Socket Programming using TCP Socket	Demonstrate the use of socket programming using UDP and TCP sockets	Lecture Demonstration at system	CS1631.5	Continuous Evaluation End Term Examination

12	Network Utilities- Ping, Netstat, Ipconfig, Ifconfig, Arp, Trace-route	Demonstrate the use of network utilities	Lecture Demonstration at system	CS1631.6	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
[CS1631.1]:	Demonstrate the concepts of packet tracer and network connecting devices.	1	1	2	2	1	1		1	1		1		1	1	
[CS1631.2]:	Demonstrate the concept of topology and configuration.	1	1	1										1		
[CS1631.3]:	Demonstrate the implementation of different protocols.	1	1	1										1		
[CS1631.4]:	Demonstrate the concepts NAT protocol configuration.	1		1					1	1	1	1		1		
[CS1631.5]:	Demonstrate the concept of socket programming.	1	1	2	1	1				1		1		1		1
[CS1631.6]:	Demonstrate the usage different network utilities.	1	1	2	1	1						1		1		

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

MANIPAL UNIVERSITY JAIPUR

SCHOOL OF COMPUTING & INFORMATION TECHNOLOGY

DEPARTMENT OF INFORMATION TECHNOLOGY
COURSE HAND-OUT

Data Mining and Warehousing Lab| IT 1631 | 1 Credit | 0 0 2 1

Session: Jan 20 – May 20 | Faculty: Dr. Akhilesh Kr. Sharma | Class: Department Core Course Class: B.Tech. IIIrd Year VI Semester

A. Introduction:

B. This course aims to discuss data mining concepts and terminology associated with data pre - processing using statistical data concept, data crawling, classification, regression, clustering, web mining and text mining. The course also discusses the pseudo code in R / Python.

C. Course Outcomes: At the end of the course, students will be able -

[IT1631.1]: To implement data structures and different operators in R and R data types like Vectors, Lists, Matrices, Arrays, Factors, Data Frames

[IT1631.2]: To implement and demonstrate the plots using R for data analysis and PCA

[IT1631.3]: To implement and demonstrate the usage of statistical operation and binning by equal height and width.

[IT1631.4]: To implement and demonstrate time series, Precision, Recall, TP rate, FP rate and F-measure and Apriori algorithmic implementation.

[IT1631.5]: To implement and demonstrate the classification and regression concepts and their implementation.

[IT1631.6]: To implement and demonstrate the usage of various types of clustering and implementation. Students may predict the result by using the trained model based on training data set.

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 BTech IT program, the student:

PSO1. May forecasting the future aspects of the trained model, simulation, implementation and inference of existing and advanced technologies.

PSO2. To grab the job as data analysts / scientists in the field of IT companies.

PSO3. To recognize the importance of professional developments by pursuing postgraduate studies and positions.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Continuous evaluation (Record + Execution + Viva+ Project)	70 (20+20+20+10)
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

To implement data structures and different operators in R and R data types like Vectors, Lists, Matrices, Arrays, Factors, Data Frames, Plots using R for data analysis and PCA, usage of statistical operation and binning by equal height and width, time series, Precision, Recall, TP rate, FP rate and F-measure and Apriori, algorithmic implementation, classification and regression concepts and their implementation, usage of various types of clustering and implementation.

REFERENCES

T1. Michael J. Crawley, "*The R Book*", 2nd Edition, Wiley, 2013

T2. A. Berson and S. J. Smith, "*Data Warehousing, Data Mining & OLAP*", Tata McGraw – Hill Edition, Tenth Reprint 2007.

T3. J.Han and M. Kambher, "*Data Mining Concepts and Techniques*", Second Edition, Elsevier

G . Lab Plan

Lab No.	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1	• To implement data structures and different operators in R and R data types like Vectors, Lists, Matrices, Arrays, Factors, Data Frames .	• Learner will be able to learn and to implement data structures and different operators in R and R data types like Vectors, Lists, Matrices, Arrays, Factors, Data Frames .	Lecture Demonstration in the lab	IT 1631	Continuous Evaluation End Term Examination
2	To read and write CSV file. To generate different graphs 2.1) R-Pie Chart 2.2) R- Bar Chart 2.3) R- Box Plot 2.4) R-histograms 2.5) R-Line Graphs 2.6) R-Scatter Plots	• Will be able to learn and to implement various charts like R-Pie Chart, R- Bar Chart, R- Box Plot, R-histograms, R-Line Graphs, R-Scatter Plots.	Lecture Demonstration in the lab	IT 1631	Continuous Evaluation End Term Examination
3	• To perform statistical operations on the dataset and data analysis. Perform initial preprocessing and data reduction using Principal Component Analysis (PCA). Convert the time in seconds to hours, minutes and seconds.	• Learner will be able to learn implement statistical operations on the dataset and data analysis. • One may perform initial pre-processing and data reduction using Principal Component Analysis (PCA).	Lecture Demonstration in the lab	IT 1631	Continuous Evaluation End Term Examination

4	To perform statistical operation and binning by equal height and width	To implement statistical operation and binning by equal height and width	Lecture Demonstration in the lab	IT 1631	Continuous Evaluation End Term Examination
5	To perform time series, Precision, Recall, TP rate, FP rate and F-measure	To measure the performance of classifier and to measure their accuracy using confusion matrix.	Lecture Demonstration in the lab	IT 1631	Continuous Evaluation End Term Examination
6	(ARM) Association Rule Mining, Apriori algorithm based experiments and visualization of various rules.	To implement apriori algorithm and to create association rules on various datasets.	Lecture Demonstration in the lab	IT 1631	Continuous Evaluation End Term Examination
7	To perform linear and multiple regression and perform residual analysis.	To implement linear and multiple regression and perform residual analysis.	Lecture Demonstration in the lab	IT 1631	Continuous Evaluation End Term Examination
8	To perform KNN classification using R Data analysis using decision tree	To implement KNN classification using R Data analysis using decision tree	Lecture Demonstration in the lab	IT 1631	Continuous Evaluation End Term Examination
9	• To represent choices and results in form of Neural Network Searching for an element in the matrix and counting the number of its occurrences.	To implement Neural Network Searching for an element in the matrix.	Lecture Demonstration in the lab	IT 1631	Continuous Evaluation End Term Examination

10	• To perform K-means clustering in R	To implement the K-means clustering in R	Lecture Demonstration in the lab	IT 1631	Continuous Evaluation End Term Examination
11	To perform hierarchical clustering and random forest in R	To implement hierarchical clustering and random forest in R	Lecture Demonstration in the lab	IT 1631	Continuous Evaluation End Term Examination
12	• To analyze the cross validation results and detailed accuracy measures on applying the algorithms and obtain differences between the percentage error and performance for the selected dataset.	To implement analyze the cross validation results and detailed accuracy measures on applying the algorithms and obtain differences between the percentage error and performance	Lecture Demonstration in the lab	IT 1631	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
[IT1631.1]:	To implement data structures and different operators in R and R data types like Vectors, Lists, Matrices, Arrays, Factors, Data Frames															
[IT1631.2]:	To implement and demonstrate the plots using R for data analysis and PCA															
[IT1631.3]:	To implement and demonstrate the usage of statistical operation and binning by equal height and width.															
[IT1631.4]:	To implement and demonstrate time series, Precision, Recall, TP rate, FP rate and F-measure and Apriori algorithmic implementation.															
[IT1631.5]:	To implement and demonstrate the classification and regression concepts and their implementation.															
[IT1631.6]:	To implement and demonstrate the usage of various types of clustering and implementation. Students may predict the result by using the trained model based on training data set.															

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

Introduction to Data Science| IT1692 | 3 Credits | 3 0 0 3

Session: Jan 20 –May 20 | Faculty: Mr. Deevesh Chaudhary | Class: B.Tech Open Elective

Introduction: This open 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 support with the design, implementation and inference of advanced technologies in Data Science.

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

[IT1692.1]. Deploy a structured lifecycle approach to data science and its statistical approaches.
[IT1692.2]. Reframe a business challenge as a data science challenge.
[IT1692.3]. Apply Data Science analytic techniques and tools to analyse data, create statistical models, and identify insights that can lead to statistical results.
[IT1692.4]. Select optimal visualization techniques to clearly communicate data analytic insights to business sponsors and others.
[IT1692.5]. Compare between different algorithms and accordingly use tools such as Python libraries in Data Science.
[IT1692.6]. Observe and illustrate the fundamental aspect of Data Science and their statistical analytics with their applications in industry and research.

A. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

b. **Problem analysis**: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
c. **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
d. **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
e. **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
f. **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
g. **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
h. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices
i. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
j. **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

k. **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

l. **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.

B. 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 (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.	

C. 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.

D. TEXT BOOKS

T1. H. Trevor et al., "*the elements of statistical learning*", Vol. 2. No.1.New York, Springer, 2009.

E. REFERENCE BOOKS

R1. C. Douglas and C. George, "*Applied Statistics and Probability for Engineers*", John Wiley and Sons, 2010.

Lecture Plan:

LEC NO	Main Topic	TOPICS	Mode of Delivery	Corresponding CO	Mode Of Assessing CO
1	**Introduction**	Data, Information Context, Knowledge	Lecture	IT1692.1, IT1692.1 & IT1692.5	Mid Term I, Quiz-1 & End Term
2		Continuous Interval, Discrete Interval	Lecture	IT1692.1 & IT1692.2	Mid Term I, Quiz-1 & End Term
3		Data Collection, Primary Data, Secondary Data, Numerical Data, Grouped Data.	Lecture and Flipped Class	IT1692.1 & IT1692.5	Mid Term I, Quiz-1 & End Term
4	**Descriptive Statistics and Inferential Statistics**	Descriptive Statistics, Descriptive Vs. Inferential Statistics	Lecture	IT1692.2 & IT1692.4	Mid Term I Quiz-2 & End Term
5		Basic Blocks of Descriptive Statistics	Lecture and Flipped Class	IT1692.2 & IT1702.4	Mid Term I, Quiz-2 & End Term
6		Central Tendency (Mean, Median, Mode for Grouped Data and Numerical Data)	Flipped Class	IT1692.2 & IT1692.4	Mid Term I, Quiz-2 & End Term
7-8		Dispersion (Range, Variance, Standard Deviation, Quartile)	Activity	IT1692.2 & IT1692.3	Mid Term I, Quiz-2 & End Term
9-10		Distribution and Visualization (Conditional Probability, Bayes' Theorem, Random Variables and Introduction to Probability Distribution)	Lecture	IT1692.3& IT1692.4	Mid Term I, Quiz-2 & End Term
11-12		Distribution and Visualization (The Frequency Distribution, Commutative Distribution, Relative and Cumulative Frequency Distributions Ogive Curve)	Lecture	IT1692.2 & IT1692.5	Mid Term I, Quiz-2 & End Term
13		Stem-and Leaf display	Lecture	IT1692.2 & IT1692.3	Mid Term I Quiz-3 & End Term
14-15		Distribution and Visualization (Normal Distribution, Empirical Rule, Chebyshev's Theorem)	Activity	IT1692.2 & IT1692.5	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)	Lecture	IT1692.3 & IT1692.5	Mid Term II, Quiz-3 & End
18		Populations and Samples, Population and Sample Variance, Population and Sample Standard Deviation	Lecture	IT1692.3 & IT1692.4	Mid Term II, Quiz-3 & End
19		Inferential Statistics, Hypothesis, Null and Alternate Hypothesis,	Lecture	IT1692.3 & IT1692.5	Mid Term II, Quiz-3 & End
20		ANOVA	Activity	IT1692.2 & IT1692.5	Mid Term II, Quiz-3 & End
21		Z statistics, T statistics	Lecture	IT1692.5 & IT1692.6	Mid Term II, Quiz-3 & End
22		F statistics, chi square statistics	Lecture	IT1692.5 & IT1692.6	Mid Term II, Quiz-3 & End
23		Binomial statistics, Parametric test and non-Parametric test	Lecture	IT1692.5 & IT1692.6	Mid Term II, Quiz-3 & End
24		Central Limit Theorem & Confidence Intervals.	Lecture	IT1692.3 & IT1692.4	Mid Term II, Quiz-3 & End
25	**Regression and Supervised Learning**	Regression analysis, Type of Regression	Lecture	IT1692.5 & IT1692.6	Mid Term II, Quiz-4 & End
26		OLS, Linear, Logistic, Multiple	Lecture	IT1692.4 & IT1692.5	Mid Term II, Quiz-4 & End Term
27		RIDGE & LASSO regression	Lecture	IT1692.2 & IT1692.3	Quiz-4 & End Term
28		Regression and Classification Trees using	Lecture	IT1692.3 & IT1692.6	Quiz-4 & End Term
29-30		Decision Tree, Random Forest Tree	Flipped Class	IT1692.3 & IT1692.6	Quiz-4 & End Term
31-32		KNN and Classification, SVM, Ensemble Methods,	Flipped Class	IT1692.3 & IT1692.6	Quiz-4 & End Term
33-34		LDA, QDA, Bias-Variance Dichotomy	Lecture	IT1692.3 & IT1692.4	Quiz-4 & End Term
35		Assessment Metrics and Evaluations	Lecture	IT1692.2 & IT1692.3	Quiz-4 & End Term
36	**Prescriptive Analysis**	Prescriptive Analysis	Activity	IT1692.5 & IT1692.6	Quiz-5 & End Term
37		Creating Data through Designed Experiments	Lecture	IT1692.4 & IT1692.5	Quiz-5 & End Term

38-39		Reinforcement Learning.	Lecture	IT1692.5 & IT1692.6	Quiz-5 & End Term
40		Active learning	Lecture	IT1692.3 & IT1692.4	Quiz-5 & End Term

F. 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 1692.1 }	Deploy a structured lifecycle approach to data science and its statistical approaches.	1	2	3	2		2		2		1			1	1	2
{CS 1692.2 }	Reframe a business challenge as a data science challenge.	3	2	3	3	1		2					2	2	3	1
{CS 1692.3 }	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
{CS 1692.4 }	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
{CS 1692.5 }	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
{CS 1692.6 }	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 and Information Technology

Department of Information Technology
Course Hand-out

ARTIFICIAL INTELLIGENCE | IT1653 | 3 Credits | 3 0 0 3
Session: Jan 20 – May 20| Faculty: **Dr. Sunil Kumar** | Sulabh Bansal | Neha Chaudhary| Class: B.Tech 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.

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

[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]. 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 (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.	
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

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

T1. E. Rich, K. Knight, and S.B. Nair, "Artificial Intelligence", 3rd Ed., Tata McGraw Hill, 2009.
T2. S. Russell, and P. Norvig, "Artificial Intelligence: A Modern Approach", Prentice Hall, 2011.

G. REFERENCE BOOKS

R1. N. J. Nilsson , "Artificial Intelligence: A New Synthesis", Morgan, 2009.

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	Lecture	**IT1653.5**	Class Quiz Sessional II
		example-induction (Find-s, Version Space, Decision Trees), Naïve Bayes Classifier			End term
29 – 32	Neural Networks	Introduction, Neuron, Model, Perceptron, Formulation , Perceptron, Back propagation	Lecture	**IT1653.6**	Class Quiz Sessional II End term
33 – 35	Genetic Algorithm	Introduction to genetic algorithm	Lecture	**IT1653.6**	Class Quiz End Term
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												
IT1653.2	Formalise a given problem and analyse it along different dimensions		3	2												
IT1653.3	Identify and implement appropriate A.I. search technique to solve the problem.	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												
IT1653.5	Apply different models performing common machine learning tasks such as classification and clustering.					2								2		
IT1653.6	Understand the role of soft computing and NLP techniques to solve problems.	2											2	2		1

0-No Attainment; 1- Low Attainment; 2- Moderate Attainment; 3- Substantial Attainment

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

DEPARTMENT OF INFORMATION TECHNOLOGY

Course Hand-out

Data Science| IT1654 | 3 Credits | 3 0 0 3
Session: Jan 20 –May 20 | Faculty: Dr. D. P. Sharma/ Dr. Anju Yadav | Class: B.Tech Department Elective

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 support 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 skill to a structured lifecycle approach to data science and its statistical approaches.
[IT1654.2]. Reframe employability to 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, research and entrepreneurship.

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]. 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 (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

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.

F. REFERENCE BOOKS

R1. Trevor, H. et al., The elements of statistical learning, Vol. 2. No.1.New York, Springer, 2009.

R2. Douglas, C. and George, C., Applied Statistics and Probability for Engineers, John Wiley and Sons, 2010.

G. LECTURE PLAN:

Class Number	Major-Topics	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1	**Introduction**	Data, Information Context, Knowledge	Understand about Data like Information Context, Knowledge	Lecture	CO 1 and 5	Mid Term I, Quiz-1 & End Term
2		Continuous Interval, Discrete Interval	Able to differentiate Continuous Interval, Discrete Interval	Lecture	CO 1 and 2	Mid Term I, Quiz-1 & End Term
3		Data Collection, Primary Data, Secondary Data, Numerical Data, Grouped Data.	Analyze and Understand things about Data such as Data Collection, Primary Data, Secondary Data, Numerical Data, Grouped Data.	Lecture and Flipped Class	CO 1and 5	Mid Term I, Quiz-1 & End Term
4	**Descriptive Statistics and Inferential Statistics**	Descriptive Statistics, Descriptive Vs. Inferential Statistics	Define the Descriptive Statistics, Descriptive Vs. Inferential Statistics	Lecture	CO 1 and 2	Mid Term I Quiz-2 & End Term
5		Basic Blocks of Descriptive Statistics	Understand the Basic Blocks of Descriptive Statistics	Lecture and Flipped Class	CO 2 and 4	Mid Term I, Quiz-2 & End Term
6		Central Tendency (Mean, Median, Mode for Grouped Data and Numerical Data)	Apply the concept of Central Tendency like (Mean, Median, Mode for Grouped Data and Numerical Data)	Flipped Class	CO 2 and 4	Mid Term I, Quiz-2 & End Term
7-8		Dispersion (Range, Variance, Standard Deviation, Quartile)	Analyze the data using parameters like Dispersion (Range, Variance, Standard Deviation,	Activity	CO 2 and 3	Mid Term I, Quiz-2 & End Term

			Quartile)			
9-10		Distribution and Visualization (Conditional Probability, Bayes' Theorem, Random Variables and Introduction to Probability Distribution)	Understand the fundamental concepts like Distribution and Visualization (Conditional Probability, Bayes' Theorem, Random Variables and Introduction to Probability Distribution)	Lecture	CO 3 and 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 fundamental concepts like Distribution and Visualization (The Frequency Distribution, Commutative Distribution, Relative and Cumulative Frequency Distributions Ogive Curve)	Lecture	CO 2 and 5	Mid Term I, Quiz-2 & End Term
13		Stem-and Leaf display	Analyze the data usingStem-and Leaf display	Lecture	CO 2 and 3	Mid Term I Quiz-3 & End Term
14-15		Distribution and Visualization (Normal Distribution, Empirical Rule, Chebyshev's Theorem)	Describe and analyze the data by different tools like Distribution and Visualization (Normal Distribution, Empirical Rule, Chebyshev's Theorem)	Activity	CO 2 and 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)	Describe and analyze the data by different tools like Distribution and Visualization (Pie Charts, Bar Graphs, Pareto Charts, Histograms, Box and Whisker Plots, Scattered Plot, Dot Plot, Error plot)	Lecture	CO 3 and 5	Mid Term II, Quiz-3 & End
18		Populations and Samples, Population and Sample Variance, Population and Sample Standard Deviation	Able to understand the basic concepts like Populations and Samples, Population and Sample Variance, Population and Sample Standard Deviation	Lecture	CO 3 and 4	Mid Term II, Quiz-3 & End
19		Inferential Statistics, Hypothesis, Null and Alternate Hypothesis,	Predict information by using tools like Inferential Statistics, Hypothesis, Null and Alternate Hypothesis,	Lecture	CO 3 and 5	Mid Term II, Quiz-3 & End
20		ANOVA	Able to perform ANOVA test	Activity	CO 2 and 5	Mid Term II, Quiz-3 & End
21		Z statistics, T statistics	Able to perform Z statistics, T statistics	Lecture	CO 5 and 6	Mid Term II, Quiz-3 & End
22		F statistics, chi square statistics	Able to perform F statistics, chi square statistics	Lecture	CO 5 and 6	Mid Term II, Quiz-3 & End
23		Binomial statistics, Parametric test and non- Parametric test	Differentiate among different test like Binomial statistics, Parametric test and non- Parametric test	Lecture	CO 5 and 6	Mid Term II, Quiz-3 & End
24		Central Limit Theorem & Confidence Intervals.	Understand about distribution Central Limit Theorem & Confidence Intervals.	Lecture	CO 3 and 4	Mid Term II, Quiz-3 & End

25	**Regression and Supervised Learning**	Regression analysis, Type of Regression	Understand the Basics concepts of Regression ,Type of Regression	Lecture	CO 5 and 6	Mid Term II, Quiz-4 & End
26		OLS, Linear, Logistic, Multiple	Able to define cost function : OLS, Linear, Logistic, Multiple	Lecture	CO 4 and 5	Mid Term II, Quiz-4 & End Term
27		RIDGE & LASSO regression	Optimize the solution using the RIDGE & LASSO regression	Lecture	CO 2 and 3	Quiz-4 & End Term
28		Regression and Classification Trees using	Understand the Basics concepts of Regression and Classification Trees using	Lecture	CO 3 and 6	Quiz-4 & End Term
29-30		Decision Tree, Random Forest Tree	Understand the Basics concepts of Decision Tree, Random Forest Tree	Flipped Class	CO 3 and 6	Quiz-4 & End Term
31-32		KNN and Classification, SVM, Ensemble Methods,	Understand the Basics concepts of KNN and Classification, SVM, Ensemble Methods,	Flipped Class	CO 3 and 6	Quiz-4 & End Term
33-34		LDA, QDA, Bias-Variance Dichotomy	Understand the Basics concepts of LDA, QDA, Bias-Variance Dichotomy	Lecture	CO 3 and 4	Quiz-4 & End Term
35		Assessment Metrics and Evaluations	Able to analyze the models by different Assessment Metrics and Evaluations	Lecture	CO 2 and 3	Quiz-4 & End Term
36	**Prescriptive Analysis**	Prescriptive Analysis	Understand the basic concepts of Prescriptive Analysis	Activity	CO 5 and 6	Quiz-5 & End Term
37		Creating Data through Designed Experiments	Understand the basic concepts of Creating Data through Designed Experiments	Lecture	CO 4 and 5	Quiz-5 & End Term
38-39		Reinforcement Learning.	Able to learn fundamentals of Reinforcement Learning.	Lecture	CO 5 and 6	Quiz-5 & End Term
40		Active learning	Able to learn fundamentals	Lecture	CO 3 and 4	Quiz-5 & End Term

			of Active learning			

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
[IT 1654.1]	Deploy a structured lifecycle approach to data science and its statistical approaches.	1	2	3	2		2		2		1			1	1	2
[IT 1654.2]	Reframe a business challenge as a data science challenge.	3	2	3	3	1		2					2	2	3	1
[IT 1654.3]	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
[IT 1654.4]	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

[IT 1654.5]	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
[IT 1654.6]	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 INFORMATION TECHNOLOGY

COURSE HAND-OUT

Cryptography & Network Security |IT 1701| [4 Credits] [3104]

Session: July- Dec 2019 | Faculty: Mr. Ankit Mundra, Dr Vivek Kumar Verma and Dr .N. S. Yadav

Class: B.Tech. IV Year VII Semester

Introduction: The course is offered Information Technology Engineering students to understand the principles and practices of Cryptography and Network Security. To acquire knowledge on standard algorithms used to provide confidentiality, integrity and availability. It allows the students to learn that the sensitive information is to be passed through your network safely.

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

[IT1701.1] Define the fundamentals of Number Theory used in Cryptography. (Remembering)

[IT1701.2] Explain the standard cipher algorithms in transit across data networks. (Understanding)

[IT1701.3] Identify Security attacks and select its identification mechanism. (Applying)

[IT1701.4] Apply various key distribution and management schemes. (Applying)

[IT1701.5] Evaluate authentication mechanisms. (Evaluating)

B. 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.

C. 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.	

D. Syllabus:

Elements of Number Theory : Euclid Algorithm, Prime Number Theorem, Euler's, Fermat's Little theorems, Entropy ; **Classical Cipher Techniques**: Caesar, Affine, Mono-alphabetic, Transposition, Polyalphabetic Ciphers; **Security Attacks**: Active V/S Passive, Security Services; **Symmetric Encryption**: Fiestel Cipher, Confusion and Diffusion, DES Algorithm; **Asymmetric Encryption**: Principles of Public Key Cryptosystems, RSA Algorithm; Message Authentication & Hashing; **Digital Signatures**: RSA Based, El-Gamal Signatures; **Key distribution**; **User Authentication Protocols**; **E-Mail Security**: PGP, S/MIME;**IPsec**: AH & ESP; SSL; TLS; **Intrusion Detection**: Statistical Anomaly Detection, Rule based detection, honeypots; **Password Protection**..

E. Text / Reference Books:

T1. S. Williams, "Cryptography and Network Security: Principles and Practices", Pearson Education, 2008.
T2. A. Kahate, "Cryptography and Network Security", Tata Mc-Graw Hill, 2006.
T3. K. Charlie, "Network Security: Private Communication in a Public World", Pearson Education, 2008.
T4. V. Bagad, I. Dhotre, "Cryptography and Network Security ", Technical Publications, 2008.
T5. B.A. Forouzan, "Network Security ", Tata Mc-Graw Hill, 2007.

F. Lecture Plan:

Lecture No	Topics	Session Outcome	Corresponding CO	Mode of Delivery	Mode of Assessing CO
1.	Introduction to Number Theory	Basic understanding of Number Theory and its application	1701.1	Lecture	In class Quiz Mid Term I End Term Exam
2.	Prime Number Concept Euclid Algorithm	Understanding the concept of Prime number and its application in Cryptography	1701.1	Lecture	In class Quiz Mid Term I End Term Exam
3.	Fermat's Little Theorem	Learn the primality test and its use in security	1701.1	Lecture	In Class Quiz, Mid Term I End Term
4.	Classical Cipher Technique Introduction to Cryptography	Understanding of traditional cryptographic technique	1701.2	Lecture	In Class Quiz Mid Term I End Term
5.	Substitution Cipher (Mono & Poly Alphabetic)	Understanding of substitutional cipher technique with its application	1701.2	Flipped Class	In Class Quiz Mid Term I End Term
6.	Caesar Cipher & Affine Cipher	Application of Caesar cipher and Affine cipher	1701.2	Flipped Class	Class Quiz, Mid Term I End Term
7.	Play Fair & Hill Cipher	Understanding of traditional cryptographic technique with its application	1701.2	Lecture	Class Quiz Mid Term I End Term
8.	Transposition Techniques and Rail Fence Cipher	Understanding of traditional cryptographic technique with its application	1701.2	Flipped Class	Class Quiz, Mid Term I End Term
9.	Security Attack Active & Passive Attack	Understand the different types of attacks on computer system and network	1701.3	Lecture	Class Quiz Mid Term I End Term
10.	Security Services (ITU-T X.800)	Learn the different security services and its application	1701.3	Lecture	Class Quiz, Mid Term I End Term
11.	Introduction to Encryption Techniques Stream Cipher and Block Cipher	Difference between block and stream cipher	1701.3	Tutorial	Class Quiz Mid Term II End Term

12.	Symmetric Encryption Feistel Cipher	Understanding of Feistel structure of encryption	1701.2, 1701.3	Tutorial	Class Quiz Mid Term II
13.	Confusion and Diffusion	Know the principle of confusion and diffusion and its role in symmetric encryption techniques	1701.2, 1701.4	Lecture	Class Quiz Mid Term II End Term
14.	DES Algorithm	Understand and Implement DES algorithm	1701.2, 1701.4	Lecture	Class Quiz Mid Term II End Term
15.	Analysis of DES Algorithm	Security analysis of DES	1701.2, 1701.4	Lecture	Class Quiz Mid Term II End Term
16.	2-DES & 3-DES	Understand the 2-DES and 3-DES algorithm with their implementation	1701.3, 1701.4	Lecture	Class Quiz Mid Term II End Term
17-18.	AES Algorithm	Understand and Implement AES algorithm	1701.3, 1701.4	Lecture	Class Quiz Mid Term II End Term
19-20.	Modes of Operation (Block)	Understand the working of different modes of symmetric encryption	1701.4	Lecture	Class Quiz Mid Term II End Term
21.	Asymmetric Encryption	Understand the principle of asymmetric key cryptography	1701.4	Lecture	Class Quiz Mid Term II End Term
22.	Public Key Cryptosystem	Understand the principle of asymmetric key cryptography	1701.4	Lecture	Class Quiz Mid Term II End Term
23.	RSA Algorithm	Understand and Implement RSA algorithm	1701.4	Lecture	Class Quiz Mid Term II End Term
24.	Security Analysis of RSA Algorithm	Limitations and Security analysis of RSA	1701.4	Flipped Class	Class Quiz Mid Term II End Term
25.	ElGamal Cryptosystem & Security Analysis	Understand and Implement ElGamal algorithm	1701.3, 1701.4	Lecture	Class Quiz Mid Term II End Term
26.	Introduction to MAC, HMAC & CMAC	Understand the concept	1701.4	Lecture	Class Quiz Mid Term II End Term

27.	Introduction to Hashing Properties of Hash	Understand the concept and properties of Hash function with examples	1701.4	Tutorial	Class Quiz Mid Term II End Term
28.	MD-5, SHA-1	Understand and Implement the MD-5 and SHA-1 algorithm	1701.2, 1701.4	Lecture	Class Quiz Mid Term II End Term
29.	SHA-128, SHA-2	Understand and Implement the SHA-128 and SHA-2 algorithm	1701.2, 1701.4	Lecture	Class Quiz Mid Term II End Term
30.	Digital Signature Scheme	Understand the need of digital signature and its application	1701.5	Lecture	Class Quiz Mid Term II End Term
31.	RSA Based	Study and Implementation of RSA digital signature algorithm	1701.5	Lecture	Class Quiz Mid Term II End Term
32.	EL-Gamal	Study and Implementation of ElGamal digital signature algorithm	1701.4, 1701.5	Lecture	Class Quiz Mid Term II End Term
33.	Problem of Key Sharing & Diffie Hellman	Understand the different schemes of key distribution	1701.4, 1701.5	Lecture	Class Quiz Mid Term II End Term
34.	Key Distribution Scheme, Symmetric Key Distribution	Understand the different schemes of key distribution	1701.4, 1701.5	Lecture	Class Quiz Mid Term II End Term
35.	Kerberos Authentication	Working of Kerberos architecture	1701.5	Lecture	Class Quiz Mid Term II End Term
36.	Symmetric Key Agreement	Understand the different schemes of key distribution	1701.4, 1701.5	Lecture	Class Quiz Mid Term II End Term
37.	Public Key Distribution	Understand the different schemes of key distribution	1701.4	Lecture	Class Quiz End Term
38.	User Authentication Protocols	Study of various authentication protocols	1701.5	Flipped Class	Class Quiz End Term
39.	IP Security Introduction	Understand Network layer security	1701.5	Tutorial	Class Quiz End Term

40.	AH & ESP Schemes	Understand Network layer security	1701.5	Tutorial	Class Quiz End Term
41.	Introduction to SSL	Understand the architecture and need of SSL	1701.5	Lecture	Class Quiz End Term
42.	OPEN SSL	Implementation and architecture of Open SSL	1701.5	Lecture	Class Quiz End Term
43.	Transport Layer Security (TLS)	Working and Implementation of TLS	1701.2, 1701.5	Lecture	Class Quiz End Term
44.	Intrusion: Introduction	Understand the concept of Intrusion Detection System (IDS)	1701.3, 1701.5	Tutorial	Class Quiz End Term
45.	Statistical Anomaly Detection	Learn the statistical methods for IDS	1701.3, 1701.5	Tutorial	Class Quiz End Term
46.	Rule Based Detection	Learn the rule-based detection methods of IDS	1701.3, 1701.5	Flipped Class	Class Quiz End Term
47.	Honeypots	Design and concept of Honeypots	1701.3, 1701.5	Lecture	Class Quiz End Term
48 – 49.	Password Protection Schemes & Policies	Learn different Password Protection Schemes & Policies	1701.5	Lecture	End Term
50.	Firewalls: Definition & Construction	Understand the working and application of firewall in enterprise networks	1701.3, 1701.5	Lecture	End Term
51 – 52.	Working Principle of Firewalls	Understand the application of firewalls	1701.3, 1701.5	Lecture	End Term

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
[IT1701.1]	Define the fundamentals of Number Theory used in Cryptography.	3	2	1	1		1				1		1	1	1	1
[IT1701.2]	Explain the standard cipher algorithms in transit across data networks.	2		2	1	1	1				1		1	1	1	1
[IT1701.3]	Identify Security attacks and select	2		1	1		1		2		1		1	1	1	1
[IT1701.4]	Apply various key distribution and management schemes.	2		2	1	1	1				1		1	1	1	1
[IT1701.5]	Evaluate authentication mechanisms.	2		2	1		1				1		1	1	1	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
Advance Data Structures| IT1702| 4 Credits | 3 1 0 4

Session: July 19 – Dec 19 | Faculty: Dr. Akhilesh Kr. Sharma | Mr. Vijay Prakash Sharma| Mr. Venkatesh G. Shankar |
Class: B.Tech IT (VII Sem)

A. Introduction: In this course, students will study a comprehensive understanding of the course of Advance Data Structures to the development and implementation of advance data structure applications. This course also motivates Students, how the data gets stored into computer memory and how efficiently by making use of different storage structures, they can save space and time. The course is intended to provide the students the experience in program design and to emphasize aspects of program efficiency in the form of advance data structure like R-B tree, 2-3 tree etc.

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

[IT1702.1]. Implement the latest data structure knowledge with the advance tree structure.
[IT1702.2]. Describe and analyse the latest graph based algorithm for enhancing the graph data structure knowledge.
[IT1702.3]. Comparing the different sorting network with the many tree data structure.
[IT1702.4]. Concentrate on many number theoretic algorithm in the use of many latest research field like data science.
[IT1702.5]. Understand and use the data structure for implementing some analogy based real life applications.
[IT1702.6]. Connect between different data structures and find best suitable for the analytics and design situation.

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

[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
	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

Advanced Trees: Definitions, **Red Black Trees:** Height of a Red Black Tree, Red Black Trees Bottom-Up Insertion, Top Down Red Black Trees, Top-Down Deletion in Red Black Trees, Analysis of Operations. **2-3 Trees:** Advantage of 2-3 trees over Binary Search Trees, Search and Update Operations on 2-3 Trees, Analysis of Operations, Dictionaries; **Fibonacci Heaps :** Structure of Fibonacci Heaps, Merge able Heap Operations, Decreasing key and deleting a node, bounding the maximum degree, Binomial Trees, Implementing Binomial Heaps and its Operations, **Graph Theory Algorithms:** Algorithms for Connectedness, Finding all Spanning Trees in a Weighted Graph, The Lightest Hamiltonian Circuit (Travelling Salesman's Problem) :The Annealing Algorithm and the Karp–Held Heuristics, Maximum Matching in Bipartite Graphs: The Hungarian Algorithm, Maximum Flow in a Transport Network : The Ford–Fulkerson Algorithm; **Sorting Network:** Comparison network, zero-one principle, bitonic sorting and merging network sorter. Priority Queues and Concatenable Queues using 2-3 Trees. Operations on Disjoint sets and its union-find problem, Implementing Sets; **Number Theoretic Algorithm:** Number theoretic notions, Division theorem, GCD, recursion, Modular arithmetic, Solving Modular Linear equation, Chinese Remainder Theorem, power of an element, Computation of Discrete Logarithms, primality Testing and Integer Factorization.

F. Reference books:

T1. E. Horowitz, S. Sahni and S. Rajasekaran, "Computer Algorithms", 2nd Edition, University Press, 2007.
T2. V. Aho, J. E. Hopcroft and J. D. Ullman, "The Design and Analysis of Computer Algorithms", 1st Edition, Pearson Education, 1999.
T3. T. H. Cormen, C. E. Leiserson, R.L.Rivest, and C. Stein, "Introduction to Algorithms", 3rd Edition, MIT press, 2009.
T4. Narshing Deo, "Graph Theory with Applications to Engineering and Computer Science", 1979.

G. Lecture Plan:

LEC NO	TOPICS	Session Outcome	Mode of Delivery	Corresponding CO	Mode Of Assessing CO
1	**Tree Data Structure**	Learner will be able to learn trees and DS.	Lecture	IT1702.1	Mid Term I, Quiz-1 & End Term
2	Introduction to BST	Recall the concepts of BST.	Lecture	IT1702.1 & IT1702.5	Mid Term I, Quiz-1 & End Term
3	Advance tree: R-B tree	Learner will be able to learn R-B tree	Lecture	IT1702.1 & IT1702.5	Mid Term I, Quiz-1 & End Term
4,5	R-B tree Insertion	Learner will be able to learn R-B tree Insertion	Lecture	IT1702.1	Mid Term I, Quiz-1 & End Term
6,7,8	R-B tree Deletion:	Learner will be able to learn R-B tree Deletion:	Flipped Class	IT1702.1	Mid Term I, Quiz-1 & End Term
9	Analysis of Operation	Learner will be able to learn Analysis of Operation	Flipped Class	IT1702.1	Mid Term I, Quiz-2 & End Term
10	2-3 tree (One tutorial)	Learner will be able to learn 2-3 tree	Lecture	IT1702.1 & IT1702.5	Mid Term I, Quiz-2 & End Term
11	2-3 trees over Binary Search Trees	Learner will be able to learn 2-3 trees	Lecture	IT1702.1	Mid Term I, Quiz-2 & End Term
12	Update Operations on 2-3 Trees	Learner will be able to apply Update Operations on 2-3 Trees	Lecture	IT1702.1	Mid Term I, Quiz-2 & End Term
13	Analysis of Operations	Learner will be able to analyse Operations	Lecture	IT1702.1	Mid Term I, Quiz-2 & End Term
14	Dictionaries	Learner will be able to learn Dictionaries	Flipped Class	IT1702.1 & IT1702.5	Mid Term I, Quiz-2 & End Term
15,16	Fibonacci Heaps	Learner will be able to learn heaps	Lecture	IT1702.1 & IT1702.5	Mid Term I, Quiz-2 & End Term
17,18	Binomial Heaps(One tutorial)	Learner will be able to learn heaps	Lecture	IT1702.1 & IT1702.5	Mid Term I, Quiz-2 & End Term

19,20	Binomial Heaps and Fibonacci Heaps	Learner will be able to learn heaps	Lecture	IT1702.1	Mid Term I, Quiz-2 & End Term
21	**Graph Theory Algorithms**		Lecture	IT1702.2 & IT1702.5	Mid Term II, Quiz-3 & End Term
22,23	Finding all Spanning Trees in a Weighted Graph	Learner will be able to learn Graph	Flipped Class	IT1702.2 & IT1702.6	Mid Term II, Quiz-3 & End Term
24,25	The Lightest Hamiltonian Circuit	Learner will be able to learn Graph Hamiltonian Circuit	Flipped Class	IT1702.2 & IT1702.6	Mid Term II, Quiz-3 & End Term
26	The Annealing Algorithm	Learner will be able to learn Annealing Algorithm	Activity	IT1702.2 & IT1702.6	Mid Term II, Quiz-3 & End Term
27	Karp–Held Heuristics	Learner will be able to learn Karp–Held Heuristics	Lecture	IT1702.2 & IT1702.6	Mid Term II, Quiz-3 & End Term
28	Maximum Matching in Bipartite Graphs	Learner will be able to learn Bipartite Graphs	Lecture	IT1702.2 & IT1702.6	Mid Term II, Quiz-3 & End Term
29,30	Maximum Flow in a Transport Network(One	Learner will be able to learn Flow Network	Lecture	IT1702.2 & IT1702.6	Mid Term II, Quiz-3 & End Term
31	**Sorting Network**	Learner will be able to learn Sorting Network	Lecture	IT1702.3 & IT1702.5	Mid Term II, Quiz-4 & End Term
32	Zero-one principle	Learner will be able to learn Zero-one principle	Lecture	IT1702.3 IT1702.6	Mid Term II, Quiz-4 & End Term
33,34	Bitonic sorting and merging network sorter(One	Learner will be able to learn Bitonic sorting	Lecture	IT1702.3 & IT1702.6	Mid Term II, Quiz-4 & End Term
35	Priority Queues and Concatenable Queues	Learner will be able to learn Queues	Lecture	IT1702.3 & IT1702.6	Mid Term II, Quiz-4 & End Term
36	Disjoint sets and its union-find problem	Learner will be able to learn Disjoint sets	Flipped Class	IT1702.3 & IT1702.5	Mid Term II, Quiz-4 & End Term
37	Implementing Sets	Learner will be able to learn Sets	Flipped Class	IT1702.3 & IT1702.5	Mid Term II, Quiz-4 & End Term
38	**Number Theoretic Algorithm**	Learner will be able to learn Number Theoretic Algorithm	Activity	IT1702.4 & IT1702.5	Quiz-5 & End Term
39	Number theoretic notions	Learner will be able to learn theoretic notions	Lecture	IT1702.4 & IT1702.5	Quiz-5 & End Term
40	Division theorem, GCD, recursion	Learner will be able to learn GCD, recursion	Lecture	IT1702.4 & IT1702.6	Quiz-5 & End Term
41,42	Modular arithmetic, Solving Modular Linear equation(	Learner will be able to learn Modular arithmetic,	Lecture	IT1702.4 & IT1702.6	Quiz-5 & End Term
43,44	Chinese Remainder Theorem, power of an	Learner will be able to learn Chinese Remainder	Lecture	IT1702.4 & IT1702.6	Quiz-5 & End Term
44	Computation of Discrete Logarithms, with use case	Learner will be able to learn Discrete Logarithms,	Lecture	IT1702.4 & IT1702.6	Quiz-5 & End Term
45	Primality Testing and Integer	Learner will be able to learn Primality Testing	Flipped Class	IT1702.4 & IT1702.6	Quiz-5 & End Term
46	Factorization and problem set	Learner will be able to learn Factorization	Flipped Class	IT1702.4 & IT1702.6	Quiz-5 & End Term
47	Factorization and problem set with use case	Learner will be able to learn Factorization problem	Activity	IT1702.4 & IT1702.6	Quiz-5 & End Term
48	Revision Till Mid- Term -I	Recall concepts	Lecture	-	Quiz-5 & End Term
49	Revision Till Mid-Term-II	Recall concepts	Lecture	-	Quiz-5 & End Term
50	Problem Solving	Recall concepts	Lecture	-	Quiz-5 & End Term

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
[IT1702.1]	Implement the latest data structure knowledge with the advance tree structure.	3			2		2		2					1		
[IT1702.2]	Describe and analyse the latest graph based algorithm for enhancing the graph data structure knowledge.		1	3				2		3		2			1	2
[IT1702.3]	Comparing the different sorting network with the many tree data structure.	1			3	2					3			2	1	3
[IT1702.4]	Concentrate on many number theoretic algorithm in the use of many latest research field like data science.	2		1			2		2	3				3	2	
[IT1702.5]	Understand and use the data structure for implementing some analogy based real life applications	2		2		3				1	2			3		2
[IT1702.6]	Connect between different data structures and find best suitable for the analytics and design situation.	2		2				3			3		1	3		2

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

MANIPAL UNIVERSITY JAIPUR
SCHOOL OF COMPUTING & INFORMATION TECHNOLOGY
DEPARTMENT OF INFORMATION TECHNOLOGY
COURSE HAND-OUT

Advanced Data Structure Lab| IT 1733 | 1 Credit | 0 0 2 1

Session: July 19 – Dec 19 | Faculty: Dr. Akhilesh Kr. Sharma | Mr. Vijay Prakash Sharma| Dr. Ashish Jain | Class: B.Tech IT (VII Sem)

A. Introduction: This course aims to discuss data structures techniques and their implementation like 2-3 trees, R-B Trees, Heap and Fibonacci tree, binomial tree, . The course also discusses the algorithm and pseudo code in C/C++ languages.

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

[IT1733.1]: To implement data structures like Binary Search Tree, Insertion and deletion.
[IT1733.2]: To implement and demonstrate Red- Black Trees, Insertion and deletion.
[IT1733.3]: To implement Fibonacci heaps and Binomial heaps with their operations.
[IT1733.4]: To implement 2-3 Trees Insertion and deletion.
[IT1733.5]: To implement Fibonacci heap binomial Heap insertion and Deletion.
[IT1733.6]: To implement contingency matrix representation, to implement bipartite graph and their operations. To implement Ford Fulkerson algorithm.

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]: 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)	Continuous evaluation (Record + Execution + Viva+ attendance)	70 (20+20+20+10)
End Term Exam (Summative)	End Term Practical 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

Advanced Trees: Definitions, **Red Black Trees:** Height of a Red Black Tree, Red Black Trees Bottom-Up Insertion, Top Down Red Black Trees, Top-Down Deletion in Red Black Trees, Analysis of Operations. **2-3 Trees:** Advantage of 2-3 trees over Binary Search Trees, Search and Update Operations on 2-3 Trees, Analysis of Operations, Dictionaries; **Fibonacci Heaps :** Structure of Fibonacci Heaps, Merge able Heap Operations, Decreasing key and deleting a node, bounding the maximum degree, Binomial Trees, Implementing Binomial Heaps and its Operations, **Graph Theory Algorithms:** Algorithms for Connectedness, Finding all Spanning Trees in a Weighted Graph, The Lightest Hamiltonian Circuit (Travelling Salesman's Problem) :The Annealing Algorithm and the Karp–Held Heuristics, Maximum Matching in Bipartite Graphs: The Hungarian Algorithm, Maximum Flow in a Transport Network : The Ford–Fulkerson Algorithm; **Sorting Network:** Comparison network, zero-one principle, bitonic sorting and merging network sorter. Priority Queues and Concatenable Queues using 2-3 Trees. Operations on Disjoint sets and its union-find problem, Implementing Sets; **Number Theoretic Algorithm:** Number theoretic notions, Division theorem, GCD, recursion, Modular arithmetic, Solving Modular Linear equation, Chinese Remainder Theorem, power of an element, Computation of Discrete Logarithms, primality Testing and Integer Factorization.

F. Reference books:

R1. E. Horowitz, S. Sahni and S. Rajasekaran, “Computer Algorithms”, 2nd Edition, University Press, 2007.

R2. V. Aho, J. E. Hopcroft and J. D. Ullman, "The Design and Analysis of Computer Algorithms", 1st Edition, Pearson Education, 1999.

R3. T. H. Cormen, C. E. Leiserson, R.L.Rivest, and C. Stein, "Introduction to Algorithms", 3rd Edition, MIT press, 2009.

G . Lab Plan

Lab No.	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1	• To implement data structures like Binary Search Tree, Insertion and deletion.	• Learner will be able to learn and to implement data structures and Binary Search Tree, Insertion and deletion.	Lecture Demonstration in the lab	IT 1733.1	Continuous Evaluation End Term Examination
2	• To implement Red-Black Trees, Insertion and deletion.	• Learner will be able to learn and will be able to implement Red- Black Trees, Insertion and deletion.	Lecture Demonstration in the lab	IT 1733.2	Continuous Evaluation End Term Examination
3	• To writing programs & to implement Fibonacci heaps and Binomial heaps with their operations.	• Learner will be able to learn implement Fibonacci heaps and Binomial heaps with their operations.	Lecture Demonstration in the lab	IT 1733.3	Continuous Evaluation End Term Examination
4	• To implement 2-3 Trees Insertion and deletion.	• Learner will be able to learn and to implement 2-3 Trees Insertion and deletion.	Lecture Demonstration in the lab	IT 1733.4	Continuous Evaluation End Term Examination
5	• To implement Fibonacci heap insertion.	• Learner will be able to learn and to implement Fibonacci heap insertion.	Lecture Demonstration in the lab	IT 1733.3	Continuous Evaluation End Term Examination
6	• To implement binomial Heap insertion and Deletion.	• Learner will be able to learn and to implement binomial Heap insertion and Deletion.	Lecture Demonstration in the lab	IT 1733.5	Continuous Evaluation End Term Examination
7	• To implement Heap operations like insertion/deletion.	• Learner will be able to learn and to implement Heap operations like insertion/deletion.	Lecture Demonstration in the lab	IT 1733.3	Continuous Evaluation End Term Examination

8	• To implement weighted graph with operations.	• To implement weighted graph with operations.	Lecture Demonstration in the lab	IT 1733.6	Continuous Evaluation End Term Examination
9	• To implement contingency matrix representation	• To implement contingency matrix representation	Lecture Demonstration in the lab	IT 1733.6	Continuous Evaluation End Term Examination
10	• To implement node vertex representation to show graph.	• To implement node vertex representation to show graph.	Lecture Demonstration in the lab	IT 1733.6	Continuous Evaluation End Term Examination
11	• To implement bipartite graph and their operations. • To implement Ford Fulkerson algorithm.	• To implement bipartite graph and their operations.	Lecture Demonstration in the lab	IT 1733.6	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
[IT1733.1]:	To implement data structures like Binary Search Tree, Insertion and deletion.	1	1	1		1	1								1	
[IT1733.2]:	To implement and demonstrate Red-Black Trees, Insertion and deletion.			1	1	1										
[IT1733.3]:	To implement Fibonacci heaps and Binomial heaps with their operations.				1	1									1	
[IT1733.4]:	To implement 2-3 Trees Insertion and deletion.	1	1			1										
[IT1733.5]:	To implement Fibonacci heap binomial Heap insertion and Deletion.			1	2	1									1	
[IT1733.6]:	To implement contingency matrix representation, to implement bipartite graph and their operations. To implement Ford Fulkerson algorithm.		1	1	3	2		1						2		1

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

MANIPAL UNIVERSITY JAIPUR

School of Computing & Information Technology

Department of Information Technology

Course Hand-out

Mobile Computing |**IT 1753**| [3 Credits] [3003]

Session: July- Dec 2019 | Faculty Dr. Lokesh Sharma | Class: B.Tech VII Semester (PE)

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.

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

[IT1753.1]: Explain the basic fundamentals of Mobile Communications.
[IT1753.2]: Analyse transmission fundamentals and various propagation and modulation techniques.
[IT1753.3]: Apply the cellular radio concepts and developments.
[IT1753.4]: Compare and Contrast the concept of WLAN and Bluetooth.
[IT1753.5]: Describe the functionality of Mobile IP and WWWW.

B. 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.

C. 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.	

D. 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.

E. Reference Books:

R1. T.S. Rappaport, "*Wireless Communications - Principle and Practice*", Second Edition, PHI, 2005.
R2. 2. W. Stallings, "*Wireless Communication and Network",*' Second Edition, PHI, 2004.
R3. R. Pandya "*Mobile and Personal Communication systems and services*", PHI, 2001.

R4. M. Ciampa, "*Guide to Designing and Implementing wireless LANs*", Thomson learning, Vikas Publishing House, 2001.

F. Lecture Plan:

Lecture no.	Major Topics	Session outcome	Correspondin g CO	Mode of Delivery	Mode of Assessing CO
L-1	**Evolution of Mobile Communication & Propagation**	Introduction and Evolution to Mobile Communication	CO1	Lecture	In class Quiz Mid Term I End Term Exam
L-2	**Evolution of Mobile Communication & Propagation**	Basics of Propagation	CO2	Lecture	In class Quiz Mid Term I End Term Exam
L-3	**Evolution of Mobile Communication & Propagation**	Propagation Models	CO2	Lecture	In Class Quiz, Mid Term I End Term
L-4	**Evolution of Mobile Communication & Propagation**	Free-Space Propagation Model, Large-Scale Path Loss	CO2	Lecture	In Class Quiz Mid Term I End Term
L-5	**Evolution of Mobile Communication & Propagation**	Small Scale Multipath Propagation	CO2	Flipped Class	In Class Quiz Mid Term I End Term
L-6 to L-7	**Modulation techniques**	Modulation Techniques	CO2	Flipped Class	Class Quiz, Mid Term I End Term
L-8 to L10	**Modulation techniques**	Liner Modulation Techniques - ASK, PSK, FSK, MSK	CO2	Lecture	Class Quiz Mid Term I End Term
L-11 to L-12	**Modulation techniques**	Spread spectrum modulation	CO2	Flipped Class	Class Quiz Mid Term I End Term
L-13	**Cellular concepts**	Cellular Concepts	CO3	Lecture	Class Quiz Mid Term I End Term
L-14	**Cellular concepts**	Frequency reuse	CO3	Lecture	Class Quiz Mid Term I End Term

L-15	**Cellular concepts**	Channel assignment strategies	CO3	Tutorial	Class Quiz Mid Term I End Term
L-16	**Cellular concepts**	Handoff strategies: Prioritizing Handoffs and practical handoff consideration	CO3	Tutorial	Class Quiz Mid Term I End Term
L-17	**Cellular concepts**	Interference and System Capacity	CO3	Lecture	Class Quiz Mid Term I End Term
L-18	**Cellular concepts**	Trunking and Grade of Service	CO3	Lecture	Class Quiz Mid Term I End Term
L-19	**Wireless LAN**	Overview of Wireless LAN Technology	CO4	Lecture	Class Quiz Mid Term II End Term
L-20	**Wireless LAN**	Challenges in Wireless LAN	CO4	Lecture	Class Quiz Mid Term II End Term
L-21 to L-23	**Wireless LAN**	Infrared LANS, Spread Spectrum LANs , Narrowband microwave LANS	CO4	Lecture	Class Quiz Mid Term II End Term
L-24	**Wireless LAN**	WLAN applications	CO4	Lecture	Class Quiz Mid Term II End Term
L-25	**Wireless LAN**	Introduction to IEEE 802	CO4	Lecture	Class Quiz Mid Term II End Term
L-26 to L-28	**Wireless LAN**	IEEE 802.11 Protocol Introduction, IEEE 802.11 Architecture, IEEE 802.11 Services	CO4	Lecture	Class Quiz Mid Term II End Term
L-29	**Wireless LAN**	IEEE 802.11 MAC and Physical Layer	CO4	Lecture	Class Quiz Mid Term II

L-30	**Bluetooth**	**Bluetooth:** Radio Specification	CO4	Flipped Class	Class Quiz Mid Term II End Term
L-31	**Bluetooth**	Baseband Specification	CO4	Lecture	Class Quiz End Term
L-32	**Bluetooth**	Link Manager Specification	CO4	Lecture	Class Quiz End Term
L-34	**Bluetooth**	Logic Link Control and Adaptation Protocol	**CO4**	Tutorial	Class Quiz End Term
L-35	**Bluetooth**	**HiperLAN & WSN**	CO4	Lecture	Class Quiz End Term
L-36	**Mobile Computing, WWWW and its applications**	**Introduction to Mobile Computing**	CO5	Lecture	Class Quiz End Term
L-37 to L-39	**Mobile Computing, WWWW and its applications**	Mobile IP Introduction and architecture	CO5	Lecture	Class Quiz End Term
L-40	**Mobile Computing, WWWW and its applications**	**Introduction to WWWW & Mobile Agent** Applications and architecture of wireless world wide web Mobile agent technology and standards	CO5	Lecture	End Term
L-41		Case Study 1 & 2	CO5	Lecture	

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
[IT1753.1]	Explain the basic fundamentals of Mobile Communications.	3				1					1		2		2	2
[IT1753.2]	Analyse transmission fundamentals and various propagation and modulation techniques.	3				1		2			1		2		2	2
[IT1753.3]	Apply the cellular radio concepts and developments.	3	2	2	2	1	1				1	1	2	3	2	2
[IT1753.4]	Compare and Contrast the concept of WLAN and Bluetooth.	3				2	1	1			1	1	2	2	2	2
[IT1753.5]	Describe the functionality of Mobile IP and WWWW	3				2	1				1	1	2	3	2	2

Lowest -1, Medium-2, Highest-3

MANIPAL UNIVERSITY JAIPUR

School of Computing & Information Technology

Department of Information Technology

Course Hand-out

Software Define Networks |IT 1754| [3 Credits] [3 0 0 3]

Session: July- Dec 2019 | Faculty: Dr Lokesh Sharma | Class: B.Tech VII Semester

Introduction: Software Defined Networking (SDN) is an emerging paradigm in computer networking that allows a logically centralized software program to control the behaviour of an entire network. Separating a network's control logic from the underlying physical routers and switches that forward traffic allows network operators to write high-level control programs that specify the behaviour of an entire network, in contrast to conventional networks, where network operators must codify functionality in terms of low-level device configuration.

This course provides students with the fundamental knowledge of SDN including history and evolution of SDN, SDN architecture, control and data planes, SDN switches and controllers, SDN programming, traffic engineering in SDN and the use of SDN in cloud network and data centre.

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

[IT1701.1] Compare the conventional network and SDN paradigm
[IT1701.2] Synthesize the flexibility and scalability of using SDN in terms of innovation and network management
[IT1701.3] Configure and troubleshoot Open Flow switches, controllers and SDN networks
[IT1701.4] Evaluate various emerging SDN applications

B. 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.

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I	
	Sessional Exam II	
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	
End Term Exam (Summative)	End Term Exam	
	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:

Software Defined Networking (SDN), Separation of Control Plane and Data Plane, IETF Forces, Active Networking; **Control and Data Plane Separation**: Concepts, Advantages and Disadvantages, the Open Flow protocol; **Network Virtualization**: Concepts, Applications, Existing Network Virtualization Framework (VMWare and others), Mininet based examples; **Control Plane**: Overview, Existing SDN Controllers including Floodlight and Open Daylight projects; Customization of Control Plane: Switching and Firewall Implementation using SDN Concepts; **Data Plane**: Software-based and Hardware-based, Programmable Network; Hardware **Programming SDNs**: Northbound Application Programming Interface, Current Languages and Tools, Composition of SDNs, **Network Functions Virtualization (NFV) and Software Defined Networks**: Concepts, Implementation and Applications; **Data Center Networks**: Packet, Optical and Wireless Architectures, Network Topologies; **Use Cases of SDNs**: Data Centers, Internet Exchange Points, Backbone Networks, Home Networks, Traffic Engineering. Programming Assignments for implementing some of the theoretical concepts listed above.

E. Text / Reference Books:

Text Books:

T1. T. D. Nadeau, K. Gray "SDN: Software Defined Networks, An Authoritative Review of Network Programmability Technologies", O'Reilly Media, August 2013.

T2. P. Goransson, C. Black, "Software Defined Networks: A Comprehensive Approach", Morgan Kaufmann, June 2014.

REFERENCES:

R1. F. Hu, "Network Innovation through Open Flow and SDN: Principles and Design", CRC Press, 2014.

R2. V. Tiwari, "SDN and Open Flow for Beginners", Amazon Digital Services, Inc., ASIN, 2013.

F. Lecture Plan:

Lec No	**Topics**	**Session Outcome**	**Corresponding CO**	**Mode of Delivery**
1.	Course Overview	Course Overview	CO1	Lecture
2.	Overview on traditional Networking Architecture-1	Overview on traditional Networking Architecture-1	CO1	Lecture
3.	Overview on traditional Networking Architecture -2	Overview on traditional Networking Architecture -2	CO1	Lecture
4.	SDN Software Stack -Introduction	SDN Software Stack -Introduction	CO1, CO2	Lecture
5.	SDN Software Stack-2	SDN Software Stack-2	CO2	Lecture
6.	SDN Data Plane Functions -1	SDN Data Plane Functions -1	CO2	Lecture
7.	SDN Data Plane Functions -2	SDN Data Plane Functions -2	CO2	Lecture
8.	SDN Control Plane Functions -1	SDN Control Plane Functions -1	CO2	Lecture
9.	SDN Control Plane Functions -2	SDN Control Plane Functions -2	CO2	Lecture
10.	SDN Control Plane Functions -3	SDN Control Plane Functions -3	CO2	Lecture
11.	Open Flow Protocol-1	Open Flow Protocol-1	CO2, CO3	Lecture
12.	Open Flow Protocol -2	Open Flow Protocol -2	CO2, CO3	Practical Exercises and Demonstration of Open Flow
13.	Open Flow Protocol-3	Open Flow Protocol-3	CO2, CO3	Lecture with Practical Exercises
14.	Open Flow Protocol-4	Open Flow Protocol-4	CO2, CO3	Lecture with Practical Exercises
15.	SDN Virtualization Concepts	SDN Virtualization Concepts	CO2, CO3	Lecture
16.	Network Virtualization Frameworks	Network Virtualization Frameworks	CO2, CO3	Lecture
17-18	Introduction to Mininet and Simulation of SDN scenarios	Introduction to Mininet and Simulation of SDN scenarios	CO2, CO3	Simulation Exercises
19-20.	Evaluation SDN scenarios	Evaluation SDN scenarios	CO2, CO3	Lecture and Study of Survey Paper
21.	Research Projects based on SDN	Research Projects based on SDN	CO2, CO3	Survey and Case Study on SDN

22.	Discussion on Research Projects	Discussion on Research Projects	CO2, CO3	Survey and Case Study on SDN and discussion
23.	Northbound APIs-1	Northbound APIs-1	CO2, CO3	Lecture
24.	Northbound APIs-2	Northbound APIs-2	CO2, CO3	Lecture
25.	Southbound API-1	Southbound API-1	CO2, CO3	Lecture
26.	Southbound API-2	Southbound API-2	CO2, CO3	Lecture
27.	Introduction to Network Functions	Introduction to Network Functions	CO2, CO3	Lecture
28.	Network Functions Virtualizations(NFV)-1	Network Functions Virtualizations(NFV)-1	CO2, CO3	Lecture
29.	Network Functions Virtualizations(NFV)-2	Network Functions Virtualizations(NFV)-2	CO2, CO3	Lecture
30.	Network Functions Virtualizations(NFV)-3	Network Functions Virtualizations(NFV)-3	CO2, CO3	Lecture
31.	Data Center Architectures -1	Data Center Architectures -1	CO4	Lecture
32.	Data Center Architectures -2	Data Center Architectures -2	CO4	Lecture
33.	Data Center Architectures -3	Data Center Architectures -3	CO4	Lecture
34.	Data Center Architectures -4	Data Center Architectures -4	CO4	Lecture
35.	Use Cases and Applications of SDN- An Introductions	Use Cases and Applications of SDN- An Introductions	CO4	Survey and Case Study on SDN and discussion
36.	SDN in Internet Exchange Points	SDN in Internet Exchange Points	CO4	Survey and Case Study on SDN and discussion

37.	SDN as Backbones Networks	SDN as Backbones Networks	CO4	Survey and Case Study on SDN and discussion
38.	SDN for Home Networks	SDN for Home Networks	CO4	Survey and Case Study on SDN and discussion
39.	Traffic Engineering in SDN	Traffic Engineering in SDN	CO4	Survey and Case Study on SDN and discussion
40.	Research Projects Evaluation	Research Projects Evaluation	CO4	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
[IT1701.1]	Compare the conventional network and SDN paradigm	2											1	1		
[IT1701.2]	Synthesize the flexibility and scalability of using SDN in terms of innovation and network management		2	2	1					1			1	1		
[IT1701.3]	Configure and troubleshoot Open Flow switches, controllers and SDN	1	2	1	1	2					1	1	1		1	
[IT1701.4]	Evaluate various emerging SDN applications.				2								2			1

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

MANIPAL UNIVERSITY JAIPUR

School of Computing & Information Technology

DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE HAND-OUT

SOCIAL NETWORK ANALYSIS || IT1759|| 3 Credits|| [3 0 0

Session: JUL-DEC-2019 | Faculty: Mr JAYA KRISHNA R|Class: B.Tech VII

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	Mode of Delivery	Session Outcome	Corresponding Couse outcome	Mode of Assessing the Outcome
1-2	Introduction to Social Web	Lecture, Activity	Know about different graphs and networks	IT1759.1	Class Quiz Mid Term I End Term
3-4	Nodes, Edges and Network measures	Lecture, Activity	Know how to create a node and its properties	IT1759.1	Class Quiz Mid Term I End Term
5-6	Describing Nodes and Edges	Lecture, Activity	Know how to create a node and its properties	IT1759.1	Class Quiz Mid Term I End Term
7-8	Describing Networks, Layouts, Networkx Introduction	Lecture, Activity	Know how to create a graph in Python	IT1759.1	Class Quiz Mid Term I End Term
9-10	Visualizing Network features in NetworkX	Lecture, Activity	Know how to Visualize a graph in Python	IT1759.1 IT1759.2	Class Quiz Mid Term I End Term
11-12	The role of Tie Strength, Measuring Tie Strength	Lecture, Activity	Role of tie strength and link prediction	IT1759.1 IT1759.2	Class Quiz Mid Term I End Term
13-14	Tie Strength and Network Structure, Tie Strength and Network Propagation	Lecture, Activity	Role of tie strength	IT1759.1 IT1759.2	Class Quiz Mid Term I End Term
15-16	Link Prediction, Entity Resolution	Lecture, Activity	Role of link prediction	IT1759.1 IT1759.2	Class Quiz Mid Term I End Term
17-18	**Link Prediction**: Case Study Friend Recommendation,	Lecture, Problem based learning, Flipped Class	How find a community in a network	IT1759.2	Class Quiz Mid Term II End Term
19-20	Introduction to Community Discovery	Lecture, Problem based learning, Flipped Class	How find a community in a network	IT1759.2	Class Quiz Mid Term II End Term
21-22	Communities in Context	Lecture, Problem based learning, Flipped Class	How find a community in a network	IT1759.2	Class Quiz Mid Term II End Term
23-24	Community Detection Algorithms	Lecture, Problem based learning, Flipped Class	How find a community in a network	IT1759.2	Class Quiz Mid Term II End Term
25-26	Quality Functions	Lecture, Problem based learning, Flipped Class	Learn different algorithms in finding a community	IT1759.2	Class Quiz Mid Term II End Term

27-28	**Algorithms**: The Kernighan-Lin algorithm	Lecture, Problem based learning, Flipped Class	Learn different algorithms in finding a community	IT1759.2	Class Quiz Mid Term II End Term
29	Agglomerative Algorithms, Spectral Algorithms	Lecture, Problem based learning, Flipped Class	Learn different algorithms in finding a community	IT1759.2	Class Quiz Mid Term II End Term
30	Markov Clustering, Other Approaches	Lecture, Problem based learning, Flipped Class	Learn different algorithms in finding a community	IT1759.2	Class Quiz Mid Term II End Term
31	Other Approaches: Label Propagation, Clique Percolation	Lecture, Problem based learning, Flipped Class	Learn different algorithms in finding a community	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	Lecture, Problem based learning, Flipped Class	Spread of Influence and how to become viral in social networks	IT1759.2 IT1759.3	Class Quiz Mid Term II End Term
33	Introduction to Social Influence	Lecture, Problem based learning, Flipped Class	Spread of Influence and how to become viral in social networks	IT1759.2 IT1759.3	Class Quiz End Term
34	Influence Related Statistics, Social Similarity and Influence, Homophile,	Lecture, Problem based learning, Flipped Class	Spread of Influence and how to become viral in social networks	IT1759.2 IT1759.3	Class Quiz End Term
35	Existential Test for Social Influence, Influence and Actions	Lecture, Problem based learning, Flipped Class	Spread of Influence and how to become viral in social networks	IT1759.2 IT1759.3	Class Quiz End Term
36	Influence Maximization in Viral Marketing	Lecture, Problem based learning, Flipped Class	Spread of Influence and how to become viral in social networks	IT1759.2 IT1759.3	Class Quiz Mid Term I End Term

1 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	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 networkx 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 Dept. 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

[IT1760.1]. Understand the models and methods of Natural Language Processing to enhance employability.
[IT1760.2]. Describe and analyse parts of speech used for any natural language with key concepts NLP.
[IT1760.3]. Design and Implement the grammatical components of a language and how it apply with NLP models.
[IT1760.4]. Comprehend the models for word sense and discourse analysis in terms of entrepreneurship.
[IT1760.5]. 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

T !. 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:

f	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1.	Introduction	Introduction to NLP	Lecture	IT 1760.1	Class Quiz
2.	Introduction	Phases of NLP	Lecture	IT 1760.1	Class Quiz Home Assignments I Sessional End Term
3-4	Introduction	Text Representation and Encoding Schemes	Lecture	IT 1760.1	Class Quiz Home Assignments I Sessional End Term
5.	Linguistics resources	Introduction to corpus, What is balanced corpus	Lecture	IT 1760.1	Class Quiz Home Assignments I Sessional End Term
6.	Linguistics resources	WordNet, Verb-Net	Lecture	IT 1760.1	Class Quiz Home Assignments I Sessional End Term
7-8	Linguistics resources	Part of Speech tagging, Role of tagging in NLP models	Lecture	IT 1760.1	Class Quiz Home Assignments I Sessional End Term
9.	Linguistics resources	Stochastic POS tagging	Lecture	IT 1760.1	Class Quiz Home Assignments I Sessional End Term
10-11	Linguistics resources	HMM	Lecture	IT 1760.1	Class Quiz Home Assignments I Sessional
12.	Linguistics resources	Transformation based tagging (TBL)	Lecture	IT 1760.1	Class Quiz Home Assignments I Sessional End Term
13.	Linguistics resources	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	Lexeme, phonemes, Phrases and idioms	Lecture	IT 1760.2	Class Quiz Home Assignments I Sessional End Term
15.	Natural language grammars	Roles of Word order in NLP models	Lecture	IT 1760.2	Class Quiz Home Assignments I Sessional End Term

16.	Natural language grammars	Agreement, tense, aspect and mood and agreement	Lecture	IT 1760.2	Class Quiz Home Assignments I Sessional End Term
17-18	Natural language grammars	Context Free Grammar, 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	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.	Semantics	Lexical semantics, WordNet	Lecture	IT 1760.3	Class Quiz Home Assignments II Sessional End Term
24.	Word Sense Disambiguation	Selection restriction	Lecture	IT 1760.4	Class Quiz Home Assignments II Sessional End Term
25-27	Word Sense Disambiguation	Machine learning approaches	Lecture	IT 1760.4	Class Quiz Home Assignments II Sessional End Term
28.	Word Sense Disambiguation	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, Reference resolution	Lecture	IT 1760.4	Class Quiz Home Assignments II Sessional End Term
31.	Discourse Analysis	Constraints on co-reference	Lecture	IT 1760.4	Class Quiz Home Assignments II Sessional
32.	Discourse Analysis	Algorithm for pronoun resolution	Lecture	IT 1760.4	Class Quiz Home Assignments II Sessional End Term
33.	Discourse Analysis	Text coherence, discourse structure	Lecture	IT 1760.4	Class Quiz Home Assignments II Sessional End Term
34.	Applications of NLP	Spell-checking	Lecture	IT 1760.5	Class Quiz Home Assignments II Sessional
35.	Applications of NLP	Text Summarization and Information Retrieval	Lecture	IT 1760.5	Class Quiz Home Assignments II Sessional End Term

36.	IBM Watson Machine Translation	Overview	Lecture	IT 1760.5	Class Quiz Home Assignments II Sessional End Term
37.	Applications of NLP	Sentiment Analysis	Lecture/Expert Lec.	IT 1760.5	Class Quiz Home Assignments II Sessional
38.	Applications of NLP	Text Entailment	Lecture/Expert Lec	IT 1760.5	Class Quiz Home Assignments End Term
39.	Applications of NLP	Textual Alignment	Lecture	IT 1760.5	Class Quiz Home Assignments End Term
40.	Applications of NLP	Skip Bigram	Lecture	IT 1760.5	Class Quiz Home Assignments End Term
41.	Applications of NLP	LFACS	Lecture	IT 1760.5	Class Quiz Home Assignments End Term
42.	Applications of NLP	Logical Form Graphs	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 & INFORMATION TECHNOLOGY
DEPARTMENT OF INFORMATION TECHNOLOGY
COURSE HAND-OUT

Advance Machine Learning Techniques | IT 1761 | 3 Credits | 3 0 0 3

Session: Jul 19-Dec 19| Faculty: Dr. Akhilesh Kumar Sharma | Class: B.Tech Dept. Elective B.Tech IT (VII Sem)

A. Introduction: This course aims to discuss concepts and terminology associate with Statistics, intelligent Systems and machine learning and also provides a concise introduction to the fundamental concepts in machine learning and popular machine learning algorithms. The course also discuss the various concepts and applications of machine learning with pseudo code of advance algorithms and cover the standard and most popular supervised learning algorithms including linear regression, logistic regression and the basics of computational learning theory. This course also discuss regarding hypothesis space, overfitting, bias and variance, tradeoffs between representational power and learnability, evaluation strategies and cross-validation and performance analysis of various algorithms of machine learning.

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

[IT1761.1]. Student will learn various application areas and tools and understand statistical techniques to build machine learning applications.

[IT1761.2]. Clearly distinguish between neural nets, generative learning, SVM, bias, variance supervised/unsupervised learning and dimensionality reduction etc. to support intelligent systems.

[IT1761.3]. To learn and design systems for various Machine learning algorithms and Gaussian and logistic and linear models.

[IT1761.4]. Evaluate the performance of different machine learning algorithms

[IT1761.5]. Propose machine learning solutions for different applications and statistical feature modelling and selection.

[IT1761.6]. Student will learn dimension reduction and unsupervised learning concepts for Machine learning.

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 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)	Sessional Exam I (Closed Book)	15
	Sessional Exam II (Closed Book)	15
	Coursera 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 and need to finish the course at coursera.	

E. Syllabus:

Introduction: overview of machine learning, related areas, applications, software tools, course objectives; **Parametric regression:** linear regression, polynomial regression, locally weighted regression, numerical optimization, gradient descent, kernel methods; **Generative learning:** Gaussian parameter estimation, maximum likelihood estimation, MAP estimation, Bayesian estimation, bias and variance of estimators, missing and noisy features, nonparametric density estimation, Gaussian discriminant analysis, naive Bayes; **Discriminative learning:** linear discrimination, logistic regression, logit and logistic functions, generalized linear models, softmax regression; **Neural networks:** the perceptron algorithm, multilayer perceptron's, back propagation, nonlinear regression, multiclass discrimination, training procedures, localized network structure, dimensionality reduction interpretation; **Support vector machines:** functional and geometric margins, optimum margin classifier, constrained optimization, Lagrange multipliers; Unsupervised learning: K-means clustering, expectation maximization, Gaussian mixture density estimation, mixture of naive Bayes, model selection; **Dimensionality reduction:** feature selection, principal component analysis, linear discriminant analysis, factor analysis, independent component analysis, multidimensional scaling, manifold learning.

F. TEXT BOOKS:

T1. Hastie T., Tibshirani R., Friedman J., "The Elements of Statistical Learning", 2e, Pearson 2008

T2. P. Harrington, "Machine Learning in Action", Manning Publication, 2012.

G. REFERENCES BOOKS:

R1. D. Barber, "Bayesian Reasoning and Machine Learning", Cambridge University Press, 2012.

R2. S. Ben-David, S. Shalev- Shwartz, "Understanding Machine Learning: From Theory to Algorithms", Cambridge University Press, 2014.

H. Lecture Plan:

NO	TOPICS	Session Outcome	Mode of Delivery	Corresponding CO	Mode Of Assessing CO
1.	Overview of machine learning, Related areas, applications, software tools, course objectives;	Recall the ML concepts application areas.	Presentation and lecture, chalk & talk	IT 1761.1	Mid Term I, Quiz, Assignment, End tern
2.	Linear regression Polynomial regression and its applications.	To understand the regression	Lecture & Coursera	IT 1761.1 and IT 1761.5	Mid Term I, Quiz, Assignment, End tern coursera
3.	Multiple regression, application areas	understand the	Lecture & Coursera	IT 1761.1 and IT 1761.5	Mid Term I, Quiz , Assignment, End ter

		multiple regression			
4.	locally weighted regression, numerical optimization, gradient descent,	understand the linear regression	Presentation and lecture, chalk & talk	IT 1761.2	Mid Term I, Quiz , Assignment, End ter
5.	Kernel tricks, kernel methods;	understand kernel methods	Presentation and lecture, chalk & talk	IT 1761.2	Mid Term I, Quiz , Assignment, End ter
6.	Gaussian parameter estimation, Maximum likelihood estimation,	understand Gaussian mixture	Presentation and lecture, chalk & talk	IT 1761.2	Mid Term I, Quiz , Assignment, End ter
7.	Prior and posterior probability estimates	understand bayes theorem	Presentation and lecture, chalk & talk	IT 1761.2	Mid Term I, Quiz , Assignment, End ter coursera
8.	MAP estimation, Bayesian estimation,	understand MAP	Presentation and lecture, chalk & talk	IT 1761.1	Mid Term I, Quiz , Assignment, End ter
9.	bias and variance of estimators Feature selection,	understand Bias & Variance	Presentation and lecture, chalk & talk	IT 1761.1	Mid Term I, Quiz , Assignment, End ter coursera
10.	outlier and noise,missing and noisy features,	understand outlier, noise	Presentation and lecture, chalk & talk	IT 1761.2	Mid Term I, Quiz , Assignment, End ter
11.	nonparametric density estimation,		Presentation and lecture, chalk & talk	IT 1761.2	Mid Term I, Quiz , Assignment, End ter
12.	Gaussian discriminant analysis,	understand Gaussian mixture	Presentation and lecture, chalk & talk	IT 1761.2	Mid Term II, Quiz , Assignment, End ter
13.	Bayes theorem, Naive Bayes;	understand NB est.	Lecture, Presentation and chalk & talk	IT 1761.2 and IT 1761.3	Mid Term II, Quiz , Assignment, End ter coursera
14.	Linear discrimination,		Lecture	IT 1761.2	Mid Term II, Quiz , Assignment, End ter
15.	logistic regression, logit and logistic functions,	understand logistic regression	Lecture & Coursera	IT 1761.3	Mid Term II, Quiz , Assignment, End ter coursera
16.	Generalized linear models, softmax regression;	understand regression	Lecture & Coursera	IT 1761.3	Mid Term II, Quiz , Assignment, End ter
17.	Introduction to Neural Networks	Understand NN	Lecture & Coursera	IT 1761.3 and IT 1761.2	Mid Term II, Quiz , Assignment, End ter coursera
18.	The perceptron algorithm,	Understand NN & perceptron	Lecture & Coursera	IT 1761.3	Mid Term II, Quiz , Assignment, End ter
19.	multilayer perceptron's, back propagation, error and bias	Understand NN & perceptron	Lecture & Coursera	IT 1761.3	Mid Term II, Quiz , Assignment, End ter
20.	nonlinear regression, multiclass discrimination,	Understand non Linear regression	Lecture, Presentation and chalk & talk	IT 1761.3	Mid Term II, Quiz , Assignment, End ter
21.	training procedures, localized network structure,	Understand training & NW structure	Lecture, Presentation and chalk & talk	IT 1761.3 and IT 1761.1	Mid Term II, Quiz , Assignment, End ter coursera
22.	dimensionality reduction interpretation;	Understand Dim. reduction	Lecture, Presentation and chalk & talk	IT 1761.4 and IT 1761.3	Mid Term II, Quiz , Assignment, End ter coursera
23.	Supervised learning, KNN	Understand KNN	Lecture & Coursera	IT 1761.4 and IT 1761.5	Mid Term II, Quiz , Assignment, End ter coursera
24.	Supervised Learning, precision and recall	Understand Accuracy	Lecture & Coursera	IT 1761.4 and IT 1761.5	Mid Term II, Quiz , Assignment, End ter coursera

25.	SVM, functional and geometric margins, optimum margin classifier,	Understand SVM	Lecture & Coursera	IT 1761.4 and IT 1761.2	Mid Term II, Quiz , Assignment, End ter coursera
26.	Unsupervised learning: K-means clustering, expectation maximization,	Understand clustering	Lecture	IT 1761.5 and IT 1761.6	Mid Term II, Quiz , Assignment, End ter coursera
27.	Gaussian mixture density estimation, mixture of naive Bayes,	Understand	Lecture	IT 1761.1 and IT 1761.3	Quiz & Assignment, End term
28.	Model selection; feature selection,	Understand model selection	Lecture	IT 1761.4	Quiz & Assignment, End term
29.	Principal component analysis,	Understand PCA	Lecture & Coursera	IT 1761.4 and IT 1761.6	Quiz & Assignment, End term
30.	linear discriminant analysis,	Understand LDA	Lecture	IT 1761.6	Quiz & Assignment, End term
31.	Revision Class-I	Recall concepts	Lecture	IT 1761.6	Quiz & Assignment, End term
32.	Revision Class-II	Recall concepts	Lecture	IT 1761.5 and IT 1761.6	Quiz & End Term, Assignment, End ter

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
[IT 1761.1]	Student will learn various application areas and tools and understand statistical techniques to build machine learning applications.	2			2	3								1		
[IT 1761.2]	Clearly distinguish between neural nets, generative learning, SVM, bias, variance supervised/unsupervised learning and dimensionality reduction etc. to support intelligent systems.		2		3	2							1		1	1
[IT 1761.3]	To learn and design systems for various Machine learning algorithms and Gaussian and logistic and linear models.	2	3	2		1	1			1	1			1	1	
[IT 1761.4]	Evaluate the performance of different machine learning algorithms				2		1								1	
[IT 1761.5]	Propose machine learning solutions for different applications and statistical feature modelling and selection	3		3			2	1			1		1	2	1	1

[IT 1761.6	Student will learn dimension reduction and unsupervised learning concepts for Machine learning.	1			1									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

Semantic Web| IT 1762| 3 Credits | 3 0 0 3

Session: July 19 – Dec 19 | Faculty: Venkatesh Gauri Shankar | Class: B.Tech Department Elective

A. Introduction: In this course, students will study a comprehensive understanding of the course of Semantic web to the describe and understanding of www and its semantic applications. This course also motivates towards use of web services and its uses with a wide variety of subject matter domains.

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

[IT1762.1]. Describe World Wide Web with the current applications.
[IT1762.2]. Understand Semantic web with its different component and architecture.
[IT1762.3]. Analyse Semantic Web Services with the middleware
[IT1762.4]. Comparison between Syntactic web and Semantic web
[IT1762.5]. Understand and use of the web services in syntactic as well as semantic web.
[IT1762.6]. Describe many centralized platform on semantic web for resource description.

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

[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 (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)	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.	
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 advanced web technology: Technological issues, XML processing, RDF processing; **Middleware technologies:** DCOM ,CORBA, IIOP, RMI, RPC; **Taxonomies and ontologies for advanced web applications:** Ontology modeling, Languages for representing ontologies on the web, Rules and inferences; **Web services**: Design and modeling of web services, Technologies for Implementing web services, SOA, SOAP,Current applications of advanced web technologies. **Metadata classification:** from Syntax to Semantics. Metadata representation and choices for annotation. Extracting metadata from semi-structured data including research, techniques and tools. Extracting metadata from unstructured text including research, techniques and tools. Comprehensive literature review. **Automatic Classification**: Overview of research and techniques for automatic classification. Statistical, Machine Learning, Language Based and Knowledge Based techniques. Classifier committee.

F. TEXT BOOKS

T1. G. Antoniou, F. V. Harmelen, *"Semantic Web Primer",* MIT Press , 2008.

T2. J. C. Jackson, *"Web Technologies: A Computer Science Perspective",* Prentice Hall , 2006.

G. REFERENCE BOOKS

R1. P.K. Yuen, V. Lau, *"Practical Web Technologies"*, Addison Wesley, September 9, 2003

H. Lecture Plan:

LEC NO	Main Topic	Session outcome	Mode of delivery	Corresponding CO	Mode Of Assessing CO
1	**Introduction to advanced web technology and Middleware technologies**	Technological issues,	Lecture	IT1762.1	Mid Term I, Quiz-1 & End Term
2		XML processing,	Lecture	IT1762.1	Mid Term I, Quiz-1 & End Term
3		RDF processing;	Lecture	IT1762.1	Mid Term I, Quiz-1 & End Term
4		Python Version.	Lecture	IT1762.1	Mid Term I, Quiz-1 & End Term
5,6		DCOM ,	Flipped Class	IT1762.1	Mid Term I, Quiz-1 & End Term
7		CORBA,	Flipped Class	IT1762.1	Mid Term I, Quiz-1 & End Term
8,9		IIOP, RMI, RPC	Activity	IT1762.1	Mid Term I, Quiz-1 & End Term
10,11	**Taxonomies and ontologies for advanced web applications and Web services**	Ontology modelling,	Flipped Class	IT1762.2	Mid Term II, Quiz-2 & End Term
12		Languages for representing ontologies on the web,	Lecture	IT1762.2	Mid Term II, Quiz-2 & End Term
13		Rules and inferences;	Lecture	IT1762.2	Mid Term II, Quiz-2 & End Term
14,15		Design and modelling of web services,	Lecture	IT1762.2	Mid Term II, Quiz-2 & End Term
16,17		Technologies for Implementing web services,	Lecture	IT1762.2	Mid Term II, Quiz-2 & End Term
18,19		SOA, SOAP,	Flipped Class	IT1762.2	Mid Term II, Quiz-2 & End Term
20, 21		Current applications of advanced web technologies	Flipped Class	IT1762.2	Mid Term II, Quiz-2 & End Term
22, 23	**Metadata classification**	Syntax to Semantics. Metadata representation and choices for annotation.	Activity	IT1762.3 & IT1762.4	Mid Term II, Quiz-3 & End Term
24,25		Extracting metadata from semi-structured data including research,	Flipped Class	IT1762.3 & IT1762.4	Mid Term II, Quiz-3 & End Term
26, 27,28		Techniques and tools.	Lecture	IT1762.3	Mid Term II, Quiz-3 & End Term
29,30,31		Extracting metadata from unstructured text including research,	Lecture	IT1762.3	Mid Term II, Quiz-3 & End Term
32, 33		Techniques and tools for meta data	Lecture	IT1762.3 & IT1762.5	Mid Term II, Quiz-3 & End Term
34,35, 36		Comprehensive literature review.	Lecture	IT1762.4 & IT1762.3	Mid Term II, Quiz-3 & End Term

37,38		Comprehensive literature review.	Flipped Class	IT1762.4 & IT1762.3	Mid Term II, Quiz-3 & End Term
39,40,41	**Automatic Classification**	Overview of research and techniques for automatic classification. Statistical,	Flipped Class	IT1762.6 & IT1762.5	Quiz-4 & End Term
42, 43		Machine Learning,	Activity	IT1762.6 & IT1762.5	Quiz-4 & End Term
44,45		Language Based and Knowledge Based techniques.	Flipped Class	IT1762.6 & IT1762.5	Quiz-4 & End Term
46, 47, 48		Classifier committee.	Activity	IT1762.6 & IT1762.5	Quiz-4 & 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
[IT1762.1]	Describe World Wide Web with the current applications.	3			2				2					1		
[IT1762.2]	Understand Semantic web with its different component and architecture.		1	3				2				2			1	2
[IT1762.3]	Analyse Semantic Web Services with the middleware				3	2								2	1	3
[IT1762.4]	Comparison between Syntactic web and Semantic web						2		2	3				3	2	
[IT1762.5]	Understand and use of the web services in syntactic as well as semantic web.			2						1	2			3		2
[IT1762.6]	Describe many centralized platform on semantic web for resource description.	2						3					1	3		2

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

MANIPAL UNIVERSITY JAIPUR
SCHOOL OF COMPUTING & INFORMATION TECHNOLOGY

DEPARTMENT OF INFORMATION TECHNOLOGY
Course Hand-out

Information & Web Security | IT1792 | 3 credits | [3 0 0 3]

Session: Aug 19 – Dec 19 | Faculty: Dr. Alka Choudhary | Class: B.Tech (VII Sem)

A. Introduction: This course is offered by Dept. of Information Technology, 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

[IT1792.1] To understand the concept of information security with classical cryptography.
[IT1792.2] Define the notion of cryptography and reinforce it with the knowledge of network.
[IT1792.3] Understand and analyse legacy and contemporary cryptographic strategies, identify the issues of network security.
[IT1792.4] Learn the design principles and implementation aspects of cyber security & forensics and evaluate them in different application scenarios
[IT1792.5] To master the web application security with different modern 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 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 ethiIT 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 ITE program, the student:

[PSO.1].Apply creativity in support of the design, simulation, implementation and inference of existing and advanced technologies.

[PSO.2]. Participate & succeed in IT oriented jobs/competitive examinations that offer inspiring & gratifying careers.

[PSO.3]. Recognize the importance of professional developments by pursuing postgraduate studies and positions.

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.	

D. Syllabus

Introduction – Introduction: Security mindset, Computer Security Concepts (CIA), Threats, Attacks, and Assets. Software Security: Vulnerabilities and protections, malware, program analysis. Malicious software (Viruses, trojans, rootkits, worms, botnets) Memory exploits (buffer overflow, heap overflow, integer overflow, format string).Practical Cryptography: Encryption, authentication, hashing, symmetric and asymmetric cryptography, Digital Signatures and Certificates. Network Security: Network security issues, Sniffing, IP spoofing, Common threats, E-Mail security, IPSec, SSL, PGP, Intruders, Virus, Worms, Firewalls-need and features of firewall, Types of firewall, Intruder Detection Systems. Cyber Security: Cyber Crime and security, Security tools, Introduction to Digital Forensic, OS fingerprinting, TCP/IP stack masking, Social Engineering. Web Security and special topics: Web application Security, Privacy and Anonymity, public policy, User authentication, authentication-via-secret and session management. Cross Site Scripting, Cross Site Request Forgery, SQL Injection.

1. **Text Books**

T1. W. Stallings, “Cryptography and Network Security: Principles and Practice”, Prentice Hall, 5th edition, 2010.

2. **References:**

R1. M. Bishop, “Introduction to Computer Security”, Addison-Wesley, 2004

R2. J. A.Buchmann, “Introduction to Cryptography”, Springer Verlag, 2001.

Sr.No.	Topics to be covered	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1	Introduction to the course	To acquaint and clear teachers expectations and understand student expectations	Lecture	NA	NA
2	Introduction to Security	Understanding of different key concepts of security.	Lecture	1792.1	Class Quiz Sessional 1 End Term
3	Computer Security Concepts (CIA)	Understanding of different functions involved in computer security concepts	Flipped Class	1792.2	Class Quiz Sessional 1 End Term
4	Introduction to Threats, Attacks	Understanding of basic component and standards of threats and attacks.	Lecture	1792.2	Class Quiz Sessional 1 End Term
5	Introduction to Assets.	Knowledge about different security assets	Lecture and Flipped Class	1792.2	Class Quiz Sessional 1 End Term
6	Introduction to software security	Understanding the working of software security	Lecture	1792.2	Class Quiz Sessional 1 End Term
7	Vulnerabilities and protections	Understanding the concept of security	Lecture	1792.2	Class Quiz Sessional 1 End Term
8	Introduction to malware	Knowledge of different malwares	Lecture	1792.2	Class Quiz Sessional 1 End Term
9	program analysis for software system	Knowledge of software systems		1792.2	Class Quiz Sessional 1 End Term
10	Introduction to Malicious software like Viruses, trojans	Knowledge of different malicious software's	Lecture	1792.2	Class Quiz Sessional 1 End Term

11	Introduction to Malicious software like rootkits, worms, botnets	Knowledge of different malicious software's	Lecture / Flipped Class	1792.2	Class Quiz Sessional 1 End Term
12	Introduction to Memory exploits (buffer overflow, heap overflow)	Understand the concepts of memory exploits	Lecture	1792.2	Class Quiz Sessional 1 End Term
13	Introduction to Memory exploits (integer overflow, format string)	Recall different memory exploits	Flipped Lecture	1792.3	Class Quiz Sessional 2 End Term
14-15	Introduction to cryptography Encryption, authentication, hashing	Recall different cryptography concepts	Flipped Class	1792.3	Class Quiz Sessional 2 End Term
16	symmetric and asymmetric cryptography	Understanding of types of cryptography	Lecture	1792.3	Class Quiz Sessional 2 End Term
17	Digital Signatures and Certificates	Explain digital signature and certificates	Lecture	1792.3	Class Quiz Sessional 2 End Term
18	Network security issues	Recall network security issues	Lecture	1792.4	Class Quiz Sessional 2 End Term
19	Sniffing	Understanding of sniffing	Lecture	1792.4	Class Quiz Sessional 2 End Term
20-21	IP spoofing	Know about IP spoofing	Lecture	1792.4	Class Quiz Sessional 2 End Term
22	Common threats and E-Mail security	Understanding of Email security	Lecture	1792.4	Class Quiz Sessional 2 End Term
23	IPSec and SSL	Understanding the root concept of SSL	Lecture	1792.4	Class Quiz Sessional 2 End Term
24	PGP, Intruders, Virus, Worms	Understanding Concepts of PGP	Lecture	1792.4	Class Quiz Sessional 2 End Term
25	Firewalls-need and features of firewall Types of firewall, Intruder Detection Systems	Knowing concept of firewalls	Lecture	1792.4	Class Quiz Sessional 2 End Term

26	Cyber Crime and security Security tools	Knowing Concept of Cyber security	Lecture	1792.4	Class Quiz Sessional 2 End Term
27	Introduction to Digital Forensic	Understanding concept of Digital forensic	Lecture	1792.5	Class Quiz End Term
28-29	OS fingerprinting	Know the concept of OS fingerprinting	Lecture	1792.5	Class Quiz End Term
30	TCP/IP stack masking	Understanding the concept of TCP/IP stack	Lecture	1792.5	Class Quiz End Term
32	Introduction to Social Engineering	Understanding to the social Engineering	Lecture	1792.5	Class Quiz End Term
34	Web application Security	Understanding the concept of web security	Lecture	1792.5	Class Quiz End Term
35	Privacy and Anonymity public policy	Understanding the public policy	Lecture	1792.5	Class Quiz End Term
36	User authentication authentication-via-secret and session management	Know the concept of User authentication	Lecture	1792.5	Class Quiz End Term
37	Cross Site Scripting	Know the concept of cross site scripting	Lecture	1792.5	Class Quiz End Term
38	Cross Site Request Forgery and SQL Injection.	Know the concept of SQL injection	Lecture	1792.5	Class Quiz End Term
39	Revision	Understanding the syllabus	Lecture	1792.5	Class Quiz End Term
40	Revision	Understanding the syllabus	Lecture	1792.5	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
[IT 1792.1]	To understand the concept of information security with classical cryptography.	3	2							1	3			2		
[IT 1792.2]	Define the notion of cryptography and reinforce it with the knowledge of network.		3	3	2					1				2		
[IT 1792.3]	Understand and analyse legacy and contemporary cryptographic strategies, identify the issues of network security.	3			3	2				1				3	2	
[IT 1792.4]	Learn the design principles and implementation aspects of cyber security & forensic and evaluate them in different application scenarios			3	2							3			2	3
[IT 1792.5]	To master the web application security with different modern techniques.		3		2									3		2

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Department of Information and technology

Course Hand-out

Major Project| IT 1881 | 12 Credits
Session: Jan 2020-July 2020 | Faculty: Neha V Sharma | Class: B.Tech Compulsory

A. Introduction: This course is offered by Dept. of Information Technology as a compulsory subject, targeting students who wish to pursue research & development in industries or higher studies in field of Information technology. The duration of B.Tech final year project is one Semester along with coursework of 8th semester. Students are required to undertake innovative and research oriented projects, which not only reflect their knowledge gained in the earlier semesters but also additional knowledge gained from their own effort. They must show the phase wise development of their project submitting the appropriate documents at the end of each phase. The student must put in effort to find answers to questions about the applications, which will also enhance the value of the project report. There will be one interim and one final seminar for evaluation of the project.

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

[IT1881.1]. Design and model a system based on real life application and hence develop employability skills.
[IT1881.2]. Plan and execute well defined objectives.
[IT1881.3]. Work in team at component level and system level, Integrate or reuse with- existing components promoting Entrepreneurship
[IT1881.4]. Derive performance metrics and assess quantitatively the performance of system
[IT1881.5]. Report and present the findings in standard formats

A. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

PO1: Apply the knowledge of basic science and fundamental computing in solving complex engineering problems

PO2: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: 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

PO4: 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

PO5: 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: 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: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

PO8: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

PO9: Function effectively as an individual, and as a member or leader in diverse IT teams, and in multidisciplinary settings.

PO10: 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

PO11: 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: 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.

B. 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
[IT 1881.1]	Design and model a system based on real life application	3	2				1	2						3		
[IT 1881.2]	Plan and execute well defined objectives.			2	1	1										1
[IT 1881.3]	Work in team at component level and system level , Integrate or reuse with- existing components								1	2		2				
[IT 1881.4]	Derive performance metrics and assess quantitatively the performance of system				2										2	
[IT 1881.5]	Report and present the findings in standard formats										2		1			

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