MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

DEPARTMENT OF COMPUTER AND COMMUNICATION ENGINEERING

PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

B.Tech –Computer and Communication Engineering | 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

Vijay

PROGRAM SPECIFIC OUTCOMES

[PSO.1]. Clearly Identify the basic principles, concepts and applications in the field of computer based Communication/networking, information sharing, signal processing, web based systems, smart devices and communication technology.

[PSO.2]. Nail down the issues prevalent in the field of Computer and Communication Engineering.

[PSO.3]. Identify the existing open problems in the field of computing and **propose** the best possible solutions.

[PSO.4]. 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

Vijay

PROGRAM ARTICULATION MATRIX

SEMESTER	COURSE CODE	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
		PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES															
I	CS 1001	3	1	3	-	-	-	-	-	-	-	-	3	-	-	-	-
	CS1030	3	1	3	-	-	-	-	-	-	-	-	3	-	-	-	-
	CV 1001	3	3	2	3	3	2	2	-	3	2	3	3	-	-	-	-
	CY 1001	2	2	2	-	3	-	3	2	-	3	-	3	-	-	-	-
	CY 1002	3	3	1	2	3	3	3	3	3	-	1	3	-	-	-	-
	CY 1030	2	-	2	-	3	-	3	2	-	3	-	3	-	-	-	-
	EC 1001	3	3	3	2	2	1	1	-	-	-	-	1	-	-	-	-
II	EE 1101	3	2	1	-	-	1	1	-	-	-	-	2	-	-	-	-
	LN 1001	-	1	-	-	-	1	-	2	2	2	1	-	-	-	-	-
	MA 1101	3	3	2	3	3	-	-	-	2	-	3	1	-	-	-	-
	ME 1001	3	3	3	2	-	2	2	-	-	-	-	-	-	-	-	-
	ME 1002	3	3	3	2	3	-	-	-	-	-	-	2	-	-	-	-
	ME 1030	1	1	-	-	1	-	1	-	1	-	1	1				
	PY 1001	3	3	3	2	2	2	2	1	2	2	2	2				
	PY 1030	3	3	1	2	2	3	2	2	2	2	1	2	-	-	-	-
III	CS 1301	3	2	1	-	-	-	-	-	-	-	-	2	2	1	2	1
	CS 1302	3	3	2	-	-	-	-	-	-	-	-	3	3	3	3	-
	CS 1303	3	2	2	-	-	-	-	-	-	-	-	2	3	2	2	1
	CS 1304	3	2	2	2	-	-	-	-	1	1	1	2	3	-	-	-
	CS1331	3	2	2	-	-	-	-	-	-	-	-	2	3	2	2	1
	CS1332	1	2	2	1	1	-	-	-	-	-	-	-	1	-	-	-
	MA1307	3	3	3	2	2	-	-	-	1	1	2	3	3	3	2	-
	BB1101	-	-	-	-	-	1	3	2	1	2	1	2	-	-	-	-
IV	CS1401	3	2	3	1	2	2	1	2	3	1	1	2	2	2	2	1
	CS1402	3	3	3	3	1	1	1	1	1	1	1	1	3	3	1	1
	CS1403	2	1	1	1	1	1	-	-	-	-	-	1	1	1	1	-
	CS1431	3	3	3	1	1	3	-	3	3	3	-	3	3	3	3	3
	CS1432	3	3	3	3	3	1	1	1	1	1	1	1	3	3	1	1
	CS1433	2	2	1	2	1	1	1	1	1	1	1	3	2	2	2	2
	MA1406	3	3	3	3	2	2	-	1	-	-	1	2	3	3	3	3
	HS1401	-	-	-	-	-	1	-	-	2	-	2	3	-	-	2	2
V	CS1501	-	3	3	2	1	2	1	2	2	2	2	-	1	3	3	1
	CC1501	2	2	2	3	3	2	2	1	1	1	1	2	2	2	2	2
	CC1502	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	3
	CC1530	3	2	2	2	3	2	-	-	3	-	-	3	3	2	1	2
	CC1551	2	2	3	3	3	1	2	2	2	2	3	3	3	2	3	2
VI	CS1602	2	2	3	3	3	2	2	1	2	1	1	1	3	1	3	1
	CC1601	2	3	3	3	2	1	1	2	2	1	2	2	3	2	3	1
	CS1631	2	3	3	2	3	2	2	2	2	2	2	1	3	2	3	1
	CC1630	2	2	2	3	3	1	1	1	2	1	1	1	2	2	3	1
	CC1634	3	2	2	2	3	1	3	1	2	1	2	1	2	2	2	1
	BB1540	3	3	3	2	1	1	2	2	2	1	3	1	3	2	2	2
	CC1652	1	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	CC1653	3	3	3	3	3	-	-	-	-	-	-	-	3	3	3	-
	CC1654	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
VII	CC1701	2	2	2	1	-	-	2	-	-	-	-	3	2	-	2	3
	CC1702	3	3	3	3	3	2	-	1	2	-	-	1	3	2	3	3
	CC1730	1	1	1	2	2	-	-	-	-	-	-	-	2	2	2	1
	CC1731	1	1	1	1	2	1	1	1	1	-	1	-	2	2	2	1
	CC1751	2	2	2	2	-	1	1	1	1	-	1	1	2	1	1	1
	CC1752	3	2	2	2	-	-	-	-	2	-	-	-	3	2	2	2
	CC1753	3	1	3	3	3	-	-	-	-	-	-	3	3	1	-	-

	CC1754	3	3	3	3	3	2	-	-	1	1	-	1	2	1	1	1
	CC1755	3	2	1	-	3	-	-	-	-	-	-	2	2	2	1	1
VIII	CC1881	2	2	1	2	3	1	-	1	-	-	-	-	2	2	1	1

PROGRAM ARTICULATION MATRIX

S.I.N.O.	Course CODE	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
1	CS 1301	3	2	1	0	0	0	0	0	0	0	0	2	2	1	2	1
2	CS 1302	3	3	0	0	0	0	0	0	0	0	0	3	2	0	2	0
3	CS 1303	2	2	2	0	0	0	1	0	0	0	0	2	2	1	2	1
4	CS 1304	2	1	1	1	0	0	0	0	1	1	1	1	2	0	0	0
5	CS1331	3	2	2	0	0	0	2	0	0	0	0	2	3	2	2	1
6	CS1332	1	2	2	1	1	0	0	0	0	0	0	0	2	0	0	0
7	MA1307	3	3	3	2	2	0	0	0	1	1	2	3	3	3	2	0
8	BB1101	0	0	0	0	0	1	3	2	1	2	1	2	0	0	0	0
9	CS1501	0	3	3	1	1	1	1	1	2	1	2	0	1	3	3	1
10	CC1501	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
11	CC1502	3	2	3	2	0	0	0	0	0	0	0	2	3	1	3	0
12	IT1504	3	2	1	0	0	0	1	0	1	2	0	1	3	2	1	1
13	CS1530	0	2	3	2	1	1	0	0	1	2	0	0	0	1	2	3
14	CC1530	3	2	2	2	3	2	0	0	3	0	0	3	3	2	1	2
15	CC1551	2	2	3	3	3	1	2	2	2	2	3	3	3	2	3	2
16	CC1701	1	1	0	0	0	0	1	0	0	0	0	0	1	0	1	0
17	CC1702	2	2	2	2	1	2	1	1	2	0	1	0	2	1	2	2
18	CC1730	1	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1
19	CC1731	1	1	1	1	2	1	2	1	1	0	1	0	2	2	2	1
20	CC1751	2	2	2	2	0	1	1	1	1	0	1	1	2	1	1	1
21	CC1752	2	1	1	1	0	0	0	0	0	0	0	0	2	1	1	1
22	CC1753	2	1	2	2	1	0	0	0	0	0	0	2	2	1	0	0
23	CC1754	0	1	1	1	1	0	0	0	0	0	1	0	1	1	1	0
24	CC1755	3	2	1	0	3	0	0	0	0	0	0	2	2	1	1	1

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PROGRAM ATTAINMENT MATRIX

S.I.N.O.	Course CODE	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	ATTAINMENT PERCENTAGE
1	CS 1301	100	100	100	0	0	0	0	0	0	0	0	100	100	100	100	100	100
2	CS 1302	100	100	0	0	0	0	0	0	0	0	0	100	66.67	0	66.67	0	62
3	CS 1303	66.67	100	100	0	0	0	0	0	0	0	0	100	66.67	50	100	100	85
4	CS 1304	66.67	50	50	50	0	0	0	0	100	100	100	50	66.67	0	0	0	70
5	CS1331	100	100	100	0	0	0	0	0	0	0	0	100	100	100	100	100	100
6	CS1332	100	100	100	100	100	0	0	0	0	0	0	0	200	0	0	0	117
7	MA1307	100	100	100	100	100	0	0	0	100	100	100	100	100	100	100	0	100
8	BB1101	0	0	0	0	0	100	100	100	100	100	100	100	0	0	0	0	100
9	CS1501	0	100	100	50	100	50	100	50	100	50	100	0	100	100	100	100	86
10	CC1501	50	50	50	33.33	33.33	50	50	100	100	100	100	50	50	50	50	50	60
11	CC1502	100	66.67	100	100	0	0	0	0	0	0	0	100	100	100	100	0	96
12	IT1504	100	100	100	0	0	0	0	0	100	100	0	100	100	100	100	0	100
13	CS1530	0	66.67	100	100	100	50	0	0	0	0	0	0	0	100	66.67	100	68
14	CC1530	100	100	100	100	100	100	0	0	100	0	0	100	100	100	100	100	100
15	CC1551	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
16	CC1701	50	50	0	0	0	0	50	0	0	0	0	0	50	0	50	0	28
17	CC1702	66.67	66.67	66.67	66.67	33.33	100	0	100	100	0	0	0	66.67	50	66.67	66.67	65
18	CC1730	100	100	100	50	50	0	0	0	0	0	0	0	50	50	50	100	72
19	CC1731	100	100	100	100	100	100	200	100	100	0	100	0	100	100	100	100	107
20	CC1751	100	100	100	100	0	100	100	100	100	0	100	100	100	100	100	100	100
21	CC1752	66.67	50	50	50	0	0	0	0	0	0	0	0	66.67	50	50	50	48
22	CC1753	66.67	100	66.67	66.67	33.33	0	0	0	0	0	0	66.67	66.67	100	0	0	71
23	CC1754	0	33.33	33.33	33.33	33.33	0	0	0	0	0	0	0	50	100	100	0	32
24	CC1755	100	100	100	0	100	0	0	0	0	0	0	100	100	50	100	100	94

OVERALL PROGRAM ATTAINMENT	82
OVERALL PROGRAM ATTAINMENT LEVEL	3

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

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

[1001.1]. Demonstrate bitwise operations and conversion of numbers in different representations through Number System.

[1001.2]. Demonstrate a deep knowledge of computer for better understanding of devices, basic fundamental of computer comprises in this course.

[1001.3]. Design flow chart, Write algorithm and pseudo code parallel with Control Statements to understand flow of program execution.

[1001.4]. Create memory oriented operation using pointers and understating programming skills by Array, Structure, Union, Enum and String are added.

[1001.5]. Create program using concept of re-usability by means of functions in C.

[1001.6]. Illustrate the concept of data base by using file handling.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

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

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

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

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[PO.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

32	Pointers: introduction	Describe functionality of pointers in programming'	Lecture	1001.4	Mid Term II, Quiz & End Term
33	1-D Array and pointer	Implementation of ID array with pointer	Lecture	1001.4	Mid Term II, Quiz & End Term
34	Functions: introduction to functions	Describe importance of fuction and modular programming	Lecture, Activity	1001.5	Mid Term II, Quiz & End Term
35	Function prototype, call, definition	Describe importance of fuction and modular programming	Lecture	1001.5	Mid Term II, Quiz & End Term
36	Storage classes	Describe usage of storage classes	Lecture	1001.5	Mid Term II, Quiz & End Term
37	Structures: definition, declaration, initialization, array of structures	Describe usage of structures	Lecture	1001.4	Quiz & End Term
38	Structures: definition, declaration, initialization, array of structures	Describe usage of structures	Lecture	1001.4	Quiz & End Term
39	Union, difference between union and structures	Describe usage of union	Lecture	1001.4	Quiz & End Term
40	File handling: introduction, operations on files, opening modes	Describe usage of file handling with various operations and modes	Lecture	1001.6	Quiz & End Term
41	File handing function	Describe usage of file handling with various operations and modes	Lecture	1001.6	Quiz & End Term
42	File handing function	Describe usage of file handling with various operations and modes	Lecture	1001.6	Quiz & End Term

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

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

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

School of Computing and Information Technology

Course Hand-out

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

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

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

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

[1030.1]. Demonstrate bitwise operations and conversion of numbers in different representations through Number System.

[1030.2]. Demonstrate a deep knowledge of computer for better understanding of devices, basic fundamental of computer comprises in this course.

[1030.3]. Design flow chart, Write algorithm and pseudo code parallel with Control Statements to understand flow of program execution.

[1030.4]. Create memory oriented operation using pointers and understating programming skills by Array, Structure, Union, Enum and String are added.

[1030.5]. Create program using concept of re-usability by means of functions in C.

[1030.6]. Illustrate the concept of data base by using file handling.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

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

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

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

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

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

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

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

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

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

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

D. Assessment Plan:

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

E. SYLLABUS

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

F. Text Books

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

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

G. Reference Books

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

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

H. Lab Experiment Plan:

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

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

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

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

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

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

C. Program Outcomes and Program Specific Outcomes

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

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

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

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

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

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

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

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

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

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

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

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

D. Assessment Plan:

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

E. Syllabus

Unit-I Classification of Fuels, Gross Calorific value and Net Calorific value. Solid, Liquid and Gaseous fuels.
Unit-II: Advanced materials and polymers: Liquid crystals, ceramics, composites, bio-materials, nanomaterials, thin films and their properties and applications.
Unit-III: Water treatment technology.
Unit- IV: Concept of corrosion and its importance, types of corrosion, factors affecting corrosion, Corrosion control methods. Chemistry of primary and secondary batteries. Working principles of fuels cells and their applications.
Unit-V: Theory and application phase rule (up to two component system).
Unit VI; General methods of chemical analysis, Instrumental methods. Introduction to spectroscopic methods of analysis: Electromagnetic radiation (EMR), Interaction of EMR with matter, Numerical Problems. Concepts of rotational, vibrational and electronic spectra, Laws of spectrophotometry

F. Text Books

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

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

G. Reference Books

No reference books required for this course.

H. Lecture Plan:

Lec No	**Topics**	**Session Outcome**	**Mode of Delivery**	**Corresponding CO**	**Mode of Assessing the Outcome**
1.	**Chemical fuels:** Introduction, Classification, Calorific value. Gross calorific value and net Calorific value. Determination of calorific value by Bomb calorimeter.	To acquaint and clear teachers expectations and understand student expectations	Lecture	1001.1	Class Quiz End Term
2.	Determination of calorific value by Boys; Numerical problems based on Bomb and Boys calorimeter.	Working of the calorimeter	Lecture, Activity	1001.1	Class Quiz Mid Term I
3.	Dulong formula; Numerical problems.	Analyse and solve numerical problems	Lecture, Activity	1001.1	Class Quiz End Term
4.	Solid fuels – Coal and its analysis – Proximate and Ultimate analysis.	Analyse and solve numerical problems	L Lecture, Activity	1001.1	Home Assignment End Term
5.	Liquid Fuels: Fractional Distillation, Petroleum cracking - catalytic cracking (Fixed Bed and moving bed) and Reforming of petroleum, Synthetic Petrol: Burgius process, Fisher Trophch method. Composition and applications of water gas, Producer gas.	Principles of distillation, cracking	Lecture	1001.1	Class Quiz End Term
6.	Numerical based on Combustion (By Weight Type and By Volume Type)	Analyse and solve numerical problems	Lecture, Activity	1001.2	Class Quiz Mid Term I End Term
7.	**Advanced materials and polymers:** Introduction, Definition, classification of polymers – based on origin, thermal behaviour, Polymerization reactions and applications, Tacticity. Functionality, Degree of polymerization, Co-polymerization – alternating, random, block and graft polymers	Describe the working of polymer	Lecture	1001.2	Class Quiz Mid Term I End term
8.	Mechanism of free radical polymerization and ionic polymerization. Mechanism of coordination polymerization, Condensation polymerization reactions, Glass transition temperature & factors affecting it	Describe mechanization of polymerization	Lecture	1001.2	Class Quiz Mid Term I End Term
9.	Molecular weight of polymers, Number 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
CY 1001.1	Understand and apply concepts of various types of fuel technology.	2						3			2		2
CY 1001.2	Understand the synthesis and applications of polymer and some advanced materials			2					2				3
CY 1001.3	Develop understanding about the water softening methods.	2				3					3		2
CY 1001.4	Understand and apply the concepts in electrochemistry and corrosion science in protecting metallic objects.								2				2
CY 1001.5	Develop concept of phase rule		2			2			2				3
CY 1001.6	Understand various modern analytical techniques.	2				3			2				3

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;

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

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

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

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

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

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

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

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

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

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

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

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

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

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

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

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

D. Assessment Plan:

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

E. SYLLABUS

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

F. TEXT BOOKS

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

G. REFERENCE BOOKS

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

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

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

[1030.1]. Develop skill in quantitative chemical analysis.

[1030.2]. Apply concept of synthetic chemistry.

[1030.3]. 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	Analyse physical property of materials	Activity	1001.3	Practical Assessments and End Term Lab Assessment

	Determination of unknown strength of HCl and CH_3COOH pH-metrically				
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											
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
[EC1101.	Apply principles of physics to describe and analyse the working of semiconductor devices and integrated circuits	3	2	3	1			1					1
[EC1101.	Analyse different biasing configurations of bipolar junction transistor	3	2	1	2	1							**1**
[EC1101.	Analyse inverting or non-inverting amplifier structures comprising of operational amplifiers	3	3	3	2	**2**							1
[EC1101.	Demonstrate interconversion on different number systems	3	2	3	2	**2**		1					1
[EC1101.	Demonstrate minimization of Boolean expressions	**3**	3	1	**2**	**2**							1
[EC1101.	Identify different elements of communication	**3**	2	**2**	2		1						2

MANIPAL UNIVERSITY JAIPUR

School of Electrical, Electronics and Communication

Department of Electrical Engineering
Course Hand-out

Basic Electrical Technology | EE 1101 | 4 Credits | 2 1 0 3

Session: July. 19 – Nov. 19 | Faculty: Dr. Manish Kumar Thukral | Class: First Year (All Branches)

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

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

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

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

C. Program Outcomes and Program Specific Outcomes

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

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

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

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

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

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

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

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

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

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

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

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

D. Assessment Rubrics:

<table>
<tr><th>Criteria</th><th>Description</th><th>Maximum Marks</th></tr>
<tr><td rowspan="3">Internal Assessment
(Summative)</td><td>Sessional Exam I (Closed Book)</td><td>20</td></tr>
<tr><td>Sessional Exam II (Closed Book)</td><td>20</td></tr>
<tr><td>In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)</td><td>20</td></tr>
<tr><td>End Term Exam
(Summative)</td><td>End Term Exam (Closed Book)</td><td>40</td></tr>
<tr><td></td><td>Total</td><td>100</td></tr>
<tr><td>Attendance
(Formative)</td><td colspan="2">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.</td></tr>
<tr><td>Make up Assignments
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<tr><td>Homework/ Home Assignment/ Activity Assignment
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</table>

E. Syllabus

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

F. TEXT BOOKS

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

G. REFERENCE BOOKS

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

H. Lecture Plan:

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

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

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

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

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

MANIPAL UNIVERSITY JAIPUR

School of Humanities and Social Sciences

DEPARTMENT OF LANGUAGES

Course Hand-out

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

Session: July19-Nov 19 | Faculty: Dr Arun Kumar Poonia| Class: B-Tech I Semester

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

D. Assessment Plan:

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

E. SYLLABUS

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

F. REFERENCES:

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

G. Lecture Plan:

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

Day 6	Comprehending conversations and lectures	Use appropriate co mmunication skills in specific contexts and for specific purposes	Lecture, PPT, Discussion	1001.1, 1001.2	Quizzes, I Sessional, End Term Examination
Day 7& 8	**Reading:** Analysis of passages; skimming and scanning; contextual meaning	Use appropriate co mmunication skills in specific contexts and for specific purposes	Lecture, PPT, Discussion	1001.1, 1001.2	Quizzes, II Sessional, End Term Examination
Day 9	Advanced vocabulary	Demonstrate meaningful group communication exchanges	Lecture, PPT, Discussion	1001.2, 1001.3, 1001.4	Quizzes, II Sessional, End Term Examination
Day 10	**Writing**: Paragraph writing; Writing Creative and Critical responses	Develop critical and creative thinking abilities for communicative competence	Lecture, PPT, Discussion	1001.1, 1001.2, 1001.4	Quizzes, II Sessional, End Term Examination
Day 11 & 12	Formal letters; Emails	Develop critical and creative thinking abilities for communicative competence	Lecture, PPT, Discussion	1001.1, 1001.2, 1001.4	Quizzes, II Sessional, End Term Examination
Day 13 & 14	Resume and Statement of Purpose	Develop critical and creative thinking abilities for communicative competence	Lecture, PPT, Discussion	1001.1, 1001.2, 1001.4	Quizzes, II Sessional, End Term Examination

Day 15	**Speaking:** Presentation Skills and discussion.	Use appropriate co mmunication skills in specific contexts and for specific purposes	Lecture, PPT, Discussion	1001.1, 1001.2, 1001.3, 1001.5	Quizzes, End Term Examination
Day 16-18	Debate on current affairs, scientific enquiry, philosophical attributions, literary sensibilities, socio-political awareness, and cultural sensitivity	Use appropriate co mmunication skills in specific contexts and 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: Ist Year

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

D. Assessment Plan:

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

E. Syllabus

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

F. Text Book:

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

G. Reference Book:

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

4. Iyengar S.R.K. and Jain, Rajendra K., *Advance Engineering Mathematics (3e)*, Narosa book distributors Pvt Ltd-New Delhi, 2007
5. Ramana B. V., *Higher Engineering Mathematics* (6th reprint), Tata Mcgraw-Hill, New Delhi, 2008

H. Lecture Plan:

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

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

19	Lagrange’s and inverse interpolation for unequal intervals.	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.2	Quizzes, assignments, Two Sessional, End Term Examination
20	Tutorial	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Problem solving	1101.2	Quizzes, assignments, Two Sessional, End Term Examination
21	Numerical Differentiation - forward and backward formulas	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.2	Quizzes, assignments, Two Sessional, End Term Examination
22	Numerical Differentiation - Central formula	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.2	Quizzes, assignments, Two Sessional, End Term Examination
23	Numerical differentiation for unequal intervals	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.2	Quizzes, assignments, Two Sessional, End Term Examination
24	Tutorial	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Problem solving	1101.2	Quizzes, assignments, Two Sessional, End Term Examination
25	Numerical Integration- Newton Cotes formula	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.2	Quizzes, assignments, Two Sessional, End Term Examination
26	Trapezoidal and Simpson’s 1/3 rd rules of integration	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.2	Quizzes, assignments, Two Sessional, End Term Examination
27	Simpson’s 3/8 th rule of integration,Weddle rule	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.2	Quizzes, assignments, Two Sessional, End Term Examination
28	Tutorial	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Problem solving	1101.2	Quizzes, assignments, Two Sessional, End Term Examination

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

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

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

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

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
MA1101.1	To describe the concept of ODE and their applications to solve the problems	3	3	1	3	1				2		2	1
MA1101.2	To describe the concept of Interpolation, Numerical differentiation & integration and their applications and in real life problems.	3	2	2	2	2				2		1	1
MA1101.3	To Describe the concept of numerical methods to evaluate the roots of Algebraic & Transcendental equations and solutions of ODE though which one could develop programming skills to develop the skill of solving the complex problems which	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: 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: I Year B.Tech

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

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

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

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

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

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

C. Program Outcomes and Program Specific Outcomes

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

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

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

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

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

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

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

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

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

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

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

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

D. Assessment Plan:

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

E. Syllabus

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

F. Text Books:

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

G. Reference Books:

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

H. List of Sheets

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

CAD

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

I. Lecture Plan:

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

		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	

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

CO	**STATEMENT**	Correlation With Program Outcomes											
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12

ME1002.1	Students will be able to understand the conventions and the methods of engineering drawing.	3	1	2	1								2
ME1002.2	Students will be able to understand the theory of projections. Draw orthographic projections of lines, planes and solids.	3	2	2	1								2
ME1002.3	Students will learn to apply sectional views to most practically represent engineered parts**.** Students will have **skill** to prepare basic engineering models.	3	3	3	1								2
ME1002.4	Student will learn **design and drafting** in autocad. Understand the application of industry standards and techniques applied in engineering graphics.	3	3	3	2	3							2

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

MANIPAL UNIVERSITY JAIPUR

School of Automobile Mechanical and Mechatronics Engineering

Department of Mechanical Engineering

Course Hand-out

Basic Workshop Practice| ME 1030 | 1 Credits

Session: JUL 19 – NOV 19 | Faculty: Ashish Sharma

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

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

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

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

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

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

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

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

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

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

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

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

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

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

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

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

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

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

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

D. Assessment Plan:

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

E. SYLLABUS

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

F. TEXT BOOKS

i. Hajra Choudhury S. K and Bose S. K, Elements of Workshop Technology, Vol I, Media
ii. Promoters & Publishing Pvt. Ltd., Mumbai, 2012.

iii. Raghuvanshi S.S, Workshop Technology, Dhanpat Rai and Sons, Delhi, 2002.
iv. Punmia B. C, Surveying, Laxmi Publications, Bangalore, 2012.
v. Uppal S.L., Electrical Wiring, Estimating and Costing, Khanna Publishers, 1978.
vi. Bishop Owen, Electronics: A First Course, (2e), NEWNES, An Imprint of Elsevier, 2006.

Lecture Plan:

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

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

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

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

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

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

[PO.1] Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
[PO.2] Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
[PO.3] Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations
[PO.4] Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions
[PO.5] Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations
[PO.6] The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice
[PO.7] Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
[PO.8] Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

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

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

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

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

D. Assessment Plan:

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

E. SYLLABUS

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

F. TEXT BOOKS

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

G. REFERENCE BOOK

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

H. Lecture Plan:

Lec. No.	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1	Discussion of Lecture Plan	To acquaint and clear teachers expectations and understand student expectations	Lecture	**1001.1**	NA
2	Introduction to OPTICS	To make the student understand the difference between physical and geometrical optics. Recall elementary idea of transverse and longitudinal waves. Develop mathematical representation of waves.	Flipped Classroom	**1001.1 & 1001.2**	In Class Quiz (Not Accounted)
3	Interference of light, Young's double slit interference, coherence	Understanding of the concept of coherent waves and interference	Lecture	**1001.2**	Class Quiz – I Home Assignment - I Mid Term I End Term
4	Intensity in double slit interference using Phasor method	Derivation of the formula for intensity distribution in double slit interference	Lecture	**1001.2**	Class Quiz – I Home Assignment - I Mid Term I End Term
5	Interference in thin film, antireflection coatings	Understand the concept of thin-film interference	Lecture	**1001.2 & 1001.6**	Class Quiz – I Home Assignment - I Mid Term I End Term
6	TUTORIAL:1		Activity (Think Pair Share)		
7	Interference in wedge shaped air film	Understand the concept of interference in wedge shaped films and introduction to Newton's ring	Lecture	**1001.2 & 1001.6**	Class Quiz – I Home Assignment - I Mid Term I End Term
8	Newton's rings – theory and experiment	Describe the Newton's ring experiment and develop the theory of Newton's ring	Lecture	**1001.2**	Class Quiz – I Home Assignment- I Mid Term I End Term
9	**TUTORIAL: 2**		Activity (Think Pair Share)		
10-11	Michelson interferometer – construction &	Description of Michelson interferometer and derivation of the formula	Lecture	**1001.2**	Class Quiz – I Home Assignment - I

	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 multiple slit diffraction pattern and diffraction grating	Lecture	**1001.2**	Class Quiz – 3 Home Assignment-2 Mid Term I End Term
20	**TUTORIAL:6**		Activity (Think Pair Share)	**1001.2**	
21	Rayleigh's criteria of resolution, Dispersion and resolving power of grating	Understand the Raleigh's criteria for resolution and derive the expression for dispersive and resolving power	Lecture	**1001.2**	Class Quiz – 3 Home Assignment-2 Mid Term I End Term
22	**TUTORIAL:7**		Activity (Think Pair Share)	**1001.2**	
23-24	Polarization of EM Waves, Polarizing sheets,	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 practical knowledge 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 Basic Sciences

Department of Physics
Course Hand-out

Engineering Physics Lab | PY1030 | 1 Credit | 0 0 2 1

Session: July- Nov, 2019| Faculty: Dr. Saikat | Class: B. Tech. I Sem.

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

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

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

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO.1] Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
[PO.2] Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
[PO.3] Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations
[PO.4] Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions
[PO.5] Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations
[PO.6] The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice
[PO.7] Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
[PO.8] Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices
[PO.9] Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

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

D. Assessment Plan:

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

E. SYLLABUS

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

F. TEXT BOOKS

1. Jewett & Serway, PHYSICS for Scientists and Engineers with Modern Physics (7e), Cengage Learning, 2008.

2. Worsnop & Flint, Advanced Practical Physics for Students (9e), Methuen & Co. Ltd, London 1987.

G. Lecture Plan:

Lec No	**Topics**	**Session Outcome**	**Mode of Delivery**	**Corresponding CO**	**Mode of Assessing the Outcome**
1	Discussion of Lecture Plan	To acquaint and clear teachers expectations and understand student expectations	Lecture	**1030.1**	NA
2	Experiments on interference	To make the student understand the difference between physical and geometrical optics. Recall elementary idea of transverse and longitudinal waves. Develop mathematical representation of waves.	Hands-on training	**1030.1 & 1030.2**	Continuous Assessment/Viva
3	Experiments on diffraction and dispersion	Understanding of the concept of coherent waves and interference	Hands-on training	**1030.2 & 1030.3**	Continuous Assessment/Viva

4	experiments on quantum theory of radiation	Derivation of the formula for intensity distribution in double slit interference	Hands-on training	**1030.2 & 1030.3**	Continuous Assessment/Viva
5	Experiments on band theory of solids	Understand the concept of thin-film interference	Hands-on training	**1030.3 & 1030.4**	Continuous Assessment/Viva
6	Experiments on semiconductors		Hands-on training	**1030.3, 1030.4 & 1030.5**	Continuous Assessment/Viva
7	Experiments on resonance circuits	Understand the concept of interference in wedge shaped films and introduction to Newton's ring	Hands-on training	**1030.3, 1030.4 & 1030.5**	Continuous Assessment/Viva
8	Experiments on Hall-effect		Hands-on training	**1030.3 & 1030.4**	Continuous Assessment/Viva

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

CO	**STATEMENT**	CORRELATION WITH PROGRAM OUTCOMES															
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12				
PY 1030.1	understand different type of error like backlash error, parallax etc. and its role in making conclusions.	3	3		1	2	1			3	1		1				
PY 1030.2	gain knowledge on the behaviour of basic instruments like Slide Callipers, Vernier Callipers, screw gauge and spherometer etc.	3	2		2	2				1	2		1				
PY 1030.3	acquire, analyse and process experimental data.	1	1	1			3	2		1	2	1	2				
PY 1030.4	understand the facts and ideas in handling the practical applications of light, electricity sound and modern physics.				1	2			2	2	1		1				
PY 1030.5	acquire hands on skills on diverse experimental tools related to physics that are essential for	1	3	1				3				2					

	engineering students																	

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and IT

DEPARTMENT OF COMPUTER AND COMMUNICATION ENGINEERING

Course Hand-out

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

Session: Jul 19-Dec 19 | Faculty: Dr. Kusum Lata Jain | Class: B.Tech. CCE III SEM

A. **Introduction:** This course is offered by Department of Computer and Communication 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 Processor.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

[PSO.1]. Should be able to clearly understand the basic principles, concepts and applications in the field of computer based Communication/networking, information sharing, signal processing, web based systems, smart devices and communication technology.

[PSO.2]. Should be able to nail down the issues prevalent in the field of Computer and Communication Engineering.

[PSO.3]. Should be able to identify the existing open problems in the field of computing and propose the best possible solutions.

[PSO.4]. Should be able to apply the contextual knowledge in the field of computing and communication to assess social, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional engineering practice.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	15
	Sessional Exam II (Closed Book)	15
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Closed Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

E. SYLLABUS

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. REFERENCE BOOKS

1. C. Hamacher, Z. Vranesic, S. Zaky, "Computer Organization", Tata McGraw Hill (TMH), 5th Edition, 2002.
2. M. Morris Mano, "Computer System Architecture", Pearson, 3rd Edition Revised, 2017.
3. W. Stallings, "Computer Organization and Architecture –Designing for Performance", PHI, 2009.
4. David A. Patterson, John L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface", Morgan Kauffmann, 4th Edition, 2010.
5. John P. Hayes, "Computer Architecture and Organization", TMH, 3rd Edition, 1998.

G. Lecture Plan:

Class Number	Topics	Sessional Outcomes	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1.	Introduction and Course Hand-out briefing Introduction to basic structure of computers	To acquaint and clear teachers expectations and understand student expectations	Lecture	CO1	I st Sessional , Quiz & ET Exam
2.	Functional units	To Describe the functions of individual functional units	Lecture	CO1	I st Sessional , Quiz & ET Exam
3.	Basic operational concepts	To Define the basic terminologies of operational concepts	Lecture	CO1	I st Sessional , Quiz & ET Exam
4.	Bus structures, software	To Conceptualize on the various types of Buses used in the system	Lecture	CO1	I st Sessional , Quiz & ET Exam
5.	Performance	To Identify the metrics to calculate the performance of the system	Flipped Class	CO1	I st Sessional Quiz, Assignment & ET Exam
6.	Tutorial	NA	Activity	CO1, CO3	I st Sessional , Quiz , Assignment & ET Exam
7.	Numbers, Arithmetic Operations And Characters	To Perform arithmetic evaluation's	Flipped Class	CO2	I st Sessional , Quiz & ET Exam
8.	Memory Locations and Addresses, Memory Operations	To Clarify on the how the storage memory is functioning	Lecture	CO2	I st Sessional , Quiz & ET Exam
9.	Instructions and Instruction Sequencing	To Examine the use of instructions	Lecture	CO2, CO3	I st Sessional , Quiz & ET Exam

10.	Register Transfer Notation, Assembly Language Notation	To Understand on the registers and assembly language	Lecture	CO2	Ist Sessional , Quiz & ET Exam
11.	Basic Instruction Types, Instruction Execution and	To Classify the types of instructions used	Lecture	CO2, CO3	Ist Sessional , Quiz
12.	Branching, Condition Codes, Generating Memory Addresses methods	To Perform the extensive advantage of branching instructions	Lecture	CO2	Ist Sessional , Quiz & ET Exam
13.	Addressing Modes, Implementation of Variables and Constants, Indirection and Pointers	To Understand the various addressing modes	Flipped Class	CO2	Ist Sessional , Quiz & ET Exam
14.	Indexing and Arrays, Relative Addressing	To Understand the various addressing modes	Lecture	CO2	Ist Sessional , Quiz & ET Exam
15.	Additional Modes	To Understand the various addressing modes	Lecture	CO2	Ist Sessional , Quiz & ET Exam
16.	Basic I/O operations, Additional Instructions	To Perform basic I/O operations	Lecture	CO2, CO3	Ist Sessional , Quiz & ET Exam
17.	Example programs	Will carry out sample real time programs	Lecture	CO2, CO3	Ist Sessional , Quiz & ET Exam
18.	Tutorial	NA	Activity	CO2	Ist Sessional , Quiz , Assignment & ET Exam
19.	Addition and Subtraction of Signed Numbers	To Perform Addition and Subtraction of Signed Numbers	Flipped Class	CO2	Ist Sessional , Quiz & ET Exam
FIRST SESSIONAL EXAM(5-7 Sep, 2019)					
20.	Design of Fast Adders	To Describe Fast adders	Lecture	CO2, CO6	IInd Sessional , Quiz & ET Exam

21.	Carry Look Ahead Adders- Bit Stage Cell,4 Bit CLA	To Describe the advantages of CLA	Lecture	CO2, CO5	IInd Sessional , Quiz & ET Exam
22.	Carry Look Ahead Adders 16 Bit	To Describe the advantages of CLA	Lecture	CO2, CO5	IInd Sessional , Quiz & ET Exam
23.	Tutorial	NA	Activity	CO2	IInd Sessional , Quiz & ET Exam
24.	Multiplication of Positive Numbers-Array Sequential Circuit	To Perform Multiplication of Positive Numbers	Flipped Class	CO2, CO5	IInd Sessional , Quiz , Assignment & ET Exam
25.	Signed Operand Multiplication-Booth Algorithm	To Perform Multiplication of any numbers	Lecture	CO2	IInd Sessional , Quiz & ET Exam
26.	Fast Multiplication-Bit Pair Recoding Of Multipliers	To Perform fast Multiplication of any numbers	Lecture	CO2	IInd Sessional , Quiz & ET Exam
27.	Carry-save addition of summands	To Examine the time reduction to perform normal multiplication	Flipped Class	CO2	IInd Sessional , Quiz & ET Exam
28.	Integer Division-Restoring	To Perform Integer Division-Restoring	Lecture	CO2	IInd Sessional , Quiz & ET Exam
29.	Integer Division- Non restoring	To Perform Integer Division-Non-Restoring	Lecture	CO2	IInd Sessional , Quiz & ET Exam
30.	Floating Point Numbers & Operation-Standards Exceptions, check to uncheck Exception	To Perform arithmetic operations on Floating point numbers	Lecture	CO2	IInd Sessional , Quiz & ET Exam
31.	Arithmetic Operations on Floating Point Numbers	To Perform arithmetic operations on Floating point numbers	Lecture	CO2	IInd Sessional , Quiz & ET Exam
32.	Examples on Arithmetic Operation on Floating Point Numbers	To Perform arithmetic operations on Floating point numbers	Lecture	CO2	IInd Sessional , Quiz & ET Exam

33.	Tutorial	NA	Activity	CO2	IInd Sessional, Quiz & ET Exam
34.	Memory Systems: Basic Concepts	To Understand the basic memory concepts	Flipped Class	CO4	IInd Sessional, Quiz & ET Exam
35.	Speed, Size & Cost	To Compare the basic parameters for the memory arrangement	Lecture	CO4 , CO5	IInd Sessional, Quiz & ET Exam
36.	Cache Memories- Mapping Functions	To Describe the concept of Cache Memory	Lecture	CO4 , CO5	IInd Sessional, Quiz
37.	Replacement Algorithms	To identify the better memory replacement algorithm	Lecture	CO4 , CO5	IInd Sessional, Quiz & ET Exam
38.	Example Of Mapping Techniques	To identify the better memory replacement algorithm	Flipped Class	CO4	IInd Sessional, Quiz & ET Exam
39.	Performance Considerations: Hit Rate & Miss Penalty, Caches on Processor Chip	To Identify the various parameters for memory performance measurements	Lecture	CO4 , CO5	IInd Sessional, Quiz & ET Exam
SECOND SESSIONAL EXAM (4-6 Nov, 2019)					
40.	Virtual Memories	To Describe on advantages of VM	Lecture	CO4, CO6	Quiz & ET Exam
41.	Address Translation	To Describe on operations of VM	Lecture	CO4	Quiz & ET Exam
42.	Tutorial	NA	Activity	CO4	Quiz & ET Exam, Assignment
43.	Accessing I/O Devices, Interrupts	To Explain how the I/O devices are accessed.	Lecture	CO5	Quiz & ET Exam
44.	Interrupt H/W, Enabling Disabling Interrupts	To Provide the basic idea on Interrupts	Lecture	CO5	Quiz & ET Exam
45.	Handling Multiple Devices, Controlling Device Requests, Exceptions	To Explain how the I/O devices are accessed and controlled over the system	Lecture	CO5	Quiz & ET Exam
46.	Use of interrupts in Operating Systems, Direct Memory Access	To Describe the use of interrupts in DMA	Lecture	CO5	Quiz & ET Exam

47.	Flynn Classification, Multi-Core Architecture	To Define the various flynns classification based on the architecture	Lecture	CO5, CO6	Quiz & ET Exam
48.	Pipelining	To Explain about the pipelining	Flipped Class	CO5	Quiz & ET Exam
49.	Data Hazards	To Define Data Hazard	Lecture	CO5	Quiz & ET Exam
50.	Instruction Scheduling: Static and Dynamic	To Explain on both static and dynamic scheduling	Lecture	CO5, CO6	Quiz & ET Exam
51.	Control Hazard	To Define control Hazard	Lecture	CO5	Quiz & ET Exam
52.	Branch Prediction	To Explain the needs branch prediction	Lecture	CO5	Quiz & ET Exam
53.	Tutorial	NA	Activity	CO5	Quiz & ET Exam
END TERM EXAM					

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

CO	STATEMENT						Correlation with Program Outcomes **(POs)**						Correlation with Program Specific Outcomes (**PSOs**)			
		PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
[CS1301.1]	Describe the interconnection between various functional units of a computer system and able to assess the performance of a computer.	**2**	**1**										**1**	**2**	**1**		
[CS1301.2]	Describe various data representations and analyse the design of fast arithmetic circuits.	**3**	**2**										**1**	**1**	**1**		
[CS1301.3]	Formulate assembly language programs for a given high level language construct.	**2**	**2**	**1**									**1**	**1**			
[CS1301.4]	Describe various parts of a system memory hierarchy and caching techniques.	**3**	**2**										**1**		**1**	**1**	
[CS1301.5]	Evaluate the performance of CPU, memory and I/O operations.	**3**	**2**	**1**									**2**	**1**	**1**	**2**	
[CS1301.6]	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 COMPUTER & COMMUNICATION ENGINEERING

Course Hand-out

Switching Theory & Logic Design| CS1302 | 4 Credits

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

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

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

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

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

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

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

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

C. Program Outcomes and Program Specific Outcomes:

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

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

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

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

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

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

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

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

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

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

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

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

[PSO.1]. Should be able to clearly understand the basic principles, concepts and applications in the field of computer based Communication/networking, information sharing, signal processing, web based systems, smart devices and communication technology.

[PSO.2]. Should be able to nail down the issues prevalent in the field of Computer and Communication Engineering.

[PSO.3]. Should be able to identify the existing open problems in the field of computing and propose the best possible solutions.

[PSO.4]. Should be able to apply the contextual knowledge in the field of computing and communication to assess social, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional engineering practice.

D. Assessment Plan:

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

E. Syllabus

Introduction to logic circuits: Variables and functions, Inversion, Truth tables, Logic gates and networks, Boolean algebra, Introduction to VHDL. **Optimized implementation of logic functions:** Synthesis using AND OR and NOT gates, Karnaugh map, Strategy for minimization, Minimization of POS forms, Incompletely Specified Functions, Multiple output circuits NAND and NOR logic networks, multilevel NAND and NOR circuits, Analysis of multilevel circuits. **Number representation and arithmetic circuits:** Positional number representation, Addition of unsigned numbers, Signed numbers, Fast adders, Design of arithmetic circuits using VHDL, BCD representation. **Combinational-Circuit building blocks:** Multiplexer, decoder, Encoder, Code converter, Arithmetic comparison circuits, VHDL for Combinational Circuits; Flip Flops, Registers, Counters. **Overview of semiconductor diode:**BJT, MOSFET, TTL–standard, High speed, low-power, low-power schottky, CMOS logic-NAND, NOR

F. Text Books

1. S.Salivahanan, S.Arivazhagan,"Digital Circuit and Design" Fourth Edition, 2012.
2. M. Morris Mano, Michael D. Ciletti, "Digital Design", *Prentice Hall of India Pvt. Ltd.*, 2008.
3. P. Leach, A. Malvino, G. Saha, "*Digital Principles and Applications*", TMH, 6th Edition, 2006.
4. Brian Holdsworth, Clive Woods, "Digital Logic Design", *Elsevier India Pvt. Ltd.*, 2005.

G. Lecture Plan

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

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

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

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

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	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**											**3**		**2**	
CS [1302.2]:	Be able to manipulate simple Boolean expressions using the theorems and postulates of Boolean algebra and to minimize combinational functions.	**3**	**3**											**3**		**2**	
CS [1302.3]:	Be able to design and analyze small combinational circuits and to use standard combinational functions/building blocks to build larger more complex circuits.	**3**	**3**	**2**										**3**		**2**	
CS [1302.4]:	Be able to design and analyze small sequential circuits and devices and to use standard sequential functions/building blocks to build larger more complex circuits.	**3**	**3**	**2**										**3**		**3**	
CS [1302.5]:	Be able to understand working and use of logic families like BJT, MOSFET etc.	**3**	**3**	**2**									**3**	**3**	**3**	**2**	

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and IT

DEPARTMENT OF COMPUTER AND COMMUNICATION ENGG.

Course Hand-out

Data Structures | CS1303 | 4 Credits | 3 1 0 4

Session: July 19 – Nov 19 | Faculty: Manoj Bohra, P. Hemrajani, Muthukumaran K| Class: III CCE

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:

[CS 1303.1] explain basic concepts of various data structures

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

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

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

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

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

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

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

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

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

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

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

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

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

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

[PSO.1]. Should be able to clearly understand the basic principles, concepts and applications in the field of computer based Communication/networking, information sharing, signal processing, web based systems, smart devices and communication technology.

[PSO.2]. Should be able to nail down the issues prevalent in the field of Computer and Communication Engineering.

[PSO.3]. Should be able to identify the existing open problems in the field of computing and propose the best possible solutions.

[PSO.4]. Should be able to apply the contextual knowledge in the field of computing and communication to assess social, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional engineering practice.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	15
	Sessional Exam II (Closed Book)	15
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Closed Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination.	

	The allowance of 25% includes all types of leaves including medical leaves.
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work at home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.

E. SYLLABUS

Introduction: 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. REFERENCE BOOKS

1. Aaron M. Tenenbaum, Yedidyah Langsam, Moshe J. Augenstein, "*Data Structures using C*", Pearson Education, 2013.
2. Ellis Horowitz, Sartaj Sahni and Susan Anderson-Freed, *"Fundamentals of Data Structures in C"*, University Press (India) Pvt. Ltd., 2014.
3. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "*Data Structures and Algorithms*", Pearson Education, 2012.
4. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, " *Introduction to algorithms*", PHI, Third Edition, 2009.
5. Seymour Lipschutz, "*Data Structures with C* (Schaum's Outline Series)", McGraw Hill Education Private Limited, 2011.
6. Mark Allen Weiss*, "Data structures and Algorithm Analysis in C",* Pearson, Second edition, 2014.

G. Lecture Plan:

Class Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1.	Introduction to data structures, Algorithm Specifications, How to Write Algorithms	define data structure and list various data structure.	Lecture	CS1303.1	Class Quiz End Term
2.	Performance Analysis- Time and Space Complexity, Asymptotic Analysis, Example , Functions in 'C', Example Programs on Functions	analyze time complexity of simple algorithms.	Lecture	CS1303.1 CS1303.1	Class Quiz Home Assignments I Sessional End Term
3.	Example Programs on Functions, Arrays : Introduction, Single Dimensional Arrays : Declaration, Initialization, Operations (Insertion and Deletion of Element)	define arrays and apply knowledge on single dimensional arrays in writing programs.	Lecture	CS1303.1 CS1303.2	Class Quiz Home Assignments I Sessional End Term
4.	Sorting Algorithms – Selection Sort, Bubble Sort and Insertion Sort	construct searching and sorting algorithms and write programs using single dimensional arrays.	Lecture	CS1303.2	Class Quiz Home Assignments I Sessional End Term
5.	Multidimensional Arrays, Two Dimensional Arrays : Declaration, Initialization, Addition of Two Matrices, Row Major and Column Major Representation	explain row major and column major memory allocation in 2-D arrays, Apply knowledge on two dimensional arrays in writing programs	Lecture	CS1303.1 CS1303.2	Class Quiz Home Assignments I Sessional End Term
6.	Example Programs on Two Dimensional Arrays, Row Major and Column Major Representation	apply knowledge on two dimensional arrays in writing programs.	Lecture	CS1303.2 CS1303.3	Class Quiz Home Assignments I Sessional End Term
7.	Pointers : Introduction, Example Programs on Pointers, Pointers and Arrays, Dynamic Memory Allocation	illustrate dynamic memory allocation using pointers in solving problems requiring list of values.	Lecture	CS1303.1 CS1303.2	Class Quiz Home Assignments I Sessional End Term
8.	Dynamic Memory Allocation: Dynamic Array creation, Dynamic structure creation.	apply knowledge on pointers in writing programs.	Lecture	CS1303.1 CS1303.2	Class Quiz Home Assignments I Sessional End Term
9.	Problems solving by students on array	analyze the applicability of array as appropriate Data Structure to solve the problem and develop an algorithm/program to provide the	Tutorial	CS1303.3	Class Quiz Home Assignments I Sessional

		solution to a given problem through it.			End Term
10.	Problems solving by students on array	structure mapping and model a given real world problem into array.	Tutorial	CS1303.3	Class Quiz Home Assignments I Sessional End Term
11.	Linked List : Introduction, Basic Terminologies, Advantages over Arrays, Applications, Structures in 'C', 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	CS1303.1 CS1303.2	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	CS1303.1 CS1303.2	Class Quiz Home Assignments I Sessional End Term
13.	Singly Linked List : Operations (Continued)	implement singly linked list storage structure and basic operations (insertion, deletion and searching) defined over it.	Lecture	CS1303.1 CS1303.2	Class Quiz Home Assignments I Sessional End Term
14.	Circular Linked List : Introduction, Operations	understand and implement circular linked list storage structure and basic operations (insertion, deletion and searching) defined over it.	Lecture	CS1303.1 CS1303.2	Class Quiz Home Assignments I Sessional End Term
15.	Doubly Linked List : Introduction, Operations	understand and implement circular linked list storage structure and basic operations (insertion, deletion and searching) defined over it.	Lecture	CS1303.1 CS1303.2	Class Quiz Home Assignments I Sessional End Term
16.	Some Example Programs on Linked List	implement linked list operations like reversing a linked list, finding middle of the list, sorting a list etc.	Lecture	CS1303.3	Class Quiz Home Assignments I Sessional End Term
17.	Problems solving by students on linked list	analyze the applicability of linked list as appropriate Data Structure to solve the problem and develop an algorithm/program to provide the solution to a given problem through it.	Tutorial	CS1303.3	Class Quiz Home Assignments I Sessional End Term
18.	Problems solving by students on linked list	structuring, mapping and model a given real world problem into linked list.	Tutorial	CS1303.3	Class Quiz Home Assignments I Sessional End Term
19.	Recursive Functions, Example Programs on Recursive	explain the working philosophy of stack and how the system stack stores local function calls.	Lecture/Expert-Lecture	CS1303.1 CS1303.3	Class Quiz Home Assignments

	Functions, Stack : About, Applications				II Sessional End Term
20.	Stack : Operations, Implementation of Stack using Array and Linked List	develop a stack based application and realize the stack functioning using arrays as well as linked list and compare their implementations.	Lecture/Expert-Lecture	CS1303.1 CS1303.2	Class Quiz Home Assignments II Sessional End Term
21.	Expression Notations : Polish Notation, Reverse Polish Notation, Infix Notation, Evaluation of Expression written in Polish Notation	explain various forms of mathematical notations to express an expression and their evaluation	Lecture	CS1303.3	Class Quiz Home Assignments II Sessional End Term
22.	Evaluation of Expression written in Reverse Polish Notation Evaluation of Expression written in Infix Notation	evaluate the postfix(infix) expression using stacks	Lecture	CS1303.3	Class Quiz Home Assignments II Sessional End Term
23.	Conversion of Expression from one Notation to Another	explain how to realize a mathematical expression using stacks and to convert an infix expression to postfix notation using stack.	Lecture	CS1303.3	Class Quiz Home Assignments II Sessional End Term
24.	Conversion of Expression from one Notation to Another	convert an infix expression to prefix notation using stack	Lecture	CS1303.3	Class Quiz Home Assignments II Sessional End Term
25.	Problems solving by students on stack applications	develop recursive code, to handle the problem using stacks, to analyze the applicability of stack with respect to a given problem	Tutorial	CS1303.3	Class Quiz Home Assignments II Sessional End Term
26.	Linear Queue : Introduction, Applications, Operations, Implementation using Array and Linked List	explain Queue Data structure, its application in real world and its operations enqueue and dequeue, to implement queue data structure using array and linked list.	Lecture	CS1303.1 CS1303.2	Class Quiz Home Assignments II Sessional End Term
27.	Circular Queue : About, Applications, Operations, Implementation using Array and Linked List	explain Circular Queue Data structure, its application in real world and its operations enqueue and dequeue	Lecture	CS1303.1 CS1303.2	Class Quiz Home Assignments II Sessional End Term
28.	Priority Queue and Deques : About, Applications, Operations, Implementation using Array and Linked List	explain Priority Queue Data structure and Deques, its application in real world and its operations enqueue and dequeue.	Lecture	CS1303.1 CS1303.2	Class Quiz Home Assignments II Sessional End Term
29.	Problems solving by students on queue applications	analyze the applicability of queue as appropriate Data Structure to solve the problem, to develop an algorithm/program to provide the solution to a given problem through it.	Tutorial	CS1303.3	Class Quiz Home Assignments II Sessional End Term

30.	Trees : Introduction , Basic Terminology, Types of Trees, Binary Search Tree : Creation, : Searching an Element , Insertion of Node	describe about binary tree (BT), tree-terminology, types of BT, creation of Binary Search Tree, search operations	Lecture	CS1303.1 CS1303.2	Class Quiz Home Assignment s II Sessional End Term
31.	Binary Search Tree : Deletion of Node, Determining Height	describe about deletion of a node in BST and computing height	Lecture	CS1303.2	Class Quiz Home Assignment s II Sessional End Term
32.	Binary Search Tree : Traversal (In-order, Pre-order and Post-order)	explain different traversal in BST	Lecture	CS1303.2	Class Quiz Home Assignment s II Sessional End Term
33.	Threaded Binary tree : Introduction, Creation , Insertion of Node, Deletion of Node and Traversal of Tree	describe about Threaded Binary tree, its applications and operations	Lecture	CS1303.1 CS1303.2	Class Quiz Home Assignment s End Term
34.	AVL Tree : Introduction , Applications Creation , Searching an Element, Insertion of Node	describe drawbacks of BST, Use of AVL tree, how to insert a value in AVL and then required rotations (LL, RR , LR and RL)	Lecture	CS1303.1 CS1303.2	Class Quiz Home Assignment s End Term
35.	AVL Tree : Deletion of Node	describe how to delete a node from AVL tree and then required rotations	Lecture	CS1303.2	Class Quiz Home Assignment s End Term
36.	Heaps : Insertion of Node , Binary Heap: Creation, Insertion of Element, Deletion of Element	describe what is heap, types, creations of max and min heaps, heap sort, use of heap in priority queue implementation	Lecture	CS1303.1 CS1303.2	Class Quiz Home Assignment s End Term
37.	B and B+ Trees	Applications of B and B+ Trees, Construction of B and B+ Trees, Insertion and Deletion of nodes in B and B+ Trees	Lecture	CS1303.1 CS1303.2	Class Quiz Home Assignment s End Term
38.	Problems solving by students on tree and its use	construct BST and AVL tree from given sequence of values	Tutorial	CS1303.3	Class Quiz Home Assignment s End Term
39.	Problems solving by students on tree and its use	construct heap from given sequence of values and implement priority queue	Tutorial	CS1303.3	Class Quiz Home Assignment s End Term
40.	Graphs : Introduction, Basic Terminology, Applications, Representation of Graphs : Adjacency Matrix Representation	describe representation of graph in term of adjacency matrix with their complexity	Lecture	CS1303.1 CS1303.2	Class Quiz Home Assignment s End Term

41.	Representation of Graphs : Adjacency List Representation	describe representation of graph in term of adjacency list with their complexity	Lecture	CS1303.1 CS1303.2	Class Quiz Home Assignments End Term
42.	Graph Traversal : Breadth First Traversal, Depth First Traversal	conceptualize on the various methods of graph traversal and understand the concept of Queue and Stack data structure	Lecture	CS1303.2	Class Quiz Home Assignments End Term
43.	Minimum Spanning Tree, Prims Algorithm, Kruskal's Algorithm	understand the application of graph such as TSP problem	Lecture	CS1303.2	Class Quiz Home Assignments End Term
44.	Shortest Path Algorithms: Dijkstra's Algorithm, Floyd's Algorithm	understand the application of graph such as computer networking(Routing System)	Lecture	CS1303.2	Class Quiz Home Assignments End Term
45.	Problems solving by students on graph algorithms	find shortest path using Dijkstra's Algorithm and Floyd's Algorithm for a given graph	Tutorial	CS1303.3	Class Quiz Home Assignments End Term
46.	Problems solving by students on graph algorithms	find MST using Prims Algorithm and Kruskal's Algorithm for a given graph	Tutorial	CS1303.3	Class Quiz Home Assignments End Term
47.	Sorting : Introduction, Bubble Sort, Insertion Sort	describe the concept of sorting with various sorting algorithm	Lecture	CS1303.1	Class Quiz Home Assignments End Term
48.	Sorting (Continued) : Quick Sort, Merge Sort	describe the application of sorting such as medical monitoring	Lecture	CS1303.1 CS1303.4	Class Quiz Home Assignments End Term
49.	Sorting (Continued) : Radix Sort , Heap Sort	describe the concept of priority queue with the help of heap sort	Lecture	CS1303.1 CS1303.4	Class Quiz Home Assignments End Term
50.	Hashing : Introduction, Applications, Hash Functions	describe different hashing techniques/functions	Lecture	CS1303.1 CS1303.2 CS1303.4	Class Quiz Home Assignments End Term
51.	Hash Collisions, Collision Resolution : Open Addressing, Chaining	describe different collision resolving techniques with examples	Lecture	CS1303.1 CS1303.2	Class Quiz Home Assignments End Term
52.	Problems solving by students on soring and its application	develop program for searching and sorting	Tutorial	CS1303.3	Home Assignments End Term

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

CO	**STATEMENT**	CORRELATION WITH PROGRAM OUTCOMES **(POs)**												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES **(PSOs)**			
		PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
[CS1303.1]	explain basic concepts of various data structures	3	2										2	3			1
[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 COMPUTER AND COMMUNICATION ENGINEERING

Course Hand-out

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

Session: Jul 19-Dec 19 | Faculty: Dr. Hemlata Goyal and Dr. Ghanshyam Raghuwanshi | Class: BTech CCE III SEM | Sec: A|B|C

A. Introduction: This course is offered by the Department of Computer and Communication Engineering as 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 aid in 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 is 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.

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

[CS 1304.1] Apply to compile and execute Java Application using Command Based Interface as well as using Eclipse Tool.

[CS 1304.2] Identify and implement the concepts of encapsulation and abstraction using class, objects and interfaces for better programming skills.

[CS 1304.3] Describe and Implement various inheritance and polymorphism forms using Java Classes and Interfaces.

[CS 1304.4] Implement various collection data structure such as linked lists, queues, stacks using Java's collection framework

[CS 1304.5] Apply, Learn and finally implement the use of advanced programming constructs/features such as exception handling, multithreading and event handling in real-life programming domains.

[CS 1304.6] Visualize a real world problem in the form of various collaborating classes and objects for enhancing employability.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

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

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

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

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

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

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

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

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

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

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

[PSO.1]. Should be able to clearly understand the basic principles, concepts and applications in the field of computer based Communication/networking, information sharing, signal processing, web based systems, smart devices and communication technology.

[PSO.2]. Should be able to nail down the issues prevalent in the field of Computer and Communication Engineering.

[PSO.3]. Should be able to identify the existing open problems in the field of computing and propose the best possible solutions.

[PSO.4]. Should be able to apply the contextual knowledge in the field of computing and communication to assess social, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional engineering practice.

D. Assessment Plan:

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

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

E. SYLLABUS

Introduction: 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. REFERENCE BOOKS

1. Java: The Complete Reference (9th Edition), By Herbert Schildt, McGraw Hill Education.
2. Balagurusamy E, "Object Oriented Programming with Java", Tata McGraw Hill, 2011.
3. Arnold K, & Gosling J, "The Java Programming Language", 2002.
4. Horstmann CS, "Big Java", Wiley's Interactive Edition, 2015.

G. Lecture Plan:

Class Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1	Introduction and Course Hand-out briefing	To acquaint and clear teachers expectations and understand student expectations	Lecture	NA	NA
2	Overview of Java: History, Evolution, C, C++ and Java Comparison, Java Byte Code ,Java Buzzwords, Java SE 8	Identify and implement the concept of OOP Java	Lecture	CO 1	Mid Term I, Quiz & End Term
3-7	Lexical issues, java keywords, OOP Programming, Control Statements, Operators	Describe the programming constructs of OOP Java	Lecture	CO 1	Mid Term I, Quiz & End Term
8-11	Data Types, Variables and Arrays: Primitive Types, Floating point, Characters, Booleans, Literals, Variables, Type Conversion and casting, wrapper classes, Boxing and Unboxing, 1D Arrays, 2D Array, multi dimension Array, Variable Length Array	Recall programming construct of OOP Java	Flipped Class	CO 1	Mid Term I, Quiz & End Term
12-17	Introduction to classes: Class Fundamentals, Declaring Objects Methods in Classes, returning values, parameterized methods Garbage Collection, finalize() method Constructors, parameterized constructors This keyword, This Constructor, Constructor Chaining	Identify and implement the concepts of class and objects.	Lecture	CO 2 & CO 6	Mid Term I, Quiz & End Term
18-23	Classes and its Methods: Overloading Methods, Using Objects as parameters, Argument passing, Returning Objects, Recursion,	Apply and describe the concept of interaction for classes and its methods	Lecture	CO 2	Mid Term I, Quiz & End
24-26	I/O Basics: Using Command line arguments ,I/O Basics, reading Console Input and Writing Console Output, PrintWriter Class, Scanner Class, reading and Writing Files, Closing files	Recall I/O basics of OOP Java	Flipped Class	CO 1 & CO 2	Mid Term II, Quiz & End Term
27-29	Inheritance: Basics, Using Super, Creating multilevel hierarchy,	Examine and describe the concept of Inheritance of OOP	Lecture	CO 3	Mid Term II,
30-34	Packages, Access protection, Importing packages, static import Interfaces: Default interface methods, static methods in interfaces	Experiment the access control using package and interfaces	Lecture, activity	CO 3	Mid Term II, Quiz & End Term

35-38	Exception Handling: Fundamentals, Exception types, Uncaught Exceptions, check uncheck Exception, Using try and catch, multiple catch clauses, nested try statements, Throw, throws, finally, built-in exceptions, creating own exception Sub classes	Recall and implement exceptions in classes	Lecture	CO 2, CO 5 & CO 6	Mid Term II, Quiz & End Term
39-42	Multithreaded Programming: Thread Model: thread priorities, synchronization, main thread, creating single thread and multiple threads, using isAlive(), join(), Interthread communication, suspending, resuming and stopping threads, using multithreads	Implement and describe the concept of multithreading	Flipped Class	CO 2 & CO 6	Quiz & End Term
43-45	String Handling: Constructors, Constructor chaining, string operations, Character extraction, comparison, searching and modifying, String Class Methods and String Buffer Class	Recall and experiment string handling in OOP Java	Lecture	CO 4	Quiz & End Term
46-49	Generic Class: Collection framework, Arraylist , LinkList, HashMap,Vector, Making own generics class	Implement and describe the generic class and collection framework	Lecture	CO 4	Quiz & End Term
50-52	GUI and Event Handling: GUI lifecycle, Events, Events listener, adapter classes, Different Event classes, Event Listener Interfaces	Apply GUI and Event handling using adapter class and interfaces	Flipped Class	CO 4 & CO 5	Quiz & End Term

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

CO	STATEMENT	Correlation with Program Outcomes(POs)												Correlation with Program Specific Outcomes (**PSOs**)			
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
[CS 1304.1]	Apply to compile and execute Java Application using Command Based Interface as well as using Eclipse Tool.	**1**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**1**	**1**	**1**	**1**	**2**	**-**	**-**	**-**
[CS 1304.2]	Identify and implement the concepts of encapsulation and abstraction using class, objects and interfaces for better programming skills.	**2**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**1**	**2**	**-**	**-**	**-**
[CS 1304.3]	Describe and Implement various inheritance and polymorphism forms using Java Classes and Interfaces.	**3**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**1**	**3**	**-**	**-**	**-**
[CS 1304.4]	Implement various collection data structure such as linked lists, queues, stacks using Java's collection framework	**3**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**1**	**2**	**-**	**-**	**-**
[CS 1304.5]	Apply, Learn and finally implement the use of advanced programming constructs/ features such as exception handling, multithreading and event handling in real-life programming domains.	**3**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**1**	**2**	**-**	**-**	**-**
[CS1304.6]	Visualize a real world problem in the form of various collaborating classes and objects for enhancing employability.	**1**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**2**	**2**	**-**	**-**	**-**

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and IT

DEPARTMENT OF COMPUTER AND COMMUNICATION ENGG.

Course Hand-out

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

Session: July 19 – Nov 19 | Faculty: Manoj Bohra, P. Hemrajani, Muthukumaran K| Class: III CCE

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:

[CS 1331.1] explain basic concepts of various data structures

[CS 1331.2] describe how arrays, linked lists, stacks, queues, trees and graphs are represented in memory and their operations

[CS 1331.3] 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

[CS 1331.4] 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]. Should be able to clearly understand the basic principles, concepts and applications in the field of computer based Communication/networking, information sharing, signal processing, web based systems, smart devices and communication technology.

[PSO.2]. Should be able to nail down the issues prevalent in the field of Computer and Communication Engineering.

[PSO.3]. Should be able to identify the existing open problems in the field of computing and propose the best possible solutions.

[PSO.4]. Should be able to apply the contextual knowledge in the field of computing and communication to assess social, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional engineering practice.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	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. REFERENCE BOOKS

1. Aaron M. Tenenbaum, Yedidyah Langsam, Moshe J. Augenstein, "*Data Structures using C*", Pearson Education, 2013.
2. Ellis Horowitz, Sartaj Sahni and Susan Anderson-Freed, *"Fundamentals of Data Structures in C"*, University Press (India) Pvt. Ltd., 2014.
3. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "*Data Structures and Algorithms*", Pearson Education, 2012.
4. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, " *Introduction to algorithms*", PHI, Third Edition, 2009.
5. Seymour Lipschutz, "*Data Structures with C* (Schaum's Outline Series)", McGraw Hill Education Private Limited, 2011.
6. Mark Allen Weiss, *"Data structures and Algorithm Analysis in C"*, Pearson, Second edition, 2014.

G. Lecture Plan:

Class Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1.	Programs based on 1-D array operations	describe and implement various operations on 1-D array	Lab	CS1331.1 CS1331.3	Internal Evaluation Home Assignments External Evaluation
2.	Programs based on 2-D array operations	describe and implement various operations on 2-D array	Lab	CS1331.1 CS1331.3	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	CS1331.1 CS1331.2	Internal Evaluation Home Assignments External Evaluation
4.	Programs to implement singly linked-list list operations	describe and implement various operations on one way linked list	Lab	CS1331.2 CS1331.3	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	CS1331.1 CS1331.2	Internal Evaluation Home Assignments External Evaluation
6.	Programs to implement stack and its operations	describe and simulate stack and its operations	Lab	CS1331.2 CS1331.3	Internal Evaluation Home Assignments External Evaluation
7.	Programs based on implementation of stack	describe and implement various application programs on stack	Lab	CS1331.1 CS1331.2	Internal Evaluation Home Assignments External Evaluation
8.	Programs based on implementation of queue and its operations	describe and implement various application programs on queue, and priority queue	Lab	CS1331.2 CS1331.3	Internal Evaluation

					Home Assignments External Evaluation
9.	Programs to implement tree and its operations	describe and implement various operations on Binary search tree	Lab	CS1331.1 CS1331.2 CS1331.3	Internal Evaluation Home Assignments External Evaluation
10.	Programs based on implementation of trees	describe and implement various operations on Binary search tree	Lab	CS1331.3	Internal Evaluation Home Assignments External Evaluation
11.	Programs to implement graph and its operations	describe and implement various operations on graph	Lab	CS1331.1 CS1331.2	Internal Evaluation Home Assignments External Evaluation
12.	Programs based on implementation of graphs	describe and implement programs on application of graph	Lab	CS1331.2 CS1331.3	Internal Evaluation Home Assignments External Evaluation
13.	Programs to perform sorting using different sorting techniques over data	describe and implement various sorting and searching techniques	Lab	CS1331.2 CS1331.4	Internal Evaluation Home Assignments External Evaluation

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

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES **(POs)**												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES **(PSOs)**			
		PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
[CS1331.1]	explain basic concepts of various data structures	3	2										2	3			1
[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 and assess the trade-offs involved in the design choices and hence develop employability skills		1	2									2		2	2	
[CS1331.4]	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 COMPUTER AND COMMUNICATION ENGINEERING

Course Hand-out

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

Session: Jul 19-Dec 19 | Faculty: Dr. Hemlata Goyal and Dr. Ghanshyam Raghuwanshi | Class: BTech CCE III SEM | Sec: A|B|C

A. Introduction: This course is offered by the Department of Computer and Communication Engineering as 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:

[CS 1332.1] Apply to compile and execute Java Application using Command Based Interface as well as using Eclipse Tool.

[CS 1332.2] Identify basic programming construct of Java language Learn and implement the concepts of encapsulation and abstraction using class, objects and interfaces for better programming skills.

[CS 1332.3] Identify and develop different classes based on real world scenario.

[CS 1332.4] Analyze and experiment with different class to demonstrate polymorphism and inheritance and exception handling model

[CS 1332.5] Apply Multi-threading Model and built classes to demonstrate multi-threading programming.

[CS 1332.6] Visualize a real world problem in the form of various collaborating classes and objects for enhancing employability.

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

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

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

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

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

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

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

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

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

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

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

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

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

[PSO.1]. Should be able to clearly understand the basic principles, concepts and applications in the field of computer based Communication/networking, information sharing, signal processing, web based systems, smart devices and communication technology.

[PSO.2]. Should be able to nail down the issues prevalent in the field of Computer and Communication Engineering.

[PSO.3]. Should be able to identify the existing open problems in the field of computing and propose the best possible solutions.

[PSO.4]. Should be able to apply the contextual knowledge in the field of computing and communication to assess social, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional engineering practice.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Criteria	**Description**	**Maximum Marks**
Internal Assessment (Summative)	Weekly evaluation (record+execution+viva+Mini Project)	70
End Term Exam (Summative)	End Term Exam	30
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work at home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

Introduction: 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. REFERENCE BOOKS

1. Java: The Complete Reference (9th Edition), By Herbert Schildt, McGraw Hill Education.
2. Balagurusamy E, "Object Oriented Programming with Java", Tata McGraw Hill, 2011.
3. Arnold K, & Gosling J, "The Java Programming Language", 2002.
4. Horstmann CS, "Big Java", Wiley's Interactive Edition, 2015.

G. Lecture Plan:

Class Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	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	CO 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	CO 1 and CO 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	CO 2 and CO 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	CO 2 and CO 3	Continuous Evaluation, project, End Term
9-10	Multithreading in Java	Illustrate multithreading programming and solve real world problem using multithreading model	Lecture Demonstration	CO 2, CO 3 and CO 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	CO 2, CO 3 and CO 5	Continuous Evaluation, project, End Term

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

CO	STATEMENT	Correlation with Program Outcomes(POs)												Correlation with Program Specific Outcomes (**PSOs**)			
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
[CS 1332.1]	Learn to compile and execute Java Application using Command Based Interface as well as using Eclipse Tool.	1				1								1			
[CS 1332.2]	Identify basic programming construct of Java language Learn and implement the concepts of encapsulation and abstraction using class, objects and interfaces for better programming skills.	1	1	1		1								1			
[CS 1332.3]	Identify and develop different classes based on real world scenario.	1	2	2	1	1								2			
[CS 1332.4]	Analyze and experiment with different class to demonstrate polymorphism and inheritance and exception handling model	1	2	2	1	1								2			
[CS 1332.5]	Apply Multithreading Model and built classes to demonstrate multi-threading programming.	1	2	2	1	1								2			
[CS 1332.6]	Visualize a real world problem in the form of various collaborating classes and objects for enhancing employability	1	2	1	1	-	-	-	-	1	-	-	2	2	-	-	-

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

DEPARTMENT OF COMPUTER & COMMUNICATION ENGINEERING

Course Hand-out

Engineering Mathematics-III| MA 1307 | 3 Credits | 3 0 0 3

Session: July 19 – December 19 | Faculty: Dr Kalpna Sharma | Class: B Tech III SEM

A. Introduction: This course is offered by Dept. of Mathematics & Statistics as a regular course, targeting students who wish to pursue B.Tech., in Computer Science and Engineering, Computer and Communication Engineering & Information Technology. It offers in depth knowledge of sets, relations, functions, Basic counting techniques, propositional and predicate and propositional logic, basic/introductory level algebraic structures and basic/introductory level graph theory. Students are expected to have background knowledge on number system.

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

[MA1307.1]. Describe the concept of Sets, Functions, Relations and their applications.

[MA1307.2]. Describe basic counting techniques and their applications to evaluate the relevant problems.

[MA1307.3]. Describe the concepts of Recurrence relations and the evaluation of problems by generating functions.

[MA1307.4]. Describe the concept of Predicates, logics, Boolean Algebra and their properties which enhance the logical and programming skills and make them employable in the relevant industry.

[MA1307.5]. Describe the concept of Algebraic structure and Group theory which helps to increase the logical skills.

[MA1307.6]. Describe the concepts of Graph Theory and apply the graph algorithms to evaluate and analyze the problems, which enhance the analytical skills.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

[PO.2]. **Effective Communication:** Articulate ideas and perspectives, by developing and enhancing the communicative skills of listening, speaking, reading, and writing in interpersonal and interactive contexts, in print and in electronic media, for various audiences and purposes.

[PO.3]. **Social Interaction:** Develop competence in understanding, appreciating, and respecting social diversity derived from the representation of points-of-view in literary texts, thereby facilitating conflict resolution, and social harmony.

[PO.4]. **Effective Citizenship**: Inculcate values of patriotism and of unity, and transfer these values to real-life through selfless volunteering and activism, for promoting community welfare.

[PO.5]. **Ethics:** Recognise the diversity and complexity of ethical dilemmas in the real world, and educate oneself to base ones actions on responsibility, and respect for human rights.

[PO.6]. **Environment and Sustainability**: Study and understand Nature and the environment on the basis of important literary texts and researches, so as to initiate responsible individual and collective action, towards sustaining our shared environment.

[PO.7]. **Self-directed Life-long Learning:** Taking initiatives and challenges to choose learning opportunities and programmes, implementing learning goals, and sustaining intellectual growth and excellence in a constantly changing global scenario.

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

[PO.9]. Individual and team work: United we grow, divided we fall is a culture at MUJ. Thus, an outgoing student should be able to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

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

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

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

[PSO.1]. Should be able to clearly understand the basic principles, concepts and applications in the field of computer-based Communication/networking, information sharing, signal processing, web based systems, smart devices and communication technology.

[PSO.2]. Should be able to nail down the issues prevalent in the field of Computer and Communication Engineering.

[PSO.3]. Should be able to identify the existing open problems in the field of computing and propose the best possible solutions.

[PSO.4]. Should be able to apply the contextual knowledge in the field of computing and communication to assess social, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional engineering practice.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	15
	Sessional Exam II (Closed Book)	15
	In class Quizzes and/or Assignments , Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (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

Sets, relations and functions: Sets and set operations, functions, binary relations, partial ordering relations, poset and Hasse diagram, equivalence relations. Principle of mathematical induction. **Basic counting techniques**: pigeon-hole principle, inclusion and exclusion principle, permutations and combinations. Discrete numeric functions, recurrence relations and generating function. **Propositional Calculus:** propositions and logical operations, conditional statements, logical equivalence of statements, tautology and contradiction, Predicates and Quantifiers, rules of inference. **Algebraic structures**: Semi-group, monoid, group, cyclic group, permutation group, Boolean algebra. **Introduction to graph theory:** Graphs and graph models, graph terminology and types of graphs, Handshaking theorem, regular graph, complete graph, bipartite graph, graph isomorphism, subgraphs, walk, path, cycle, Eulerian graph.

F. TEXT BOOKS

1. Kenneth H. Rosen, "Discrete Mathematics and its applications", Seventh Edition, McGraw Hill, 2014.
2. Narsing Deo, "Graph Theory with applications to engineering and Computer Science", PHI, 2004.

G. REFERENCE BOOKS

1. Reinhard Diestel, "Graph Theory", Springer International Edition, 2005.
2. Bernard Kolman, Robert C. Busby, Sharon Cutler Ross, "Discrete Mathematical Structures", Pearson Education, 2004.
3. J.P. Tremblay, R. Manohar, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw-Hill, 2006.

H. Lecture Plan:

Class Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1	Set and set operations, Venn diagram	Describe basis related to set theory	Lecture	CO1	Mid Term I, Quiz & End Term
2	Principle of inclusion and exclusion	Will be able to solve problems related to the topic	Lecture	CO1	Mid Term I, Quiz & End Term
3	Cartesian product of sets and binary relations	Knowledge of basics of Relation	Lecture	CO1	Mid Term I, Quiz & End Term
4	Domain, co-domain and range of relations	Will be able to identify domain and range for relations	Lecture	CO1	Mid Term I, Quiz & End Term
5	Pictorial and matrix representation of relations	Learn new way of representation	Lecture	CO1	Mid Term I, Quiz & End Term
6	Equivalence relations	Explore new properties of relations	Lecture	CO1	Mid Term I, Quiz & End Term
7	Equivalence classes, partition	Can able to make subsets with some interesting properties	Lecture	CO1	Mid Term I, Quiz & End Term
8	Partial ordering relation, partially ordered set	Will be able to identify comparison between elements	Lecture	CO1	Mid Term I, Quiz & End Term
9	Hasse diagram of posets	Explore different way of representation	Lecture	CO1	Mid Term I, Quiz & End Term
10	Functions-Defintions, one-to-one onto	Basics of functions	Lecture	CO1	Mid Term I, Quiz & End Term
11	Composition of Functions, inverse of a function	Recall algebraic operations	Lecture	CO1	Mid Term I, Quiz & End Term
12	Basic Principle of Counting-Product rule, Sum rule	Understand a way of counting	Tutorial	CO2	Mid Term I, Quiz & End Term
13	Review on Permutations and Combinations	Revision of few fundamental concepts	Tutorial	CO2	Mid Term I, Quiz & End Term

14	Problems under Permutations and Combinations	Exercise new problems	Tutorial	CO2	Mid Term I, Quiz & End Term
15	Pigeon-hole principle	Explore new methodology of counting	Lecture	CO2	Mid Term I, Quiz & End Term
FIRST SESSIONAL EXAM					
16	Discrete Numeric function definition and examples, sum and product of DNFs	Understand different aspect of a series	Lecture	CO3	Mid Term 2, Quiz & End Term
17	Definition of Generating Function, examples, finding generating function for the sequence of real numbers	Able to make association between sequence & series	Lecture	CO3	Mid Term 2, Quiz & End Term
18	Recurrence relations - formulation of recurrence relations	A new approach for counting problem	Lecture	CO3	Mid Term 2, Quiz & End Term
19	Solution of recurrence relations using generating functions	Application of recurrence relations	Lecture	CO3	Mid Term 2, Quiz & End Term
20	Semi-groups, monoids definition and examples	Basics of Algebraic structure	Lecture	CO5	Mid Term 2, Quiz & End Term
21	Group defintion and examples, some basic theorems	Extension of Algebraic structure with some properties	Lecture	CO5	Mid Term 2, Quiz & End Term
22	Cyclic groups	New property of Groups	Lecture	CO5	Mid Term 2, Quiz & End Term
23	Permutation groups	Algebraic structure of functions	Lecture	CO5	Mid Term 2, Quiz & End Term
24	Axiomatic definition of Boolean Algebra and examples	Exploration of Boolean algebra	Lecture	CO4	Mid Term 2, Quiz & End Term
25	Boolean expressions, Boolean functions	Properties of Boolean algebra	Lecture	CO4	Mid Term 2, Quiz & End Term
26	Propositions, conjunction and disjunction of propositions, negation of a proposition, implications,	Basics of Predicate calculus	Lecture	CO4	Mid Term 2, Quiz & End Term
27	converse, contrapositive and inverse of a proposition, contradiction and tautology	Properties of Predicate calculus	Lecture	CO4	Mid Term 2, Quiz & End Term
28	contradiction and tautology, logical equivalences	Idetify nature of language	Lecture	CO4	Mid Term 2, Quiz & End Term
29	Predicates - ways of expressing sentences using predicates	Application of predicate calculus	Lecture	CO4	Mid Term 2, Quiz & End Term
30	Quantifiers - expressing sentences using predicates and quantifiers and quantified express into sentences	Extension of language writing	Lecture	CO4	Mid Term 2, Quiz & End Term
SECOND SESSIONAL EXAM					
31	Graphs, digraphs, Simple graph, multi graph, pseudo graph	Basic knowledge of Graph formation	Lecture	CO6	Quiz & End Term

32	Degree of a vertex in a graph, adjacency and incidence.	Basic definitions and representation in matrix form	Lecture	CO6	Quiz & End Term
33	Some basic properties, Subgraphs	Properties of graph	Lecture	CO6	Quiz & End Term
34	Complete graphs, bipartite graphs	Different types of graph	Lecture	CO6	Quiz & End Term
35	Graph isomorphism	Equivalence of two graphs	Lecture	CO6	Quiz & End Term
36	Walk, path, cycle in a graph	Different types of graph	Lecture	CO6	Quiz & End Term
37	Eulerian and Hamiltonian walk.	Application of graph with important graphs	Lecture	CO6	Quiz & End Term
END TERM EXAM					

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
MA1307.1	Describe the concept of Sets, Functions, Relations and their applications.	**3**	**2**	**1**							**1**	**2**	**1**	**2**	**1**	**2**	
MA1307.2	Describe basic counting techniques and their applications to evaluate the relevant problems.	**3**	**3**	**3**	**2**	**1**				**1**	**1**	**1**	**2**	**2**	**1**	**1**	
MA1307.3	Describe the concepts of Recurrence relations and the evaluation of problems by generating functionn	**3**	**3**	**2**	**1**	**2**				**1**			**3**	**3**	**1**	**1**	
MA1307.4	Describe the concept of Predicates, logics, Boolean Algebra and their properties which enhance the logical and programming skills and make them employable in the relevant industry.	**3**	**3**	**3**	**2**	**1**							**2**	**1**	**1**	**1**	
MA1307.5	Describe the concept of Algebraic structure and Group theory which helps to increase the logical skills.	**2**	**1**	**1**	**1**								**1**	**1**	**1**	**1**	
MA1307.6	Describe the concepts of Graph Theory and apply the graph algorithms to evaluate and analyze the problems, which enhance the analytical skills.	**2**	**2**	**2**	**1**	**1**							**2**	**3**	**3**	**2**	

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and IT

DEPARTMENT OF COMPUTER AND COMMUNICATION ENGG

Course Hand-out

VEG | BB1101 | 3 Credits | 3 0 0 3

Session: Jan 20-May 20 | Faculty: Dr AnirVanna | Class: CCE III SEM

A. **Introduction:** The course is offered to understand Moral Values and Ethics in personal as well as professional life. It is basic requirement of every human to be a good human being and a good citizen. It further imparts him basics of corporate governance so as to empower him to work technically and professionally in any organization with confidence and conviction and at the same time with honesty & integrity..

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

[BB1101.1**]** Define the meaning and relevance of Value and Ethics and apply in personal & professional life.

[BB1101.2**]** Describe the importance of three Gunas for self-development, lifelong learning & growth.

[BB1101.3**]** Find issues and identify solutions related to Public & Private Governance systems.

[BB1101.4**]** Explain the relevance of Company's Act 2013 with reference to corporate world.

[BB1101.5**]** Explain the role and key objectives of organizational governance in relation to ethics and law.

[BB1101.6**]** Demonstrate the social & environmental responsibilities of corporate for sustainability, harmony and growth.

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 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

[**PSO.1] Understand :** Should be able to clearly understand the basic principles, concepts and applications in the field of computer based Communication/networking, information sharing, signal processing, web based systems, smart devices and communication technology.

[PSO.2] Critically analyse and interpret Should be able to nail down the issues prevalent in the field of Computer and Communication Engineering.

[PSO.3] Write Should be able to identify the existing open problems in the field of computing and propose the best possible solutions.

[PSO.4] Develop. Should be able to apply the contextual knowledge in the field of computing and communication to assess social, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional engineering practice.

D . **Assessment Plan:**

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Sem Exam I (Close Book)	15
	Mid Sem Exam II (Close Book)	15
	In class Quizzes/ Assignments Students' Presentations	20(Min 5 each) 10
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

Values: Relevance of Value Education in day-to-day life. Mantra for success - Value, Moral and Ethics.
Determinants of human nature (Three Gunas) and its impact on human life.**Relevance of traits** like Personality, Attitude, Behaviour, Ego, Character, introspection, Motivation, Leadership and 4 Qs with relevant Case Studies*.
Governance: Understanding of Public and Private sector Governance systems; Courts & CAG.Public Sector Governance: Need, relevance, stakeholders.Private Sector Governance: Proprietary, Partnership, Company (Pvt Ltd & Ltd), Company' Act 2013, Board of Directors; its Roles and Responsivities. Regulatory bodies; its role in ethical governance.Projects on PPP mode-relevance & prospects.**CSR**: Relationship with Society, Philanthropy and Business strategy, CSR Policy, Triple Bottom Line

F. REFERENCE BOOKS

a. Professional Module of ICSI.
b. Ghosh B.N., Business Ethics & Corporate Governance, McGraw Hill.
c. Mandal S.K., Ethics in Business & Corporate Governance, McGraw Hill .
d. Ray C.K., Corporate Governance, Value & Ethics, Vaya Education of India
e. Chatterjee Abha, Professional Ethics, Oxford Publications.

***Suggestive Case Studies:**

f. Uphar Theatre Tragedy- Engineering Ethics
g. Bhopal Gas Tragedy- Operational Engineering Ethics
h. Satyam Case- Financial Reporting Ethics
i. Enron Case- Business Ethics
j. Neerav Modi Case- Financial Fraudulence *cases*

G. Lecture Plan:

Class No.	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1	**Introduction: Values:** Meaning & Relevance of value education	To acquaint and clear teacher's expectations and understand student expectations. Basics of Value Education	Lecture	BB 1101.1	In class Quiz Mid Term I End Term Exam
2	Success: Meaning in perspective of morals & ethics	To understand the concept of success achieved with or without morals / ethics/ values	Lecture, case study	BB 1101.1	In class Quiz Mid Term I End Term Exam
3,4	Professional Ethics & ethical dilemmas Case study-Neerav Modi	To understand the role of professional ethics in the life & deal with dilemmas	Lecture	BB 1101.1	In class Quiz, assignment Mid Term I End Term Exam
5	Three Gunas and their relevance, Nature and kinds of value with examples	Understand basic traits in one's personality, its causes and relevance with value based living.	Lecture	BB 1101.2	In Class Quiz, Mid Term I End Term
6,7	Relevance of traits of individual like Personality, Attitude, Behaviour	To acquaint & develop positive traits of personality in oneself	Short stories, Lecture	BB 1101.2	Class Quiz assignment Mid Term I End Term
8.9	Ego, Character, introspection, Motivation	To acquaint & develop positive traits of personality in oneself and understand negative traits	Lecture Short stories	BB 1101.2	In Class Quiz Mid Term I End Term
10,11	Leadership traits & 4Qs (PQ, IQ, EQ, SQ)	To realize importance of leadership and to imbibe in life	Lecture Short stories	BB 1101.2	In Class Quiz assignment Mid Term I End Term
12,13	Governance & its relevance Case studies- Bhopal Gas & Uphar Cinema	To acquaint with the concept of Governance	Lecture	BB 1101.3	In Class Quiz Mid Term II End Term
14	Public Sector Governance: Need, relevance, stakeholders	Understand various aspects of public sector governance	Lecture	BB 1101.3	Class Quiz, Mid Term II End Term
15	Public Finance, Audit & Control	Understand basics of Public Finance, Check & balance	Lecture Case study	BB 1101.3	Class Quiz, assignment Mid Term II End Term
16,17	Private Sector Governance, proprietary & partnership firms and corporate, PPP mode projects	Understand meaning of proprietary & partnership in a firm / company and perspective in PPP mode	Lecture Short stories	BB 1101.3 & 1101.4	Class Quiz Mid Term II End term

18, 19	Company' Act 2013 : Roles & Responsibilities of Directors & regulatory authorities	Explain various Regulations and practices of Corporate Governance internationally & understand key role of directors	Lecture	BB 1101.4	Class Quiz Mid Term II End Term
20,21	Role of Ethics in Governance Case studies- Satyam & Enron	Recognize the necessity of ethics & transparency in Governance	Movie : Gandhi	BB 1101.5	Class Quiz, assignment Mid Term II End Term
22,23	CSR: Relationship with Society, Philanthropy and Business strategy	To understand the relevance of giving back to society by a corporate & its importance in society	Lecture, case study	BB 1101.6	Class Quiz, End Term
24	CSR Policy, Triple Bottom Line	Understand the concept of TBL in organizational frameworks	Lecture case study	BB 1101.6	Class Quiz assignment End Term
25,26	Students' Presentation	Recall contents and their importance through case studies.	Flipped Class	ALL	Class Quiz End Term

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

CO	**STATEMENT**	Correlation with Program Outcomes **(POs)**												Correlation with Program Specific Outcomes (PSOs)			
		PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO4**
[BB1101.1**]**	Define the meaning and relevance of Value and Ethics and apply in personal & professional life.						1		2								
[BB1101.2**]**	Describe the importance of three Gunas for self-development, lifelong learning & growth.						1		2	1	1		2			1	
[BB1101.3**]**	Find issues and identify solutions related to Public & Private Governance systems.						1	1		1	2						
[BB1101.4**]**	Explain the relevance of Company's Act 2013 with reference to corporate world.						1		1	1							
[BB1101.5**]**	Explain the role and key objectives of organizational governance in relation to ethics and law.						1		2	1			1			1	
[BB1101.6**]**	Demonstrate the social & environmental responsibilities of corporate for sustainability, harmony and growth.						1	3				1	1			3	

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

DEPARTMENT OF COMPUTER AND COMMUNICATION ENGINEERING

Course Hand-out

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

Session: Jan 2020-May 2020 | Faculty: Dr. Geeta Rani| Class: B.Tech (CCE) IV SEM

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

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

[CS 1401.1] Describe the objectives, structure, functionality and types of operating systems.

[CS 1401.2] Write System programs for process and thread creation, execution, inter-process communication.

[CS 1401.3] Compare various algorithms used for process scheduling.

[CS 1401.4] Apply the concepts of deadlock to solve resource allocation problems.

[CS 1401.5] Evaluate the performance of different memory management techniques.

[CS 1401.6] Describe disk scheduling and various 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]. Understand Should be able to clearly understand the basic principles, concepts and applications in the field of computer based Communication/networking, information sharing, signal processing, web based systems, smart devices and communication technology.

[PSO.2]. Critically Analyse and Interpret Should be able to nail down the issues prevalent in the field of Computer and Communication Engineering.

[PSO.3]. Problem Solving Should be able to identify the existing open problems in the field of computing and propose the best possible solutions.

[PSO.4]. Apply Should be able to apply the contextual knowledge in the field of computing and communication to assess social, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional engineering practice.

D. Assessment Plan:

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

E. SYLLABUS

Introduction: 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: Overview, multithreaded models Thread libraries Programs using Pthreads. Process scheduling: Basic concepts, scheduling criteria. Process Synchronization: Background, Critical section problem Peterson's solution Synchronization Hardware, Semaphores Classical problems of synchronization Classical problems of 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 (Address Binding, Logical vs Physical Address Space, Dynamic Loading, Dynamic Linking and Shared Libraries, Overlays) 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 Space Allocation Methods for Files (Contiguous, Linked , Indexed), Free Space Management (Bit Vector, Linked List, Grouping, Counting), 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, The Security Problem, User Authentication, Program Threats, System Threats Intrusion Detection.

F. REFERENCE BOOKS

1. A. Silberschatz, P. B. Galvin and G. Gagne, *"Operating System Concepts"*, 9th Edition, Wiley, 2014.
2. A.S. Tanenbaum, "Modern Operating Systems", 3rd Edition, Prentice Hall India, 2009.
3. F W. Stallings, "Operating Systems", 7th Edition, Pearson, 2012.
4. W. R. Stevens and S. A. Rago, "Advanced Programming in the UNIX Environment", 3rd Edition, Addison-Wesley, 2013.

G. Lecture Plan:

Class Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1	Introduction and Course Hand-out briefing Introduction to Operating system structure.	To acquaint and clear teachers' expectations and understand student expectations.	Lecture Interaction	-	NA
2	Operating system operations, Process management, Memory management	Understanding basic concepts of OS.	Lecture	1401.1	Class Quiz, Video Assignment, Assignment, First Sessional Examination, End Term Examination.
3	Storage management, Protection and security, Special purpose systems	Understanding basic concepts of OS.	Lecture	1401.1	
4	System Structure: Operating system services, User operating system interfaces		Lecture	1401.1	
5	System calls, Types of system calls, System programs	Identify use of system calls as per requirement and write programs for executing system calls.	Demonstration	1401.2	
6	Operating system structure, Virtual machines, System boot.	To perform booting the system.	Demonstration	1401.2	
7	Process Concept	To create and delete processes.	Lecture	1401.1	
8	Process scheduling	To identify suitable scheduling algorithm.	Lecture	1401.1	
9	Operations on processes	To perform various operations on processes.	Lecture	1401.1	
10	Inter-process Communication, Unix Pipes	To use pipes for establishing IPC.	Demonstration	1401.2	Class Quiz, Video

11	Pipes	To use pipes for establishing IPC.	Demonstration	1401.2	Assignment, Assignment, First Sessional Examination, End Term Examination.
12	Multithreaded Programming: Overview	To Understand concept of threading for parallel programming.	Lecture	1401.1	
13	Multithreaded models	Apply concept of threading for parallel programming.	Lecture	1401.1	
14	Thread libraries	Apply concept of threading for parallel programming.	Lecture	1401.1	
15	Programs using Pthreads	Apply concept of threading for parallel programming.	Demonstration	1401.2	
16	Programs using Pthreads (cont..)	Apply concept of threading for parallel programming.	Demonstration	1401.2	
17	Process scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms.	To determine scheduling criteria.	Lecture and learning by solving	1401.1	
18	Scheduling algorithms	To compare various scheduling algorithms.	Lecture and learning by solving	1401.3	Class Quiz, Video Assignment, Assignment, First Sessional Examination, End Term Examination.
19	Scheduling algorithms	To compare various scheduling algorithms.	Lecture and learning by solving	1401.3	
20	Scheduling algorithms	To compare various scheduling algorithms.	Lecture and learning by solving	1401.3	
21	Process Synchronization: Background, Critical section problem	To apply concepts for synchronisation.	Lecture and learning by solving	1401.1	
22	Peterson's solution	To apply Peterson's solution.	Lecture and learning by solving	1401.1	
23	Synchronization Hardware.	To understand about Synchronization Hardware.	Lecture and learning by solving	1401.1	
24	Semaphores	To apply semaphores.	Lecture and learning by solving	1401.1	
25	Classical problems of synchronization	To solve classical problems.	Lecture and learning by solving	1401.1	
FIRST SESSIONAL EXAM 14 Feb 2020- 18Feb 2020					

26	Classical problems of synchronization (Contd...)	To solve classical problems	Lecture and learning by solving	1401.1	Class Quiz, Video Assignment, Assignment, Second Sessional Examination, End Term Examination.
27	Synchronization Programs using PThreads.	To solve classical problems	Lecture and learning by solving	1401.2	
28	Semaphores comparison with other solutions.	To compare semaphores.	Lecture and learning by solving	1401.1	
29	Classical problems of synchronization	To solve classical problems.	Lecture and learning by solving	1401.1	
30	Methods for handling deadlocks, Deadlock prevention.	To identify the state of deadlock.	Lecture and learning by solving	1401.4	
31	Deadlock avoidance	Apply knowledge for resolving the problem of deadlock.	Lecture and learning by solving	1401.4	
32	Deadlock detection Recovery from deadlock	Apply knowledge for resolving the problem of deadlock.	Lecture and learning by solving	1401.4	
33	Recovery from deadlock	Apply knowledge for recovery from deadlock.	Lecture and learning by solving	1401.4	
34	Memory Management :Address Binding, Logical vs Physical Address Space	To understand the concept of memory management.	Lecture and learning by solving	1401.5	
35	Dynamic Loading, Dynamic Linking	To solve the problems related to memory management.	Lecture and learning by solving	1401.5	Class Quiz, Video Assignment, Assignment, Second Sessional Examination, End Term Examination.
36	Shared Libraries, Overlays	To use the shared libraries and memory management.	Lecture and learning by solving	1401.5	
37	Swapping, Contiguous Memory Allocation	To solve the problem of memory allocation.	Lecture and learning by solving	1401.5	
38	Paging	To apply the concept of paging.	Lecture and learning by solving	1401.5	
39	Structure of Page Table	To understand structure of page table.	Lecture and learning by solving	1401.5	
40	Segmentation	To apply the concept of segmentation.	Lecture and learning by solving	1401.5	
41	Demand Paging, Page Replacement Policies	To apply paging algorithms.	Lecture and learning by solving	1401.5	
42	Allocation of Frames , Thrashing	To use frames.	Lecture and learning by solving	1401.5	

SECOND SESSIONAL EXAM 3April 2020-07 April 2020					
43	File Concept, Access Methods,	To understand the file handling.	Lecture	1401.5	Class Quiz, Assignment, End Term Examination.
44	Directory and Disk Structure	To understand structure of disk.	Lecture	1401.5	
45	File System Mounting	To mount file system.	Lecture	1401.5	
46	File System Structure	To understand file structure.	Lecture	1401.5	
47	File System Implementation	To apply file handling.	Lecture	1401.5	
48	Space Allocation Methods for Files (Contiguous, Linked , Indexed)	To identify allocation method.	Lecture	1401.5	
49	Free Space Management (Bit Vector, Linked List, Grouping, Counting)	To apply space management techniques.	Lecture	1401.5	
50, 51	Disk Scheduling Algorithms, Disk Management, Swap Space Management	To implement the disk scheduling algorithms.	Lecture and learning by solving	1401.6	
END TERM EXAM 27 April 2020-13 May2020					

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

CO	STATEMENT	Correlation with Program Outcomes **(POs)**												Correlation with Program Specific Outcomes (**PSOs**)			
		PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO4**
[CS1401.1]	Describe the objectives, structure, functionality and types of operating systems.	**3**	**2**	**1**		**2**	**1**						**1**	**2**	**1**		
[CS1401.2]	Write System programs for process and thread creation, execution, inter-process communication.	**2**	**2**	**2**									**1**	**2**	**1**	**2**	
[CS1401.3]	Compare various algorithms used for process scheduling.	**2**	**2**	**3**									**1**	**1**	**2**	**2**	
[CS1401.4]	Apply the concepts of deadlock to solve resource allocation problems.	**2**	**2**	**3**			**2**		**2**	**3**			**2**	**1**	**1**	**2**	**1**
[CS1401.5]	Evaluate the performance of different memory management techniques.	**2**	**2**	**2**						**1**	**1**		**2**	**1**	**2**	**2**	
[CS1401.6]	Describe disk scheduling and various storage strategies.	**3**	**2**	**2**									**2**	**1**	**2**	**2**	

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Department of Computer Science & Engineering
Course Hand-out

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

Session: Jan '20 – May '20 | Faculty: Dr. V. P. S. Dhaka, Dr. Arvind Dhaka, Mr. Satyabrata Roy | Class: B.Tech. 2nd Year IV Semester (Core Course)

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

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

CS1402.1: Classify, Compare & recall different file-based system, Data Model.

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

CS1402.3: Interpret different query language SQL, Relation Algebra, calculus and acquire the skill apply the techniques and rules in different real-life 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. Should be able to clearly understand the basic principles, concepts and applications in the field of computer based Communication/networking, information sharing, signal processing, web based systems, smart devices and communication technology.

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

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

PSO4. Should be able to apply the contextual knowledge in the field of computing and communication to assess social, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional engineering practice.

D. Assessment Plan:

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

E. SYLLABUS

Introduction: Data, data processing requirement, traditional file based system, Def of database, database management system, 3-schema architecture, Benefits of DBMS. Database system applications, Purpose of database systems, Different database users. DBMSs, data driven development, OLAP, OLTP. **Data Modelling and ER/EER diagrams:** Conceptual data model, Conceptual data modelling using E-R data model, entities, attributes, relationships, Generalization, specialization, specifying constraints. **Relational Algebra and Calculus:** Selection and projection set operations, renaming - Joins – Union, intersection, Division, Examples of Algebra overviews, Relational calculus, Tuple relational Calculus, Domain relational calculus, Expressive Power of Algebra and calculus. **Relational Model, ER mapping to corresponding relational models & Relational Algebra:** the relational data model, relational constraints and the relational algebra, relational model concepts, relational constraints and relational database schemas, update operations and dealing with constraints violations, basic relational algebra operations, additional relational operations, examples of queries in relational database design using ER-to-Relational Mapping**.** **SQL:** Data definition, Constraints and schema changes in SQL2, Basic queries in SQL, more complex SQL queries, Insert, Delete and Update statements in SQL, Views (Virtual tables) in SQL, Specifying General Constraints as assertion, Additional features of SQL. **Database Design & Normalisation :** Def of relation, relational model operators, Keys, relational model integrity rules, Functional dependencies and normalization for relational databases :Informal design guidelines for schemas, functional dependencies, Normal forms based on Primary keys, General definitions of second and third normal forms, Boyce-Codd normal form, Relational database algorithms and further dependencies: Algorithms for relational database schema design, multivalued dependencies and fourth normal form. **Transaction Processing & Management:** Transaction concept &State, Concurrency Control: Lock Based Protocols, Multiple granularity, Deadlocks. **Recovery:** Recovery & Atomicity, Log based Recovery. **Concurrency control mechanisms:** concurrency control techniques: Locking techniques for concurrency control techniques, concurrency control based on Timestamp ordering, multiversion concurrency control techniques, validation (optimistic) concurrency for concurrency control in indexes, some other concurrency control issues. **File Storage,** Indexing & Hashing: File structures, RAID Level, Order indices, B+-Tree Indices File, B+-Tree extensions, Multiple Key Access, Static Hashing and Dynamic Hashing.

F. TEXT BOOKS

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

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

G. REFERENCE BOOKS

1. C. J. Date, “Database Systems”, Prentice Hall of India, New Delhi, 2012
2. Raghu Ramakrishnan, “Database Management Systems (2nd Ed)”, McGraw Hill, 2000.
3. 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, CARTESIAN PRODUCT (CROSS PRODUCT) Operations.	Interpret different Relational Algebra operations and apply the techniques and rules in different problems	PPT, Lecture, Class Notes	1402.3	Mid Term I, Quiz & End Term
19.	Binary Relational Operations: JOIN and DIVISION Operation	Interpret JOIN and DIVISON operations and apply the techniques and rules in different problems.	PPT, Lecture, Class Notes	1402.3	Mid Term I, Quiz & End Term
20.	Variations of JOIN: THETA JOIN, EQUI JOIN, NATURAL JOIN, INNER JOIN and OUTER JOIN	Interpret different types of JOIN operations and apply the techniques and rules in different problems	PPT, Lecture, Class Notes	1402.3	Mid Term I, Quiz & End Term
21.	Additional Relational Operations: Generalized Projection, Aggregate Functions and Grouping.	Interpret additional Relational Algebra operations and apply the techniques and rules in different problems	PPT, Lecture, Class Notes	1402.3	Mid Term II, Quiz & End Term
22.	Tuple Relational Calculus: Tuple Variable and Range Relations, Expressions and Formulas in tuple relational calculus.	Interpret different Relational Calculus operations and apply the techniques and rules in different problems	PPT, Lecture, Class Notes	1402.3	Mid Term II, Quiz & End Term
23.	The Existential and Universal Quantifiers, Safe Expressions.	Understand existential and universal and existential quantifiers.	PPT, Lecture, Class Notes	1402.3	Mid Term II, Quiz & End Term
24.	Domain Relational Calculus.	Understand concepts of domain relational calculus.	PPT, Lecture, Class Notes	1402.3	Mid Term II, Quiz & End Term
25.	SQL Data Definition and Data Types, Specifying Constraints in SQL, Schema change	Understand fundamentals of SQL	PPT, Lecture, Class Notes	1402.3	Mid Term II, Quiz & End Term

	statements in SQL.				
26.	Basic queries in SQL, More complex SQL queries: Comparisons involving NULL and Three-Valued Logic, Nested Queries, Tuples, and Set/Multiset Comparisons.	Interpret SQL and apply the techniques and rules in different problems	PPT, Lecture, Class Notes	1402.3	Mid Term II, Quiz & End Term
27.	Correlated Nested Queries, EXISTS and UNIQUE functions in SQL.	Interpret SQL and apply the techniques and rules in different problems	PPT, Lecture, Class Notes	1402.3	Mid Term II, Quiz & End Term
28.	Joined tables in SQL and Outer Joins, Aggregate functions in SQL.	Interpret SQL and apply the techniques and rules in different problems	PPT, Lecture, Class Notes	1402.3	Mid Term II, Quiz & End Term
29.	GROUP BY, HAVING Clauses, INSERT, DELETE, AND UPDATE Statements in SQL.	Interpret SQL and apply the techniques and rules in different problems	PPT, Lecture, Class Notes	1402.3	Mid Term II, Quiz & End Term
30.	Views (Virtual tables) in SQL, Specifying General Constraints as assertion and Triggers, Additional features of SQL.	Interpret SQL and apply the techniques and rules in different problems	PPT, Lecture, Class Notes	1402.3	Mid Term II, Quiz & End Term
31.	Database Design: Redundant information in tuples and update anomalies, insertion anomalies, deletion anomalies and modification anomalies.	Understand the concepts of different anomalies and how they can be removed	PPT, Lecture, Class Notes	1402.4	Mid Term II, Quiz & End Term
32.	Properties of Relational Decompositions: Dependency preservation and Lossless join property of a decomposition.	Understand concepts of relational decompositions	PPT, Lecture, Class Notes	1402.4	Mid Term II, Quiz & End Term
33.	Functional Dependencies: Definition of functional dependencies, Inference rules for functional dependencies.	Understand concepts of functional dependencies	PPT, Lecture, Class Notes	1402.4	Mid Term II, Quiz & End Term
34.	Equivalence of sets of functional dependencies, Minimal sets of functional dependencies.	Understand the process of finding out equivalence among given sets of FDs and finding out minimal sets of functional dependencies	PPT, Lecture, Class Notes	1402.4	Mid Term II, Quiz & End Term
35.	Normal forms based on Primary keys, Normalization of relations, Definition of Super Key and Candidate Key. Definition of Prime and Non-Prime Attribute.	Understand different normalization techniques for optimizing database and analyse database design	PPT, Lecture, Class Notes	1402.4	Mid Term II, Quiz & End Term

36.	Normal Forms: First normal form, Second normal form.	Understand 1NF and 2NF	PPT, Lecture, Class Notes	1402.4	Mid Term II, Quiz & End Term
37.	Third normal form and Boyce-Codd normal form.	Understand 3NF and BCNF	PPT, Lecture, Class Notes	1402.4	Mid Term II, Quiz & End Term
38.	Multivalued dependencies and fourth normal form.	Understand concepts of multivalued dependencies	PPT, Lecture, Class Notes	1402.4	Mid Term II, Quiz & End Term
39.	Introduction to transaction processing, Desirable properties of transactions.	Understand and summarize transaction processing	PPT, Lecture, Class Notes	1402.5	Quiz & End Term
40.	Characterizing schedules based on recoverability.	Understand and summarize concepts of recoverability of schedules	PPT, Lecture, Class Notes	1402.5	Quiz & End Term
41.	Characterizing schedules based on Serializability: Serial, Nonserial and conflict serializable schedules.	Understand and summarize concepts of schedules	PPT, Lecture, Class Notes	1402.5	Quiz & End Term
42.	View equivalence and View Serializability.	Understand and summarize concepts of serializability	PPT, Lecture, Class Notes	1402.5	Quiz & End Term
43.	Concurrency control techniques: Two Phase locking Techniques (Binary Lock, Shared/Exclusive Lock).	Understand and summarize concurrency control techniques.	PPT, Lecture, Class Notes	1402.5	Quiz & End Term
44.	Basic 2PL, Strict 2PL, Rigorous 2PL.	Understand the concepts of locking for concurrency control	PPT, Lecture, Class Notes	1402.5	Quiz & End Term
45.	Deadlock prevention protocol (Wait-Die, Wound-Wait), Deadlock detection and starvation.	Understand different strategies of deadlock prevention and detection strategies	PPT, Lecture, Class Notes	1402.5	Quiz & End Term
46.	Concurrency control based on Timestamp Ordering (Basic TO, Strict TO and Thomas's Write Rule.	Understand concurrency control based on timestamp ordering.	PPT, Lecture, Class Notes	1402.5	Quiz & End Term
47.	Granularity of Data items and Multiple Granularity Locking.	Understand concepts of multiple granularity locking	PPT, Lecture, Class Notes	1402.5	Quiz & End Term
48.	Database Recovery Techniques: Recovery Concepts, Recovery Technique based on Deferred Update.	Understand and summarize recovery techniques.	PPT, Lecture, Class Notes	1402.5	Quiz & End Term
49.	Recovery Technique based on Immediate Update, Recovery Systems Check pointing and Shadow paging.	Understand and summarize recovery techniques.	PPT, Lecture, Class Notes	1402.5	Quiz & End Term
50.	File Storage: File structures (Fixed Length Record, Variable Length Record), Record Blocking and Spanned	Explain different database storage structure and access technique	Lectures, Flipped Classroom	1402.6	Quiz & End Term

	versus Un-spanned Records.				
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 acquire the skill apply the techniques and rules in different real-life 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- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

EPARTMENT OF COMPUTER AND COMMUNICATION ENGINEERING

Course Hand-out

Microprocessor & Microcontrollers | CS 1403 | 3 Credits | 3 0 0 3

Session: Jan 20-May 20 | Faculty: Vidyadhar Jinnappa Aski| Class: B.Tech IV Semester | CCE Core

A. **Introduction:** This course is offered by the Department of Computer and Communication Engineering as the core course. 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 focus would be on architectural aspects and the programmer's model with an intensive teaching 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:

[CS 1403.1] Interpret and illustrate the basic architecture of 16-bit 8086 Microprocessors & its need.

[CS 1403.2] Realise & Apply basic instruction set of 8086 to write the assembly language programming.

[CS 1403.3] Analyse and Implement various instruction timing, delay loops, Procedures and Macros.

[CS 1403.4] Comprehend the internal architecture and interfacing of different peripheral devices with 8086 microprocessor.

[CS 1403.5] Acquire proficient knowledge of 16-Bit microcontroller based systems and therefore develop employability skills.

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

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

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

[PO.3]. **Design/development of solutions:** Upon analysing, the B Tech CCE graduate should be able to devise solutions for complex engineering problems and design system components or processes that meet the specified requirements with appropriate consideration for law, safety, cultural & societal obligations with environmental considerations.

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

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

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

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

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

[PO.9]. Individual and team work: United we grow, divided we fall is a culture at MUJ. Thus an outgoing student should be able to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

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

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

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

[PSO.1]. Should be able to clearly understand the basic principles, concepts and applications in the field of computer based Communication/networking, information sharing, signal processing, web based systems, smart devices and communication technology.

[PSO.2]. Should be able to nail down the issues prevalent in the field of Computer and Communication Engineering.

[PSO.3]. Should be able to identify the existing open problems in the field of computing and propose the best possible solutions.

[PSO.4]. Should be able to apply the contextual knowledge in the field of computing and communication to assess social, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional engineering practice.

D. Assessment Plan:

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

E. SYLLABUS

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 BOOKS

1. D. V. Hall, "Microprocessors and Interfacing", TMH, Revised Second Edition, 2006.
2. N. S. Kumar, M. Saravanan, et. al. "Microprocessors and Microcontrollers", Oxford Higher Education, 2015.
3. C. Hamacher, Z. Vranesic, "Computer Organization", TMH, 2002.
4. Y. Liu, G.A. Gibson, "Microcomputer Systems- The 8086/8088 Family", PHI Learning private Ltd., 2011.

G. REFFERENCE BOOKS

1. B. B. Brey, "*The Intel Microprocessors*", Seventh Edition, Prentice Hall India, 2005.
2. Clements, "*Microprocessor system design 68000 Hardware", Software, and Interfacing*, PWS Publishing Company, Third Edition, 1997.

H. LECTURE PLAN

Lec. 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

Lec. No.	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
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
FIRST SESSIONAL EXAM					
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
SECOND SESSIONAL EXAM					
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

Lec. No.	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
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
END TERM EXAM					

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

CO	STATEMENT	Correlation With Program Outcomes **(POs)**											Correlation with program specific Outcomes			
		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 1403.1]	Interpret and illustrate the basic architecture of 16-bit 8086 microprocessors & its need.	2	2	1									1	2	1	2
[CS 1403.2]	Realize & Apply basic instruction set of 8086 to write the assembly language programming.	3	2	1	2								1	1		
[CS 1403.3]	Analyze and Implement various instruction timing, delay loops, Procedures and Macros.		3		2								1	1		
[CS 1403.4]	Comprehend the internal architecture and interfacing of different peripheral devices with 8086 microprocessor.	2	2										1	2		
[CS 1403.5]	Become proficient at working on 16-Bit microcontroller based systems and therefore develop employability skills.			1	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 AND COMMUNICATION ENGINEERING

Course Hand-out

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

Session: Jan 2020-May 2020 | Faculty: Dr. Geeta Rani| Class: B.Tech (CCE) IV SEM

A. **Introduction:** This course is offered by the Department Computer and Communication Engineering as a core course. The objective of this lab course 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:

[CS 1431.1] Explain basic Unix commands and write shell Scripts.

[CS 1431.2] Write system programs using file and process system calls and PThread API.

[CS 1431.3] Compare various algorithms used for process scheduling.

[CS 1431.4] Describe concepts related to concurrency and achieve the same for cooperating processes, Apply various deadlock handling strategies to solve resource allocation problems.

[CS 1431.5] 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, 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]. <u>Understand</u> Should be able to clearly understand the basic principles, concepts and applications in the field of computer based Communication/networking, information sharing, signal processing, web based systems, smart devices and communication technology.

[PSO.2]. <u>Critically Analyse and Interpret</u> Should be able to nail down the issues prevalent in the field of Computer and Communication Engineering.

[PSO.3]. <u>Problem Solving</u> Should be able to identify the existing open problems in the field of computing and propose the best possible solutions.

[PSO.4]. <u>Apply</u> Should be able to apply the contextual knowledge in the field of computing and communication to assess social, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional engineering practice.

D. Assessment Plan:

<table>
<tr><th>Criteria</th><th>Description</th><th>Maximum Marks</th></tr>
<tr><td rowspan="3">Internal Assessment
(Summative)</td><td>Continuous evaluation
(Record + Execution + Viva)</td><td>60</td></tr>
<tr><td>Lab project</td><td>10</td></tr>
<tr><td>End Term Exam (Closed Book)</td><td>30</td></tr>
<tr><td>End Term Exam
(Summative)</td><td>Total</td><td>100</td></tr>
<tr><td></td><td>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.</td><td></td></tr>
<tr><td>Attendance
(Formative)</td><td colspan="2">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.</td></tr>
<tr><td>Make up Assignments
(Formative)</td><td colspan="2">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.</td></tr>
<tr><td>Homework/ Home Assignment/
Activity Assignment
(Formative)</td><td colspan="2"></td></tr>
</table>

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. REFERENCE BOOKS

1. A. Silberschatz, P. B. Galvin and G. Gagne, "Operating System Concepts", 9th Edition, Wiley, 2014.
2. A.S. Tanenbaum, "Modern Operating Systems", 3rd Edition, Prentice Hall India, 2009.

3. F W. Stallings, “Operating Systems”, 7th Edition, Pearson, 2012.
4. W. R. Stevens and S. A. Rago, “Advanced Programming in the UNIX Environment”, 3rd Edition, Addison-Wesley, 2013.
5. Das, S., Unix Concepts and Applications, (4e), Tata McGraw-Hill Publications, 2017.
6. Blum, R., and Bresnahan, C., Linux Command Line and Shell Scripting Bible, (3(e), Wiley india Pvt. Ltd, 2015.

G. Lecture Plan:

Lab Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1,2	Illustration of shell function such as wild cards, redirection, pipes, sequencing, grouping, background processing, command substitution, sub shells.	Write basic commands of Unix.	Lecture and Demonstration at system.	1431.1	Continuous Evaluation, End Term Examination.
3	Write shell scripts with the help of variables, loops (for, while), and conditional statements (if else, case).	Write Shell scripts.			
4	Use of Shell variables, arguments to shell procedure, test command, arithmetic with EXPR command, interactive shell procedures with read.	Write shell scripts.	Lecture, Demonstration at system.	1431.1	
5	Programs illustrating use of System Call	Apply system calls as per requirement and write programs for executing system calls.	Lecture, Demonstration.	1431.1 1431.2	
6	Write Programs illustrating Process Creation, Inter-Process Communication, Zombie and Orphan Process.	Create process and implement Inter-Process Communication.	Lecture Demonstration.	1431.1 1431.2	Continuous Evaluation, End Term Examination.
7	Write Programs on Multithreading using Pthreads.	Apply concept of threading for parallel programming.	Lecture, Demonstration	1431.2	
8,9	Implementation CPU Scheduling Algorithms viz. FCFS, SJF, Priority and Round Robin	To compare various scheduling algorithms.	Demonstration	1431.3	
10	Implementation of Producer-Consumer Problem	Apply the concepts for solving producer-consumer problem.	Lecture, Demonstration	1431.4	
11	Implementation of Bankers Algorithm	To identify the state of deadlock, and write program for resolving the problem of deadlock.	Lecture, Demonstration	1431.4	Continuous Evaluation, Project evaluation,

12	Illustration of memory allocation strategies: First Fit, Best Fit, Next Fit and Worst Fit	Write programs to solve the problems related to memory management.	Lecture, Demonstration	1431.5	End Term Examination.
13	Illustration of Page Replacement Algorithms: FIFO, Optimal and LRU	Write programs to solve the problems Page Replacement.	Lecture, Demonstration	1431.5	Continuous Evaluation, Project evaluation, End Term Examination.
END TERM EXAMINATION 17 April 2020-24 April 2020					

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

CO	STATEMENT	Correlation with Program Outcomes **(POs)**												Correlation with Program Specific Outcomes (**PSOs**)			
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO4
[CS1431.1]	Explain basic Unix commands and write shell Scripts.	**3**	**1**	**1**	**1**	**2**				**2**	**1**		**1**	**3**			**1**
[CS1431.2]	Write system programs using file and process system calls and PThread API.	**2**	**1**	**1**	**1**					**2**	**1**		**1**		**1**		
[CS1431.3]	Compare various algorithms used for process scheduling.	**1**	**1**	**1**	**1**					**2**	**1**		**1**				
[CS1431.4]	Describe concepts related to concurrency and achieve the same for cooperating processes, Apply various deadlock handling strategies to solve resource allocation problems.	**2**	**2**	**1**	**1**					**2**	**1**		**1**			**2**	
[CS1431.5]	Evaluate the performance of different memory management techniques and page replacement algorithms.	**2**	**2**	**1**	**1**					**2**	**1**		**1**				

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

MANIPAL UNIVERSITY JAIPUR

SCHOOL OF COMPUTING & INFORMATION TECHNOLOGY

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
COURSE HAND-OUT

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

Session: Jan '20 – May '20 | Faculty: Dr. V. P. S. Dhaka, Dr. Arvind Dhaka, Mr. Satyabrata Roy | Class: B.Tech. 2nd Year IV Semester (Core Course)

A. Introduction:

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

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

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

C PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

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

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

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

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

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

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

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

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

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

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

Program Specific Outcomes (PSOs)

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

PSO1. Should be able to clearly understand the basic principles, concepts and applications in the field of computer based Communication/networking, information sharing, signal processing, web based systems, smart devices and communication technology.

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

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

PSO4. Should be able to apply the contextual knowledge in the field of computing and communication to assess social, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional engineering practice.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	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

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

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

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Department of Computer and Communication & Engineering

Course Hand-out

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

Session Jan 20 – May20 |Faculty: Vidyadhar Jinnappa Aski | B.Tech IV Semester | CCE Core

A. Introduction: This lab is offered by department of Computer and Communication Engineering as a core lab. The aim of this laboratory is to have a basic Realizing 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]: Realize & Apply basic instruction set of 8086 to write the assembly language programming and therefore develop employability skills.
[CS1433.3]: Analyze and Implement various instruction timing, delay loops, Procedures and Macros and therefore develop employability skills.
[CS1433.4]: Analyze and Implement various string instruction and Flag instructions.
[CS1433.5]: Comprehend the internal architecture and interfacing of different peripheral devices with 8086 microprocessor.

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 analyses complex engineering problems reaching substantiated conclusions using basic principles of mathematics, computing techniques and communication engineering principles.

[PO.3]. **Design/development of solutions**: Upon analyzing, the B Tech CCE graduate should be able to devise solutions for complex engineering problems and design system components or processes that meet the specified requirements with appropriate consideration for law, safety, cultural & societal obligations with environmental considerations.

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

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

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

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

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

[PO.9]. **Individual and team work**: United we grow, divided we fall is a culture at MUJ. Thus an outgoing student should be able to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

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

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

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

[PSO.1]. Should be able to clearly Realize the basic principles, concepts and applications in the field of computer based Communication/networking, information sharing, signal processing, web based systems, smart devices and communication technology.

[PSO.2]. Should be able to nail down the issues prevalent in the field of Computer and Communication Engineering.

[PSO.3]. Should be able to identify the existing open problems in the field of computing and propose the best possible solutions.

[PSO.4]. Should be able to apply the contextual knowledge in the field of computing and communication to assess social, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional engineering practice.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	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. REFERENCES

1. Douglas. V. Hall, "*Microprocessors and Interfacing*", TMH, Revised Second Edition 2006, ISBN-10: 0-07-060167-4. Reprint -2011.

G. Lab Plan

Lab No.	**Topics**	**Session Outcome**	**Mode of Delivery**	**Correspond ing 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	Realize 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.	Realize 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.	Realize 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.	Recognize 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.	Realize 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.	Realize 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.	Realize 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

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

CO	STATEMENT	Correlation with Program Outcomes (**POs**)												Correlation with Program Specific Outcomes (**PSOs**)			
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO4
[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]	Realize & Apply basic instruction set of 8086 to write the assembly language programming and therefore develop employability skills.	1	3	1							1			1	3		2
[CS1433.3]	Analyze and Implement various instruction timing, delay loops, Procedures and Macros and therefore develop employability skills.	3	1	3	2	1								1			3
[CS1433.4]	Analyze and Implement various string instruction and Flag instructions.	1									1		1	1			1
[CS1433.5]	Comprehend the internal architecture and interfacing of different peripheral devices with 8086 microprocessor.	1	1	2	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 & COMMUNICATION ENGINEERING

Course Hand-out

Engineering Mathematics-IV| MA 1406 | 3 Credits | 3 0 0 3

Session: Jan 20-May 20 | Faculty: Dr Kalpna Sharma| Class: B Tech IV SEM

A. **Introduction:** This course is offered by Dept. of Mathematics & Statistics as a regular course, targeting students who wish to pursue B.Tech., in Computer Science and Engineering, Computer and communication Engineering & Information Technology. It offers basic/introductory knowledge of Numerical methods, Fourier series, Fourier transforms, Probability, random variables, Laplace transforms and Stochastic Process. Students are expected to have background knowledge on Permutations and Combinations, and school level mathematics.

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

[MA1406.1]. Describe numerical methods and apply to find solutions of mathematical problems which enhance the problem-solving skills and make them employable.

[MA1406.2]. Describe the concept of Laplace Transform and its applications to find solutions of related problems.

[MA1406.3]. Describe the concept of Fourier series & Fourier Transform and their applications to find solutions of related problems.

[MA1406.4]. Describe the concept of probability theory & random process and their uses in the analysis of real-life problems.

[MA1406.5]. Describe the concept of probability distribution, Markov process & Queuing theory and their uses in related problems, which may enhance their skills to solve problems and make them employable.

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

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

[PO.2]. **Effective Communication:** Articulate ideas and perspectives, by developing and enhancing the communicative skills of listening, speaking, reading, and writing in interpersonal and interactive contexts, in print and in electronic media, for various audiences and purposes.

[PO.3]. **Social Interaction:** Develop competence in understanding, appreciating, and respecting social diversity derived from the representation of points-of-view in literary texts, thereby facilitating conflict resolution, and social harmony.

[PO.4]. **Effective Citizenship**: Inculcate values of patriotism and of unity, and transfer these values to real-life through selfless volunteering and activism, for promoting community welfare.

[PO.5]. **Ethics:** Recognise the diversity and complexity of ethical dilemmas in the real world, and educate oneself to base ones actions on responsibility, and respect for human rights.

[PO.6]. **Environment and Sustainability**: Study and understand Nature and the environment on the basis of important literary texts and researches, so as to initiate responsible individual and collective action, towards sustaining our shared environment.

[PO.7]. **Self-directed Life-long Learning:** Taking initiatives and challenges to choose learning opportunities and programmes, implementing learning goals, and sustaining intellectual growth and excellence in a constantly changing global scenario.

[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.

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[PSO.3]. Should be able to identify the existing open problems in the field of computing and propose the best possible solutions.

[PSO.4]. Should be able to apply the contextual knowledge in the field of computing and communication to assess social, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional engineering practice.

D. Assessment Plan:

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

E. SYLLABUS

Probability random variables, Moment generating functions, probability distributions: binomial, Poisson, normal, gamma and exponential distributions, F and t distributions, stochastic processes, Markov chain, Queuing Theory.

Laplace Transforms: Transforms of elementary functions, inverse transforms, convolution theorem. Application of Laplace transforms in the solution of differential equations, Fourier series, Fourier transforms and its applications.

Numerical Methods: Interpolation, Numerical differentiation, Numerical integration: Trapezoidal, Simpson's 1/3 and 3/8 Rule, Weddle Rule. Solution of system of linear algebraic equations: Gauss Jacobi, Gauss Seidel.

F. TEXT BOOKS

1. V. Sundarapandian, "Probabilty, Statistics and Queuing Theory", PHI, 2013.
2. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, Delhi, 2006
3. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley India Eastern, 2006

G. REFERENCE BOOKS

1. Srimanta Pal, Subhdh C. Bhunia, "Engineering Mathematics", Oxford University Press, 2015.
2. Babu Ram, "Engineering Mathematics", Vol. I & II, Pearson, 2012.
3. P. Kousalya, "Probability, Statistics and Random Processes", Pearson, 2013.
4. Richard A. Johnson and C.B. Gupta, "Probability and Statistics for Engineers", Pearson Education, 2009.
5. S. S. Sastry, "Introductory Methods of Numerical Analysis", PHI, 2005

H. Lecture Plan:

Class Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1	Numerical Methods: Introduction to numerical methods,	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture	CO1	Mid Term I, Quiz & End Term
2	Finite differences, Forward, Backward and Central finite differences,	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture	CO1	Mid Term I, Quiz & End Term
3	Relation among the difference operators	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture	CO1	Mid Term I, Quiz & End Term
4	Interpolation with equal intervals, Newton's Interpolation formula for forward differences,	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture	CO1	Mid Term I, Quiz & End Term
5	Newton's Interpolation formula for backward differences,	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture	CO1	Mid Term I, Quiz & End Term
6	Stirling's Interpolation formula for central difference, their Application	Identify, formulate, apply appropriate techniques, professional ethics,	Lecture	CO1	Mid Term I, Quiz & End Term

		Communicate effectively & life-long learning			
7	Numerical Differentiation - forward and backward formulas	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture	CO1	Mid Term I, Quiz & End Term
8	Numerical Differentiation - Central formula	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture	CO1	Mid Term I, Quiz & End Term
9	Tutorial	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture	CO1	Mid Term I, Quiz & End Term
10	Numerical Integration, Introduction, Trapezoidal rule,	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture	CO1	Mid Term I, Quiz & End Term
11	Simpson's 1/3 rule, Simpson's 3/8 rule,	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture	CO1	Mid Term I, Quiz & End Term
12	Weddle's rule.	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture	CO1	Mid Term I, Quiz & End Term
13	Solution of Algebraic equations by using Gauss's Jacobian	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture	CO1	Mid Term I, Quiz & End Term
14	Gauss's Seidel rule	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture	CO1	Mid Term I, Quiz & End Term
15	Tutorial	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture	CO1	Mid Term I, Quiz & End Term
FIRST SESSIONAL EXAM					
16	Laplace Transform: Introduction, Laplace Transform of some Elementary functions	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture	CO2	Mid Term II, Quiz & End Term
17	Properties of the Laplace Transform,	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture	CO2	Mid Term II, Quiz & End Term

18	their applications in Numerical Problems,	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture	CO2	Mid Term II, Quiz & End Term
19	Differentiation, Integration Formulae and related problems	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture	CO2	Mid Term II, Quiz & End Term
20	Inverse Laplace Transform, their Properties,	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture	CO2	Mid Term II, Quiz & End Term
21	Convolution Theorem,	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture	CO2	Mid Term II, Quiz & End Term
22	Numerical Problems	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture	CO2	Mid Term II, Quiz & End Term
23	Solution of Differential equation by using the Laplace Transform	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture	CO2	Mid Term II, Quiz & End Term
24	Fourier Transforms and Applications	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture	CO3	Mid Term II, Quiz & End Term
25	Tutorial	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture	CO3	Mid Term II, Quiz & End Term
26	Fourier Series	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture	CO3	Mid Term II, Quiz & End Term
27	Tutorial	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture	CO3	Mid Term II, Quiz & End Term
28	Probability, Addition Law, Multiplication Law,	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture	CO4	Mid Term II, Quiz & End Term
29	Conditional Probability and related problems	Identify, formulate, apply appropriate techniques, professional ethics,	Lecture	CO4	Mid Term II, Quiz & End Term

		Communicate effectively & life-long learning			
30	Bayes' Theorem, related problems,	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture	CO4	Mid Term II, Quiz & End Term
31	Random Variables, Mathematical Expectation,	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture	CO5	Mid Term II, Quiz & End Term
32	Moments, Moment Generating Function	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture	CO5	Mid Term II, Quiz & End Term
33	Probability distribution, Binomial distribution	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture	CO5	Mid Term II, Quiz & End Term
34	Poisson's distribution,	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture	CO5	Mid Term II, Quiz & End Term
SECOND SESSIONAL EXAM					
35	gamma and exponential distributions	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture	CO5	End Term, Quiz & End Term
36	Normal Distribution	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture	CO5	End Term, Quiz & End Term
37	Tutorial	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture	CO5	End Term, Quiz & End Term
38	Stochastic processes,	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture	CO5	End Term, Quiz & End Term
39	Markov chain	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture	CO5	End Term, Quiz & End Term
40	Queuing theory,	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture	CO5	End Term, Quiz & End Term

41	study of two Models	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture	CO5	End Term, Quiz & End Term
42	f-distribution, related problems	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture	CO5	End Term, Quiz & End Term
43	t-distribution,	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture	CO5	End Term, Quiz & End Term
44	Tutorial	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture	CO5	End Term, Quiz & End Term
END TERM EXAM					

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

CO	STATEMENT	Correlation with Program Outcomes **(POs)**												Correlation with Program Specific Outcomes (**PSOs**)		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	**PSO 1**	**PSO 2**	**PSO 3**
[MA1406.1]	Describe numerical methods and apply to find solutions of mathematical problems which enhance the problem-solving skills and make them employable.	**3**	**3**	**3**	**3**	**2**	**2**		**1**			**1**	**2**	**3**	**3**	**2**
[MA1406.2]	Describe the concept of Laplace Transform and its applications to find solutions of related problems.	**2**	**3**	**2**	**2**								**2**	**2**	**1**	**1**
[MA1406.3]	Describe the concept of Fourier series & Fourier Transform and their applications to find solutions of related problems.	**2**	**3**	**2**	**2**								**2**	**2**	**1**	**1**
[MA1406.4]	Describe the concept of probability theory & random process and their uses in the analysis of real-life problems.	**3**	**3**	**3**	**2**	**2**						**1**	**2**	**2**	**3**	**2**
[MA1406.5]	Describe the concept of probability distribution, Markov process & Queuing theory and their uses in related problems, which may enhance their skills to solve problems and make them employable.	**3**	**3**	**2**	**2**	**2**						**1**	**2**	**3**	**3**	**3**

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

MANIPAL UNIVERSITY JAIPUR

School of COMPUTING & INFORMATION TECHNOLOGY

DEPARTMENT OF COMPUTER AND COMMUNICATION ENGG

Course Hand-out

Economics | HS1401 | 3 Credits | 3 0 0 3

Session: Jan 20-Dec 20 | Faculty: Dr. Manas Roy | Class IV SEM

A. **Introduction:** This course is offered by Dept. of Economics to the Engineering departments, targeting students to give basic understanding in the concept of economics. It mainly deals with economic issues related to consumer behaviour, firms, industries and business organizations to make aware the students regarding economic environment. This course also discusses the preliminary concepts associated with macroeconomic variable like GDP inflation, balance of payments etc. It explores various possibilities emerging in an economy and the role of economic policy in this context.

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

[HS 1401.1] Describe the basic principles of micro and macroeconomic analysis.

[HS 1401.2] Interpret and illustrate decision making process in practical life.

[HS 1401.3] Aware of the tools and techniques of economics for real world.

[HS 1401.4] Recognize the problems and give solutions to it

[HS 1401.5] Recall the assumptions that underpin the Micro/Macro model.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

[PO.3]. **Design/development of solutions:** Upon analysing, the B Tech CCE graduate should be able to devise solutions for complex engineering problems and design system components or processes that meet the specified requirements with appropriate consideration for law, safety, cultural & societal obligations with environmental considerations.

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

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

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

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

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

[PO.9]. Individual and team work: United we grow, divided we fall is a culture at MUJ. Thus an outgoing student should be able to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

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

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

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

[**PSO.1]** Should be able to clearly understand the basic principles, concepts and applications in the field of computer based Communication/networking, information sharing, signal processing, web based systems, smart devices and communication technology.

[PSO.2] Should be able to nail down the issues prevalent in the field of Computer and Communication Engineering.

[PSO.3 should be able to identify the existing open problems in the field of computing and propose the best possible solutions.

[PSO.4] Should be able to apply the contextual knowledge in the field of computing and communication to assess social, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional engineering practice.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	15
	Sessional Exam II (Closed Book)	15
	Video Assignment & Presentation	30
End Term Exam (Summative)	End Term Exam (Closed Book)	40
	Total	100
Attendance	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

Definition, nature and scope of economics; Introduction to micro and macroeconomics; law of demand and supply; elasticity of demand and supply; cardinal and ordinal approaches of utility; production, laws of production; cost and revenue analysis; various market situations; Break even analysis; Capital budgeting Macro Economics: National income and its concepts, value of money and its changes; foreign exchange rate; monetary and fiscal policies and other macro concepts (Balance of payments, Business cycles etc.)

F. REFERENCE BOOKS

1. P. Samuelson and Nordhaus, Economics, 19th Edition, Tata McGraw-Hill, 2008.
2. Dornbusch, Fischer and Startz, Macroeconomics, McGraw Hill, 2010
3. H C Peterson, Managerial economics, Pearson, 9th Edition, 2012
4. Lipsey & Chrystal, Economics, Oxford University Press, 2011.
5. Richard T. Froyen, Macroeconomics, Pearson Education Asia, 2005.

G. Lecture Plan:

Lec No	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1	Overview of the course structure	To acquaint and clear the overview of the course	Lecture	NA	NA
2	Objective of the course	Discussion of the objective of the course for the engineers	Lecture	NA	NA
3,4	Definition, nature and scope of economics, introduction to micro and macroeconomics	Describe the concept given by different economists, its scope, differences between micro and macro economics	Lecture	1401.1	Class Test Mid Term I
5,6,7,	Cardinal approaches of utility	Describe the concept of cardinal approach of utility, Law of DMU and equi marginal utility	Lecture	1401.1	Class Test Mid Term I
8,9,10,11	Law of demand and supply, elasticity of demand and supply	Describe the concept of demand, supply, elasticity of demand and supply with examples, conceptual questions	Lecture	1401.1	Class Test Mid Term I
12	Revision of previous lectures	Recall all the concepts discussed in previous classes	Lecture	1401.5	Class Test Mid Term I End Term
13	Discussion of the topics related to assignment	Discussion about the assignment topics	Lecture, Activity		Home Assignment Mid Term I End term
14,15,16	Ordinal approaches of utility	Recall of the differences between the concept of the cardinal approach and ordinal approach of utility , IC analysis, Consumers equilibrium, IE,SE,PE	Lecture	1401.5	Class Test Mid Term I End Term
I MTE					
17,18,19	Production, laws of production	Discussion of the concept of production, recognize production function, producers equilibrium, RTS	Lecture	1401.4	Class Test Mid Term II End Term
20,21	Cost and revenue analysis	Discussion of the concept of cost and cost function, recognize SR and LR cost curves, revenues	Lecture	1401.4	Class Test Mid Term II End Term
22,23	Various market situations; Break even analysis	Aware of market morphology with examples, Interpret and illustrate BEA	Lecture	1401.3	Class Test Mid Term II End Term

24	Revision of previous lectures	Recall all the concepts discussed in previous classes	Lecture	1401.5	Class Test Mid Term II End Term
25	Discussion of the topics related to assignment	Recall the discussion about the assignment topics	Lecture, Activity	1401.5	Home Assignment Mid Term II End term
26	Capital budgeting	Interpret and illustrate the concept of CB and various tools	Lecture	1401.2	Home Assignment Class Test End Term
27,28	Macro Economics: National income and its concepts	Interpret and illustrate the concept of NI,GDP,GNI,PI etc., circular flow	Lecture	1401.2	Home Assignment Class Test End Term
II MTE					
31,32,33	Monetary and fiscal policies	Concept of monetary and fiscal policies, Aware of its instruments, importance and limitations	Lecture	1401.3	Home Assignment Class Test End Term
34,35	Inflation	Concept of inflation, Aware of demand pull and cost push inflation	Lecture	1401.3	Home Assignment Class Test End Term
36,37	Various macro concepts: Balance of payments, Business cycles	Aware of the concept of BOP, Business cycles	Lecture	1401.3	Home Assignment Class Test End Term
38	Discussion of the topics related to end sessional examination	Recall the discussion about the assignment topics	Lecture	1401.5	End Term
39	Conclusion and Course Summarization	Recall all the concepts discussed in previous classes	Lecture	1401.5	End Term
END SEM EXAMINATION					

H. Course Articulation Matrix: (Mapping of COs with POs & 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
HS 1401.1	Describe the basic principles of micro and macroeconomic analysis									**1**		**2**	**2**			**1**	
HS 1401.2	Interpret and illustrate decision making process in practical life						**1**			**2**			**2**				**1**
HS 1401.3	Aware of the tools and techniques of economics for real world									**2**		**2**	**2**				
HS 1401.4	Recognize the problems and give solutions to it									**2**		**2**	**2**			**2**	**2**
HS 1401.5	Recall the assumptions that underpin the Micro/Macro model.									**2**			**3**			**1**	

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

DEPARTMENT OF COMPUTER AND COMMUNICATION ENGINEERING

Course Hand-out

Design and Analysis of Algorithms | CS1501| 4 Credits | 4 0 0 3

Session: July 19 – Nov 19 | Dr. Manoj Kumar Sharma & Dr. Geeta | Class: V CCE

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.

B. Course Outcomes: At the end of the course, students 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 Program Specific Outcomes.

[PSO.1] Should be able to clearly understand the basic principles, concepts and applications in the field of computer based Communication/networking, information sharing, signal processing, web based systems, smart devices and communication technology.

[PSO.2] Should be able to nail down the issues prevalent in the field of Computer and Communication Engineering.

[PSO.3] Should be able to identify the existing open problems in the field of computing and propose the best possible solutions.

[PSO.4] Should be able to apply the contextual knowledge in the field of computing and communication to assess social, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional engineering practice.

D. Assessment Plan:

<table>
<tr><th>Criteria</th><th>Description</th><th>Date</th><th>Maximum Marks</th></tr>
<tr><td rowspan="3">Internal Assessment
(Summative)</td><td>Sessional Exam I (Closed Book)</td><td>Sept 10 – Sept 12</td><td>15</td></tr>
<tr><td>Sessional Exam II (Closed Book)</td><td>Oct 25 – Oct 27</td><td>15</td></tr>
<tr><td>Quizzes and Assignments
(Accumulated and Averaged)</td><td>Regularly</td><td>30</td></tr>
<tr><td>End Term Exam
(Summative)</td><td>End Term Exam (Closed Book)</td><td>Nov 28 – Dec 12</td><td>40</td></tr>
<tr><td></td><td>Total</td><td></td><td>100</td></tr>
<tr><td>Attendance
(Formative)</td><td colspan="3">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.</td></tr>
<tr><td>Make up Assignments
(Formative)</td><td colspan="3">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.</td></tr>
<tr><td>Homework/ Home Assignment/ Activity Assignment
(Formative)</td><td colspan="3">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.</td></tr>
</table>

E. SYLLABUS:

Algorithm Analysis: A priori and a posteriori Analysis, Time Space Tradeoff, Asymptotic Notations, Properties of asymptotic notations, Recurrence equations, Solving recurrence equations using Substitution method and Master's method; **Trees: B-Tree Red Black Tree; Divide and Conquer:** Binary Search, Finding Maximum and Minimum, Merge Sort, Quick Sort, Matrix Multiplication; **Greedy Algorithms:** Knapsack Problem, Job Sequencing with deadline, Optimal Merge Pattern, Single Source Shortest Path, Minimum Cost Spanning tree; **Dynamic Programming:** Multistage Graphs, Matrix Chain Multiplication, All-Pair shortest paths, Optimal binary search trees, 0/1 Knapsack, Travelling salesperson problem, Graph Traversals, Connected Components, Spanning Trees, Bi-connected components; **Complexity Classes**: Introduction to NP-Hard and NP-Completeness; **Approximation Algorithm**, **Randomized Algorithm.**

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

F. REFERENCE BOOKS:

1. E. Horowitz, S. Sahni and S. Rajasekaran, *"Computer Algorithms"*, 2nd Edition, University Press, 2007.
2. T. H. Cormen, C. E. Leiserson, R.L.Rivest, and C. Stein, "*Introduction to Algorithms*", 3rd Edition, MIT press, 2009.
3. 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:

Class Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1.	Introduction to Algorithms, Specification of Algorithm, Complexity	Analyse growth of function	Lecture/ Group Discussion	CS1501.1	Quiz 1 and Sessional-I and End-Sem
2.	Asymptotic Notation- Analysis of Algorithm,	Analyse running times of algorithms using asymptotic analysis	Lecture/ Group Discussion	CS1501.1	Quiz 1 and Sessional-I and End-Sem
3.	Time & Space Complexity – Hands-on	Analyse running times of algorithms using asymptotic analysis	Lecture/ Group Discussion	CS1501.1	Quiz 1 and Sessional I and End-Sem
4.	Insertion Sort and Analysis, QA-Discussions	Analyse running times of algorithms using asymptotic analysis	Lecture/ Group Discussion	CS1501.1	Quiz 1 and Sessional-I and End-Sem
5.	Selection Sort and Bubble Sort Analysis, QA-Discussions	Analyse running times of algorithms using asymptotic analysis	Lecture/ Group Discussion	CS1501.1	Quiz 1 and Sessional-I and End-Sem
6.	Divide and Conquer: Merge Sort and Analysis, QA-Discussions	Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it	Lecture/ Group Discussion	CS1501.2	Quiz 1 and Sessional-I and End-Sem
7.	Quick Sort and Analysis,	Analyse algorithm using Recurrence relation	Lecture/ Group Discussion	CS1501.2	Quiz 1 and Sessional-I and End-Sem
8.	Master Theorem and its cases	Analyse algorithm using Recurrence relation	Lecture/ Group Discussion	CS1501.2	Quiz 2 and Sessional-I and End-Sem
9.	Randomized Quick sort Analysis	Analyse algorithm using Recurrence relation	Lecture/ Group Discussion	CS1501.2	Quiz 2 and Sessional-I and End-Sem
10.	Heap Sort - Insertion, Deletion – Analysis	Analyse algorithm using Recurrence relation	Lecture/ Group Discussion	CS1501.2	Quiz 2 and Sessional-I and End-Sem
11.	Heap Sort- Priority Queue	Analyse algorithm using Recurrence relation	Lecture/ Group Discussion	CS1501.2	Quiz 2 and Sessional-I and End-Sem
12.	Heap - Insertion, Deletion – Analysis	Analyse algorithm using Recurrence relation	Lecture/ Group Discussion	CS1501.2	Quiz 2 and Sessional-I and End-Sem
13.	Strassen's Matrix Multiplication	Adaptation of different matrix multiplication strategies	Lecture	CS1501.2	Quiz 2 and Sessional-I and End-Sem
14.	Greedy Paradigm - Introduction, Coin Change Problem	Synthesize efficient greedy algorithms in common engineering design situations	Lecture	CS1501.4	Quiz 3 and Sessional-I and End-Sem

15.	Job Sequencing with deadline, Interval Scheduling Problem (Given as Assignment)	Synthesize efficient greedy algorithms in common engineering design situations	Lecture	CS1501.4	Quiz 3 and Sessional-I and End-Sem
16.	Knapsack-problem,	Synthesize efficient greedy algorithms in common engineering design situations	Lecture	CS1501.4	Quiz 3 and Sessional-I and End-Sem
17.	Optimal Merge tape, Huffman Encoding	Synthesize efficient greedy algorithms in common engineering design situations	Lecture/ Group Discussion	CS1501.4	Quiz 3 and Sessional-I and End-Sem
18.	Spanning Trees - MST	Synthesize efficient greedy algorithms in common engineering design situations	Lecture	CS1501.4	Quiz 3 and Sessional-1 and End-Sem
FIRST SESSIONAL EXAM From 05-09-2019 to 09-09-2019					
19.	Prim's, Algorithm	Design and Analyze different path finding strategies	Lecture	CS1501.4	Quiz 3 and Sessional-2 and End-Sem
20.	Kruskal's Algorithm	Design and Analyze different path finding strategies	Lecture	CS1501.4	Quiz 3 and Sessional-2 and End-Sem
21.	Dijkstra's Algorithm-SSSP	Design and Analyze different path finding strategies	Lecture	CS1501.4	Quiz 3 and Sessional-2 and End-Sem
22.	Graph Search Algorithm - BFS/ DFS	Design and Analyze different path finding strategies	Lecture	CS1501.4	Quiz 4 and Sessional-2 and End-Sem
23.	Topological Sort,	Design and Analyze different path finding strategies	Lecture/ Group Discussion	CS1501.4	Quiz 4 and Sessional-2 and End-Sem
24.	Bellman Ford Algorithm	Design and Analyze different path finding strategies	Lecture/ Group Discussion	CS1501.4	Quiz 4 and Sessional-2 and End-Sem
25.	Connected Components, Bi-connected Components	Synthesize efficient greedy algorithms in common engineering design situations	Lecture/ Group Discussion	CS1501.4	Quiz 4 and Sessional-2 and End-Sem
26.	Introduction to Dynamic Programming-	Design and analysis of dynamic-programming algorithms	Lecture/ Group Discussion	CS1501.3	Quiz 5 and Sessional-2 and End-Sem
27.	Top Down Fibonacci, Binomial Coefficient	Design and analysis of dynamic-programming algorithms	Lecture/ Group Discussion	CS1501.3	Quiz 5 and Sessional-2 and End-Sem
28.	Bottom up Binomial Coefficient, Dynamic Knapsack,	Design and analysis of dynamic-programming algorithms	Lecture/ Group Discussion	CS1501.3	Quiz 5 and Sessional-2 and End-Sem
29.	Longest Integer Sequence, Longest Common Subsequence	Design and analysis of dynamic-programming algorithms	Lecture/ Group Discussion	CS1501.3	Quiz 5 and Sessional-2 and End-Sem

30.	Multi-Stage Graph	Design and analysis of dynamic-programming algorithms	Lecture/ Group Discussion	CS1501.3	Quiz 5 and Sessional-2 and End-Sem
31.	Floyd Warshal Algorithm – All pair of shortest path	Design and analysis of dynamic-programming algorithms	Lecture/ Group Discussion	CS1501.3	Quiz 5 and Sessional-2 and End-Sem
32.	Matrix Chain Multiplication	Design and analysis of dynamic-programming algorithms	Lecture/ Group Discussion	CS1501.3	Quiz 6 and Sessional-2 and End-Sem
33.	TSP- DP method	Design and analysis of dynamic-programming algorithms	Lecture/ Group Discussion	CS1501.3	Quiz 6 and Sessional-2 and End-Sem
34.	OBST-Optimal Binary Search Tree	Design and analysis of dynamic-programming algorithms	Lecture/ Group Discussion	CS1501.3	Quiz 6 and Sessional-2 and End-Sem
35.	Backtracking Intro – Problems	Design and analysis of dynamic-programming algorithms	Lecture/ Group Discussion	CS1501.3	Quiz 6 and Sessional-2 and End-Sem
36.	Graph Coloring, M-Graph Coloring	Synthesize new graph algorithms and algorithms that employ graph computations as key components,	Lecture/ Group Discussion	CS1501.5	Quiz 6 and Sessional-2 and End-Sem
SECOND SESSIONAL EXAM From 04-11-2019 to 06-11-2019					
37.	Sum of Subset Problem	Synthesize new graph algorithms and algorithms that employ graph computations as key components,	Lecture/ Group Discussion	CS1501.5	Quiz 6 and End-Sem
38.	N-Queen Problem	Synthesize new graph algorithms and algorithms that employ graph computations as key components,	Lecture/ Group Discussion	CS1501.5	Quiz 6 and End-Sem
39.	Sudoku Game - Design & Implementation (Given as an assignment)	Synthesize new graph algorithms and algorithms that employ graph computations as key components,	Lecture/ Group Discussion	CS1501.5	Quiz 6 and End-Sem
40.	Branch & Bound – Knapsack	Synthesize new graph algorithms and algorithms that employ graph computations as key components,	Lecture/ Group Discussion	CS1501.5	Quiz 6 and End-Sem
41.	Branch & Bound - Job Assignment	Synthesize new graph algorithms and algorithms that employ graph computations as key components,	Lecture/ Group Discussion	CS1501.5	End-Sem
42.	15 Puzzle Problem (Given as an assignment)	Synthesize new graph algorithms and algorithms that employ graph computations as key components,	Lecture/ Group Discussion	CS1501.5	End-Sem
43.	Branch & Bound – TSP	Synthesize new graph algorithms and algorithms that employ graph computations as key components,	Lecture/ Group Discussion	CS1501.5	End-Sem

44.	String Matching – Meaning and Application	Synthesize new graph algorithms and algorithms that employ graph computations as key components,	Lecture/ Group Discussion	CS1501.5	End-Sem
45.	Naïve String Matching, Rabin Karp Algorithm	Synthesize new graph algorithms and algorithms that employ graph computations as key components,	Lecture/ Group Discussion	CS1501.5	End-Sem
46.	Knuth-Morris-Pratt (KMP) Algorithm	Synthesize new graph algorithms and algorithms that employ graph computations as key components,	Lecture/ Group Discussion	CS1501.5	End-Sem
47.	Randomization & Approximation Algorithm	Synthesize new graph algorithms and algorithms that employ graph computations as key components,	Lecture/ Group Discussion	CS1501.5	End-Sem
48.	Randomization & Approximation Algorithm	Synthesize new graph algorithms and algorithms that employ graph computations as key components,	Lecture/ Group Discussion	CS1501.5	End-Sem
END TERM EXAM From 29-11-2019 to 13-12-2019					

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

CO	STATEMENT	Correlation with Program Outcomes **(POs)**										Correlation with Program Specific Outcomes (**PSOs**)					
		PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CS1501.1	Analyze worst-case running times of algorithms using asymptotic analysis.		3		2				2					3			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	3
CS1501.3	Design dynamic-programming algorithms, and analyse them to enhance entrepreneurship skills.				2	2								2	1	3	2
CS1501.4	Synthesize efficient greedy algorithms in common engineering design situations to enhance employment skills.						2		2	3				3	2		3
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	3

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

MANIPAL UNIVERSITY JAIPUR

School of Computing & Information Technology

DEPARTMENT OF COMPUTER & COMMUNICATION ENGINEERING

Course Hand-out

Cryptography and Security| CC1501| 4 Credits | 3 1 0 4

Session: Jul 20-Nov 20 | Faculty: Dr. Arjun Singh and Dr. Manjit Kaur| Class: V SEM

A. Introduction: This course is offered by the Department of computer and communication engineering to familiarize students with cryptography and concepts of security and its importance. The course gives clear idea of different Symmetric/Asymmetric algorithms. It also discusses the application and need of cryptography in the field of computation. The course gives a brief introduction and helps to identify the direction and the current trends of the subjects in real time applications.

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

[CC1501.1] Explain the basic concept of Cryptography & Security with importance on mathematical background of number theory with its usage in the field of computing

[CC1501.2] Identify the usage of tools in performing and understanding the security attacks.

[CC1501.3] Identifying and acquiring appropriate skills to solve real time problems in real world.

[CC1501.4] Perform experiments to analyze the performance and applicability of learned cryptographic algorithms

[CC1101.5] Identify the research trends and also to propose their own design for different security issues to have safer environment for computation in order to acquire more employability options.

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

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

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

[PSO.1]. Should be able to clearly understand the basic principles, concepts and applications in the field of computer based Communication/networking, information sharing, signal processing, web based systems, smart devices and communication technology.

[PSO.2]. Should be able to nail down the issues prevalent in the field of Computer and Communication Engineering.

[PSO.3]. Should be able to identify the existing open problems in the field of computing and propose the best possible solutions.

[PSO.4]. Should be able to apply the contextual knowledge in the field of computing and communication to assess social, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional engineering practice.

D. Assessment Plan:

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

E. SYLLABUS

Introduction: Number theory and finite fields, Shannon ciphers and perfect security, computational ciphers and semantic security: Computer Security Concepts: the OSI security architecture, security attacks, security services and mechanisms; Block Cipher: DES, triple-DES; Block Cipher AES: AES structure, AES transformation functions, AES key expansions, AES implementation; electronic codebook mode, cipher block chaining mode, cipher feedback mode, output feedback mode, counter mode; Pseudorandom Number Generation: Principles of pseudorandom number generation, pseudorandom number generators, pseudorandom number generation using block ciphers and stream ciphers, stream ciphers, cryptographic hash functions, message authentication codes, digital signatures; Public-Key Cryptography: Components of public-key cryptography, RSA algorithm, Diffee-Hellman key exchange, ElGamal cryptographic system, Elliptic curve arithmetic, Elliptic curve cryptography, pseudorandom number generation based on a public-key cryptosystem; Operating Systems. Security capabilities of different platforms, Identification and authentication. Passwords, choosing, managing, and spoofing attacks. User accounts, file permissions, backups, Access Control and Firewalls, ownership, Assessing and Securing a system , Information Warfare, Security Administration, Insider Threat; Corporate Espionage

F. REFERENCE BOOKS

1. W. Stallings, "Cryptography and Network Security, Principles and Practices", 6th Edition, Pearson Education, 2013.
2. B. A. Forouzan, "Cryptography and Network Security", 3rd Edition, McGraw Hill, 2015.
3. R2. Pieprzyk, T. Hardjono, J. Seberry, "Fundamentals of Computer Security", springer- Verlag Berlin Heidelberg, 2013.
4. R3. C. P. Pfleeger, "Security in Computing", 4th Edition, Prentice Hall, 2014.

G. Lecture Plan:

Class Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1-2	Introduction and Course Hand-out briefing	To acquaint and clear teachers expectations and understand student expectations	Lecture	NA	NA
1-5	Introduction to Security & Cryptography: Need for Computer, Security, Basic concepts, Security Attributes, security attacks, Security services and mechanisms.	Identifying the Security attribute and its importance	Lecture	CC1501.1	Class Quiz Mid Term1
6-12	Cryptography: Introduction, Symmetric ciphers, Symmetric Key, cryptography, Different types of Encryption	Identify different classical encryption technique with their drawbacks	Lecture Gaming activity	CC 1501.1 CC 1501.2	Class Quiz End Term Mid Term1 Project Video Assignment
13-20	Block Cipher: S-DES, DES, its rounds, strength of DES, triple DES; Modes: Electronic codebook mode, cipher block chaining mode, cipher feedback mode, output feedback mode, counter mode; Finite fields	Working and basics of modern encryption techniques and modes of Encryption	Lecture	CC 1501.3 CC 1501.4	End Term Mid Term I Sessional Project.
21-25	Block Cipher AES: AES structure, AES transformation functions, AES key expansions, AES implementation;	Advance encryption scheme and its working and applications	Lecture	CC1501.3, CC1501.4 CC1501.5, CC1501.1	Class Quiz Mid Term I End Term
FIRST SESSIONAL EXAM					
26-30	Pseudorandom Number Generation: Principles of pseudorandom number generation, pseudorandom number generators, pseudorandom number generation using block ciphers and stream cipher	Importance of Pseudo Random Numbers and its application	Lecture	CC1501.5, CC1501.1	Class Quiz Mid Term II End Term Project
31-37	Basics of Number theory, Public-key cryptography,	Working of modern Cryptographic algorithms	Lecture	CC1501.3 CC1501.4	Class Quiz Mid Term

	RSA, its implementation, El Gamal cryptographic system, Elliptic curve arithmetic, Elliptic curve cryptography			CC1501.5	II End term Project
38-43	Key Management, Diffee-Hellman key exchange, Certification Authority, Digital Certificate.	Key exchange relevance and its application	Lecture	CC1501.3 CC1501.4	Class Quiz Mid Term II End Term Project
SECOND SESSIONAL EXAM					
44-48	Basics of Hash, MAC, working of it, Digital signature and authentication protocols	Working of Hash, Mac	Activity (Think Pair Share)	CC1501.3 CC1501.1	Class Quiz End Term
48-52	Security Attacks :Different types of attack and its existing Solutions	Possible attacks and its solution	Activity (Think Pair Share)	CC1501.2, CC1501.5 CC1501.1	Class Quiz, End Term
52-56	Operating Systems. Security capabilities of different platforms, Identification and authentication. Passwords, choosing, managing, spoofing attacks. User accounts, file permissions, backups, Access Control and Firewalls.	Operating system attacks	Self-study	CC1501.1, CC1501.2 CC1501.4 CC1501.5	Class Quiz, End Term
END TERM EXAM					

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

CO	STATEMENT	Correlation with Program Outcomes **(POs)**												Correlation with Program Specific Outcomes (**PSOs**)			
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO4
[CC1501.1]	Explain the basic concept of Cryptography & Security with importance on mathematical background of number theory with its usage in the field of computing	2						1			1		2	2		1	1
[CC1501.2]	Identify the usage of tools in performing and understanding the security attacks	1	2		1	3		1		1		1	1	1	1	1	1
[CC1501.3]	Identifying and acquiring appropriate skills to solve real time problems in real world		2					2	1	1	1	1	1		2	2	1
[CC1501.4]	Perform experiments to analyse the performance and applicability of learned cryptographic algorithms		1	2	3			1	1	1		1	1		2	2	2
[CC1501.5]	Identify the research trends and also to propose their own design for different security issues to have safer environment for computation in order to acquire more employability options.		1	1	1		2	2	1	1		1				2	2

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

DEPARTMENT OF COMPUTER AND COMMUNICATION ENGG.

Course Hand-out

Formal Language and Automata Theory | CC 1502| 4 Credits | 3 1 0 4

Session: Jul 19-Dec 19 | Faculty: Dr. Deepak Sinwar and Mr. Satyabrata Roy| Class: B. Tech V SEM

A. Introduction: This course is offered by Dept. of Computer and Communication Engineering as a core course, targeting students who wish to pursue research & development or higher studies in field of theory of computation. Automata Theory is an exciting, theoretical branch of computer and communication engineering. It established its roots during the 20th Century, as mathematicians began developing - both theoretically and literally - machines which imitated certain features of man, completing calculations more quickly and reliably. The word automaton itself, closely related to the word "automation", denotes automatic processes carrying out the production of specific processes. Simply stated, automata theory deals with the logic of computation with respect to simple machines, referred to as automata. Through automata, computer scientists are able to understand how machines compute functions and solve problems and more importantly, what it means for a function to be defined as computable or for a question to be described as decidable.

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

[CC 1502.1] Develop abstract models such as finite automata, finite automata with outputs, pushdown automata, linear bounded automata and Turing machines based on any problem specified in formal language.

[CC 1502.2] Compare the characteristics of different types of formal languages and grammars as mentioned in Chomsky Hierarchy.

[CC 1502.3] Determine the type of computational problems and examine the decidability of them by constructing Turing machines.

[CC 1502.4] Propose an optimal abstract model as well as developing skills which can be applied to a suitable real life problem.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

[PO.3]. **Design/development of solutions**: Upon analysing, the B Tech CCE graduate should be able to devise solutions for complex engineering problems and design system components or processes that meet the specified requirements with appropriate consideration for law, safety, cultural & societal obligations with environmental considerations.

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

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

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

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

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

[PO.9]. Individual and team work: United we grow, divided we fall is a culture at MUJ. Thus an outgoing student should be able to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

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

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

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

[PSO.1]. Should be able to clearly understand the basic principles, concepts and applications in the field of computer based Communication/networking, information sharing, signal processing, web based systems, smart devices and communication technology.

[PSO.2]. Should be able to nail down the issues prevalent in the field of Computer and Communication Engineering.

[PSO.3]. Should be able to identify the existing open problems in the field of computing and propose the best possible solutions.

[PSO.4]. Should be able to apply the contextual knowledge in the field of computing and communication to assess social, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional engineering practice.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	15
	Sessional Exam II (Closed Book)	15
	In class Quizzes (Accumulated and Averaged)	10
	Assignments, Activity feedbacks	15
	Video assignment	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 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

Mathematical Preliminaries and Notation: Three basic concepts, Some Applications, Deterministic Finite Accepters, Nondeterministic Finite Accepters, Equivalence of Deterministic and Nondeterministic Finite Accepters, Reduction of the Number of States in Finite Automata, Regular Expressions, Identifying Non-regular Languages; Context-Free grammars: Parsing and Ambiguity, Context-Free Grammars and Programming Languages, Methods for Transforming Grammars, Two important Normal Forms, Nondeterministic Pushdown Automata, Pushdown Automata and Context–Free Languages, Deterministic Pushdown Automata and Deterministic Context-Free Languages; The Standard Turing Machine: Linear Bounded Automata, Recursive and Recursively Enumerable Languages, Unrestricted Grammars, Context Sensitive grammars and Languages, The Chomsky Hierarchy.

REFERENCE BOOKS

1. An Introduction to Formal Languages and Automata – Peter Linz, Jones and Bartlett Student Edition, Fifth Edition, 2010.
2. Introduction to Automata Theory, Languages and Computations - J. E. Hopcroft, R. Motwani, J. Ullman, Pearson Education, Third Edition, 2006.
3. Introduction to the Theory of Computation – Michael Sipser, Cengage Learning, Third Edition, 2012.
4. Introduction to Languages and the Theory of Computation – John Martin, Tata McGraw Hill, Fourth Edition, 2010.
5. Formal Language and Automata Theory – C. K. Nagpal, Oxford University Press, Sixth Impression, 2013.

G. Lecture Plan:

Class Number	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	Mathematical Preliminaries and Notation	Understand basics of set theory, groups, relations, functions.	Lecture	1502.1	In Class Quiz Mid Term I End Term
3	Three Basic Concepts (Languages, Grammars and Automata)	Understand basics of Automata Theory i.e., languages, grammars etc.	Lecture	1502.1	In Class Quiz Mid Term I End Term
4	Some Applications	Understanding the applications of Automata	Lecture	1502.1	In Class Quiz Mid Term I End Term
5-6	Deterministic Finite Automata/ Accepters (DFA)	Introduction to DFA and its designing	Lecture, Practice questions	1502.1	Home Assignment Mid Term I End Term
7	Nondeterministic Finite Accepters (NFA)	Construction of NFA using different approaches for different type of problems	Lecture, Practice questions	1502.1	In Class Quiz Home Assignment Mid Term I End Term
8-9	Equivalence of DFA and NFA	Understanding the basic difference between DFA and NFA and realising the importance of NFA	Lecture, Practice questions	1502.1	In Class Quiz Home Assignment Mid Term I End Term
10	Reduction of the number of states in Finite Automata	Understanding the algorithm for minimizing the DFA	Lecture, Practice questions	1502.1	In Class Quiz Home Assignment Mid Term I

					End Term
11-12	FA with output: Mealy and Moore machine	Understand the design principles of Mealy and Moore machines	Lecture, Practice questions	1502.1	In Class Quiz Home Assignment Mid Term I End Term
13	Equivalence between Mealy machine and Moore machine	Compare Mealy machines with Moore machines and understand the algorithm to convert Mealy machine into Moore machine and vice-versa.	Lecture, Flipped class room	1502.1	In Class Quiz Home Assignment Mid Term I End Term
FIRST SESSIONAL EXAM					
14	Grammar and Formal Languages	Understand the notations and properties of formal languages and grammar	Lecture	1502.2	In Class Quiz Home Assignment Mid Term I End Term
15	Chomsky Hierarchy	Understand the properties of formal languages and to compare properties of different languages of Chomsky Hierarchy	Lecture	1502.2	In Class Quiz Home Assignment Mid Term I End Term
16	Regular Expressions and Finite Automata	Construct regular expressions	Lecture, Practice questions	1502.2	In Class Quiz Home Assignment Mid Term I End Term
17	Regular Grammar	Construct regular grammar	Lecture, Practice questions	1502.2	In Class Quiz Home Assignment Mid Term I End Term
18	Properties of Regular Languages	Study the properties of regular languages	Lecture, Practice questions	1502.2	In Class Quiz Home Assignment Mid Term II End Term
19	Identifying Non-Regular Languages	Compare and identify the non-regular languages	Flipped Classroom	1502.2	In Class Quiz Home Assignment Mid Term II End Term
20	Pumping Lemma for Regular Languages	Understand Pumping lemma for regular languages and applying this lemma to prove a given language is not regular	Lecture, Practice questions	1502.2	In Class Quiz Home Assignment Mid Term II End Term
21	Context Free Languages	Study the properties of context free languages	Lecture, Practice questions	1502.2	In Class Quiz Home Assignment Mid Term II End Term

22	Leftmost and Rightmost Derivations	Deriving a string from CFL using either leftmost or rightmost derivations	Lecture, Practice questions	1502.2	In Class Quiz Home Assignment Mid Term II End Term
23	Derivation trees	Deriving language from CFGs and constructing derivation trees from it	Lecture, Practice questions	1502.2	In Class Quiz Home Assignment Mid Term II End Term
24	Parsing and Ambiguity	Determine whether a grammar is ambiguous or not by deriving a parse tree from CFL	Lecture, Practice questions	1502.2	In Class Quiz Home Assignment Mid Term I End Term
25	Context Free Grammars	Understanding the concept of CGF, designing of CFG for CFL	Lecture, Practice questions	1502.2	In Class Quiz Home Assignment Mid Term II End Term
26-28	Simplification of Context Free Grammars and Normal Forms, Methods for Transforming Grammars	Simplify a given CFG using three transformation method	Lecture, Practice questions	1502.2	In Class Quiz Home Assignment Mid Term II End Term
29	Chomsky Normal Form (CNF)	Normalize a CFG into CNF	Flipper Classroom	1502.2	In Class Quiz Home Assignment Mid Term II End Term
30-31	Greibach Normal Form (GNF)	Normalize a CFG into GNF	Lecture, Practice questions	1502.2	In Class Quiz Home Assignment Mid Term II End Term
32	Pushdown Automata (PDA) and Context–Free Languages	Construction of PDA using different approaches for different type of problems	Lecture	1502.1	In Class Quiz Home Assignment Mid Term II End Term
33	Deterministic Pushdown Automata, Nondeterministic Pushdown Automata	Understanding acceptability of PDAs and categorizing the PDAs into DPDA and NPDA	Lecture, Practise questions	1502.1	In Class Quiz Home Assignment Mid Term II End Term
34-35	Design of DPDA, NPDA, Conversion between PDA and CFG	Differentiate DPDA from NPDA and understanding equivalence of them	Flipped Classroom	1502.1	In Class Quiz Home Assignment Mid Term II End Term
SECOND SESSIONAL EXAM					

36	Linear Bounded Automata and Context-Sensitive Languages	Understanding basic concepts of LBA and CSL	Flipped Classroom	1502.1	In Class Quiz Home Assignment Mid Term II End Term
37	Turing Machine and Recursive, Recursive Enumerable Languages	Understanding principles of Turing machines, halting problems and the languages of Turing machine	Lecture, Practise questions	1502.1 1502.3	In Class Quiz Home Assignment Mid Term II End Term
38-39	The Standard Turing Machine and variants of Turing Machine, Solving Some Problems by using Turing Machine, Problems that cannot be solved by Turing Machine. Halting Turing machine, PCP Problem, etc.	Understanding variants of Turing machine and applying these to solve problems	Flipped Classroom	1502.1 1502.3	In Class Quiz Home Assignment End Term
40-41	Design of DTM, NTM	Design different DTM, NTM for different problems	Lecture, Practise questions	1502.1 1502.3	In Class Quiz Home Assignment End Term
42	Recursive and Recursively Enumerable Languages, Unrestricted Grammars, Context Sensitive Grammars and Languages, The Chomsky Hierarchy revisited	Understanding the Chomsky hierarchy in detail and revision of the same	Lecture, Practise questions	1502.3 1502.4	In Class Quiz Home Assignment End Term
END TERM EXAM					

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

CO	STATEMENT	Correlation with Program Outcomes **(POs)**												Correlation with Program Specific Outcomes (**PSOs**)			
		PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
[CC1502.1]	Develop abstract models such as finite automata, finite automata with outputs, pushdown automata, linear bounded automata and Turing machines based on any problem specified in formal language.	**3**	**2**	**2**									**2**	**3**		**2**	
[CC1502.2]	Compare the characteristics of different types of formal languages and grammars as mentioned in Chomsky Hierarchy.	**1**	**2**	**2**									**1**			**1**	
[CC1502.3]	Determine the type of computational problems and examine the decidability of them by constructing Turing machines.	**2**	**3**	**3**	**2**									**2**		**2**	
[CC1502.4]	Propose an optimal abstract model as well as developing skill which can be applied to a suitable real life problem.	**2**	**2**	**2**	**2**								**2**	**2**	**1**	**3**	

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Department of Computer and Communication Engineering
Course Hand-out

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

Session: June 19 – Nov 19 | Faculty: Dr. Anshuman Kalla & Dr. Arvind Dhaka | Class: V Sem

A. Introduction: This course is offered by the Department of Computer and Communication Engineering and 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

[1504.1] Define the significance of relevant terminologies, explain the transmission of digital & analog signals over different types of transmission media and outline the effects of various transmission impairments on analog & digital transmission.

[1504.2] Describe the principles of signal encoding techniques used for digital data to digital signal conversion and analog data to digital signal conversion and compare them.

[1504.3] Develop skills pertaining to error detection and correction techniques in order to find and overcome error encountered during transmission and discuss flow control and error control techniques.

[1504.4] Discuss and distinguish between different types of multiplexing techniques and spread spectrum techniques.

[1504.5] Identify and compare various generations of wireless cellular networks.

C. Program Outcomes and Program Specific Outcomes

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

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

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

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

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

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

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

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

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

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

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

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

Program Specific Outcomes (PSOs)

On successful completion of B.Tech. in Computer and Communication Engineering (CCE), the student:

[PSO1]. Should be able to clearly understand the basic principles, concepts and applications in the field of computer based communication/networking, information sharing, signal processing, web based systems, smart devices and communication technology.

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

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

[PSO4]. Should be able to apply the contextual knowledge in the field of computing and communication to assess social, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional engineering practice.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Close Book)	15
	Sessional Exam II (Close Book)	15
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Close Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	

E. Syllabus

Data Transmission: Concepts and Terminology, Analog and Digital Data Transmission, Transmission Impairments, Channel Capacity.
Transmission Media: Guided Transmission Media, Wireless Transmission, Wireless Propagation, Line-of-Sight Transmission.
Signal Encoding Techniques: Analog and Digital Signals, Digital-To-Digital Conversion: Line Coding Schemes, Block Coding, Scrambling, Analog-To-Digital Conversion: Pulse Code Modulation, Delta Modulation.
Digital Data Communication Techniques: Asynchronous and Synchronous Transmission, Types of Errors, Error Detection, Error Correction, Line Configurations.
Data Link Control Protocols: Flow Control, Error Control, High-Level Data Link Control (HDLC).
Multiplexing: Frequency-Division Multiplexing (FDM), Time-Division Multiplexing (TDM), Code-Division Multiple Access (CDMA); Space Division Multiplexing.
Spread Spectrum: The Concept of Spread Spectrum, Frequency Hopping Spread Spectrum (FHSS), Direct Sequence Spread Spectrum (DSSS).
Cellular Wireless Communication Techniques: Introduction, Generations: 1G, 2G, 3G, 4G, and 5G.

F. Text Books

1. W. Stallings, "Data and Computer Communications", 9th Edition, Pearson Education, 2010
2. B. Forouzan, "Data communication & networking" Fifth Edition. TMH, 2012.
3. L. Peterson and T. Davie "*Computer Networks: A Systems Approach*" Fifth Edition, Morgan Kaufmann Publishers, 2012.
4. R. Stevens, *"TCP/IP Illustrated*", Addison-Wesley Publication, 2011.

G. **Lecture Plan**

Lecture No.	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1.	Data, Data Communication, Data Network, Internet	Lay the foundation of the course, discuss the PO, PSO and CO. Discuss the Layered Architecture and specifically identify the functioning of layer – 1 and layer – 2.	Lecture	NA	NA
2.	Need of Layered Protocol Architecture (OSI &TCP/IP)		Lecture	NA	NA
3.	TCPIP - Layers and its Functioning, *PO* and *PSO* discussion		Lecture & Activity	NA	NA
4.	Concepts and Terminology – Simplex, Half-Duplex, Full-Duplex, Frequency, Bandwidth	Define the significance of relevant terminologies	Lecture	[1504.1]	Class Quiz Mid Term - I End Term
5.	Time Domain and Frequency Domain Concepts, Data Rate		Lecture & Problem Solving Practice	[1504.1]	Class Quiz Mid Term - I End Term
6.	Analog and Digital Data and Signals,	Discuss and identify the transmission of digital & analog signals over different types of transmission media and characteristics of Analog and Digital Transmission	Lecture	[1504.1]	Class Quiz Mid Term - I End Term
7.	Analog and Digital Transmission		Lecture	[1504.1]	Class Quiz Mid Term - I End Term
8.	Attenuation, Delay Distortion, Noise	Identify and comprehend various transmission impairments and its effects	Lecture & Problem Solving Practice	[1504.1]	Class Quiz Mid Term - I End Term
9.	Data Rate and Nyquist Bandwidth	Comprehend and compute the channel capacity of noiseless and noisy channel.	Lecture	[1504.1]	Class Quiz Mid Term - I End Term
10.	Shannon Capacity Formula		Lecture & Problem Solving Practice	[1504.1]	Class Quiz Mid Term - I End Term
11.	Twisted Pair & CAT Types	Identify and distinguish various Transmission Media: Guided Transmission Media	Lecture & Activity	[1504.1]	Class Quiz Mid Term - I End Term

12.	Coaxial Cable, Optical Fiber		Lecture	[1504.1]	Class Quiz Mid Term - I End Term
13.	Antennas , Terrestrial Microwave	Discuss the principles of Wireless Transmission and understand their applications	Lecture	[1504.1]	Class Quiz Mid Term - I End Term
14.	Satellite Microwave, Broadcast Radio, Infrared		Lecture & Problem Solving Practice	[1504.1]	Class Quiz Mid Term - I End Term
15.	Ground Wave Propagation, Sky Wave Propagation	Identify and explain wireless propagation modes	Lecture & Activity	[1504.1]	Class Quiz Mid Term - I End Term
16.	Line-of-Sight Propagation		Lecture & Problem Solving Practice	[1504.1]	Class Quiz Mid Term - I End Term
17.	Free Space Loss	Explain the principles of Line-of-sight Propagation	Lecture & Problem Solving Practice	[1504.1]	Class Quiz Mid Term - I End Term
18.	Atmospheric Absorption, Multipath, Refraction		Lecture	[1504.1]	Class Quiz Mid Term - I End Term
19.	Analog and Digital Signals, Line Coding Schemes: Unipolar, Polar	Identify and distinguish various Signal Encoding Techniques: Digital-To-Digital Conversion. Draw the waveforms for various line coding and scrambling techniques.	Lecture & Problem Solving Practice	[1504.2]	Class Quiz Mid Term - I End Term
20.	NRZ & Bipolar – AMI		Lecture & Problem Solving Practice	[1504.2]	Class Quiz Mid Term - I End Term
21.	Biphase – Manchester & Differential Manchester		Lecture & Problem Solving Practice	[1504.2]	Class Quiz Mid Term - I End Term
22.	Modulation Rate and Scrambling Techniques		Lecture & Problem Solving Practice	[1504.2]	Class Quiz Mid Term - I End Term

23.	ASK & FSK	Discuss and determine the principles and working of Digital Data – Analog Signal and draw the respective waveforms	Lecture	[1504.2]	Class Quiz Mid Term - I End Term
24.	PSK – BPSK		Lecture	[1504.2]	Class Quiz Mid Term - I End Term
25.	MFSK		Lecture	[1504.2]	Class Quiz Mid Term - I End Term
26.	QAM		Lecture	[1504.2]	Class Quiz Mid Term - I End Term
27.	Pulse Code Modulation	Discuss and determine the principles and working of Analog Data – Digital Signal and draw the respective waveforms	Lecture & Problem Solving Practice	[1504.2]	Class Quiz Mid Term - I End Term
28.	Delta Modulation		Lecture	[1504.2]	Class Quiz Mid Term - I End Term
		I MTE			
29.	Asynchronous and Synchronous Transmission	Apply the knowledge of various error detection and correction techniques in order to find and overcome error encountered during transmission	Lecture	[1504.3]	Class Quiz Mid Term - I End Term
30.	Type of Error, Redundancy, Detection Vs Correction		Lecture	[1504.3]	Class Quiz Mid Term - II End Term
31.	Cyclic Redundancy Check		Lecture	[1504.3]	Class Quiz Mid Term - II End Term
32.	Polynomials & CRC Architecture		Lecture & Problem Solving Practice	[1504.3]	Class Quiz Mid Term - II End Term
33.	Error Correction and Block Code Principle		Lecture & Problem Solving Practice	[1504.3]	Class Quiz Mid Term - II End Term
34.	Line Configurations		Lecture	[1504.3]	Class Quiz Mid Term - II End Term

35.	Framing	Comprehend the concept of sliding window for exercising flow control, distinguish between various ARQ techniques and understand how they can be used in HDLC protocol.	Lecture	[1504.3]	Class Quiz Mid Term - II End Term
36.	Flow Control - Stop-and-Wait Protocol		Lecture & Problem Solving Practice	[1504.3]	Class Quiz Mid Term - II End Term
37.	Sliding Window		Lecture & Problem Solving Practice	[1504.3]	Class Quiz Mid Term - II End Term
38.	Error Control: Stop-and-Wait ARQ		Lecture & Problem Solving Practice	[1504.3]	Class Quiz Mid Term - II End Term
39.	Go-Back-N ARQ		Lecture & Problem Solving Practice	[1504.3]	Class Quiz Mid Term - II End Term
40.	Selective Repeat ARQ		Lecture & Problem Solving Practice	[1504.3]	Class Quiz Mid Term - II End Term
41.	High-Level Data Link Control (HDLC)		Lecture	[1504.3]	Class Quiz Mid Term - II End Term
42.	Introduction to Multiplexing	Discuss and distinguish between different types of multiplexing techniques	Lecture	[1504.4]	Class Quiz Mid Term - II End Term
43.	Frequency Division Multiplexing (FDM)		Lecture	[1504.4]	Class Quiz Mid Term - II End Term
44.	Time-Division Multiplexing (TDM)		Lecture & Activity	[1504.4]	Class Quiz Mid Term - II End Term

45.	The Concept of Spread Spectrum	Instill the principles of spread spectrum techniques, discuss with help of block diagrams the working of slow and fast FHSS and in particular the use of CDMA technique	Lecture	[1504.4]	Class Quiz Mid Term - II End Term
46.	Frequency Hopping Spread Spectrum (FHSS)		Lecture	[1504.4]	Class Quiz Mid Term - II End Term
47.	Slow and Fast FHSS		Lecture & Problem Solving Practice	[1504.4]	Class Quiz Mid Term - II End Term
48.	Direct Sequence Spread Spectrum (DSSS)		Lecture & Problem Solving Practice	[1504.4]	Class Quiz Mid Term - II End Term
49.	Performance Consideration – FHSS and DSSS		Lecture	[1504.4]	End Term
50.	Code Division Multiple Access (CDMA)		Lecture & Problem Solving Practice	[1504.4]	End Term
II MTE					
51.	Introduction, Generations: 1G, 2G, 3G,	Identify, compare and contrast various generations of wireless cellular networks.	Lecture	[1504.5]	End Term
52.	4G, and 5G		Lecture	[1504.5]	End Term
END SEM EXAMINATION					

H. 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	PSO4
IT 1504.1	Define the significance of relevant terminologies, explain the transmission of digital & analog signals over different types of transmission media and outline the effects of various transmission impairments on analog & digital transmission.	1	1							1	2		1	2	1		
IT 1504.2	Describe the principles of signal encoding techniques used for digital data to digital signal conversion and analog data to digital signal conversion and compare them.	2	2	1							1			3	1		
IT 1504.3	Develop skills pertaining to error detection and correction techniques in order to find and overcome error encountered during transmission and discuss flow control and error control techniques.	3	2	1							1			2	2	1	
IT 1504.4	Distinguish between different types of multiplexing techniques and spread spectrum techniques.	2								1	2			2	1		
IT 1504.5	Identify and compare various generations of wireless cellular networks.	2						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 AND COMMUNICATION ENGINEERING

Course Hand-out

Design and Analysis of Algorithms Lab. | CS1530| 1 Credits | 0 0 2 1

Session: July 19 – Nov 19 | Dr. Manoj Kumar Sharma & Dr. Geeta | Class: V CCE

A. Introduction: This course is offered by Computer Science and Engineering Department, 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 Algorithms and their Complexity.

[CS1530.2] 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 used in sorting algorithms like merge sort, heap sort and quick sort and analysis of different cases.

[CS1530.4] Analyze the applications of Greedy, Dynamic and Graph based techniques to solve given 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

[PSO.1] **Understand** Should be able to clearly understand the basic principles, concepts and applications in the field of computer based Communication/networking, information sharing, signal processing, web based systems, smart devices and communication technology.

[PSO.2] **Critically Analyse and Interpret** Should be able to nail down the issues prevalent in the field of Computer and Communication Engineering.

[PSO.3] **Problem Solving** Should be able to identify the existing open problems in the field of computing and propose the best possible solutions.

[PSO.4] **Apply** Should be able to apply the contextual knowledge in the field of computing and communication to assess social, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional engineering practice.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Continuous evaluation (Record + Execution + Viva)	60
	Lab project	10
	End Term Exam (Closed Book)	30
End Term Exam (Summative)	Total	100
	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.	
Attendance (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.	
Make up Assignments (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.	
Homework/ Home Assignment/ Activity Assignment (Formative)		

E. SYLLABUS

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

F. REFERENCE BOOK:

1. E. Horowitz, S. Sahni and S. Rajasekaran, *“Computer Algorithms”*, 2nd Edition, University Press, 2007.
2. T. H. Cormen, C. E. Leiserson, R.L.Rivest, and C. Stein, "*Introduction to Algorithms*", 3rd Edition, MIT press, 2009.
3. 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:

Class No	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1.	Write a Binary Search Program using iterative approach	Take input from the user and implement only iterative approach	Lab discussion and Demonstration at system	CS1530.1 CS1530.3	Internal Evaluation Home Assignments External Evaluation
2.	Write a Binary Search Program using recursive approach	Take input from the user and implement only recursive approach	Lab discussion and Demonstration at system	CS1530.1 CS1530.3	Internal Evaluation Home Assignments External Evaluation
3.	Write a programs to implement Insertion Sort	Input an array from user and implement insertion sort using iterative approach	Lab discussion and Demonstration at system	CS1530.1 CS1530.3	Internal Evaluation Home Assignments External Evaluation
4.	Write a programs to implement Selection Sort	Input an array from user and implement selection sort using iterative approach	Lab discussion and Demonstration at system	CS1530.1 CS1530.3	Internal Evaluation Home Assignments External Evaluation
5.	Write a programs to implement Merge Sort	Input an array from user and write a logic to implement merge sort	Lab discussion and Demonstration at system	CS1530.1 CS1530.3	Internal Evaluation Home Assignments External Evaluation
6.	Write a programs to implement Quick Sort	Input an array from user and write a logic to implement quick sort concept	Lab discussion and Demonstration at system	CS1530.1 CS1530.3	Internal Evaluation Home Assignments External Evaluation
7.	Write a programs to implement sorting a given list of elements in ascending order using the following sorting methods. HeapSort – MAX Heap and MIN Heap	Input an array from user and write a logic to implement both Max and Min heap concept	Lab discussion and Demonstration at system	CS1530.1 CS1530.3	Internal Evaluation Home Assignments External Evaluation
8.	Write a programs based on Priority Queue	Input an array from user and write a logic to implement Priority Queue concept	Lab discussion and Demonstration at system	CS1530.1 CS1530.3	Internal Evaluation Home Assignments External Evaluation
9.	Write a programs to implement knapsack problem using greedy method	Input an array from user and write a logic to implement knapsack approaches	Lab discussion and Demonstration at system	CS1530.4	Internal Evaluation Home Assignments External Evaluation

10.	Write a programs to implement the single source shortest path problem using greedy method. (Dijkstra's).	Input an array from user and write a logic for path finding	Lab discussion and Demonstration at system	CS1530.4	Internal Evaluation Home Assignments External Evaluation
11.	Write programs to implement following algorithms: Prim's, Kruskal's	Input edges and vertex's of the graph and implement spanning tree concept through code	Lab discussion and Demonstration at system	CS1530.4 CS1530.2	Internal Evaluation Home Assignments External Evaluation
12.	Programs to implement following algorithms: Breadth first search, Depth first search	Input edges and vertex's of the graph and implement shortest path finding concept for both DFS and BFS	Lab discussion and Demonstration at system	CS1530.4 CS1530.2	Internal Evaluation Home Assignments External Evaluation
13.	Write programs to implement following algorithms: a. Fibonacci series dynamic programming using top-down approach. b. Fibonacci series dynamic programming using bottom-up approach.	Input the data from the user and implement Fibonacci series operation using dynamic programming approach	Lab discussion and Demonstration at system	CS1530.4	Internal Evaluation Home Assignments External Evaluation
14.	Write a program to implement longest integer sequence LIS.	Input the data from the user and implement longest integer sequence using dynamic programming approach	Lab discussion and Demonstration at system	CS1530.4	Internal Evaluation Home Assignments External Evaluation
15.	Write a program to implement longest common subsequence LCS.	Input the data from the user and implement longest common subsequence using dynamic programming approach	Lab discussion and Demonstration at system	CS1530.4	Internal Evaluation Home Assignments External Evaluation
16.	Write a program to implement Binomial Coefficient using Dynamic Programming.	Input the data from the user and implement binomial coefficient using dynamic programming approach	Lab discussion and Demonstration at system	CS1530.4	Internal Evaluation Home Assignments External Evaluation
17.	Write a program for solving travelling sales person problem	Input the data from the user and implement TSP problem using dynamic programming	Lab discussion and Demonstration at system	CS1530.4	Internal Evaluation Home Assignments External Evaluation

		approach			
18.	Write program to implement queen problems	Consider the problem of eight queens on a chess board. Two queens are said to attack each other if they are on the same row, column or diagonal. Write a program that implements back tracking algorithm to solve the problem i.e., place eight non-attacking queens on the board.	Lab discussion and Demonstration at system	CS1530.2	Internal Evaluation Home Assignments External Evaluation
19.	Write a program to implement Randomized Quick sort.	Input the data from the user and implement randomized quick sort approach	Lab discussion and Demonstration at system	CS1530.2	Internal Evaluation Home Assignments External Evaluation
20.	Write a program to implement Graph Coloring Problem.	Input the data from the user and implement graph coloring approach	Lab discussion and Demonstration at system	CS1530.2	Internal Evaluation Home Assignments External Evaluation

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

CO	STATEMENT	Correlation with Program Outcomes **(POs)**												Correlation with Program Specific Outcomes (**PSOs**)			
		PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CS1530.1	Explain basic concepts of various Algorithms and their Complexity.	**2**	**1**										**1**			**1**	
CS1530.2	Apply appropriate algorithm to solve problems and assess the trade-offs involved in the design choices also calculate the running time complexity.	**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**

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

DEPARTMENT OF COMPUTER AND COMMUNICATION ENGINEERING

Course Hand-out

Data Communications Lab | CC 1530 | 1 Credit | 0 0 2 1

Session: July - Nov 2019 | Faculty: Dr Anshuman Kalla, Dr Arvind Dhaka| Class: B.Tech V SEM

A. **Introduction:** This laboratory course is offered by the Department of Computer and Communication Engineering and aims to facilitate the practical understanding of the concepts and principals being discussed in the course - Data Communications. Students will be able perform experiments related to Digital Modulation techniques, analog data to digital signal encoding techniques, multiplexing techniques and multiple accessing techniques with the view to analyze and interpret the corresponding waveforms.

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

[CC 1530.1] Visualize and analyze signals and working of basic equipment (Function Generator and Digital Storage Oscilloscope (DSO))

[CC 1530.2] Perform various modulation, demodulation techniques in data communication and trace the corresponding waveforms.

[CC 1530.3] Introduce packet tracer and simulate basic topologies to understand the functioning of Data Link Layer

[CC 1530.4] Perform multiplexing and multiple accessing techniques and trace the corresponding waveforms.

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 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.

[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 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.

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

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

[PO.9]. Individual and team work: United we grow, divided we fall is a culture at MUJ 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.

[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 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)

On successful completion of B.Tech. in Computer and Communication Engineering (CCE), the student:

[PSO.1]. Should be able to clearly understand the basic principles, concepts and applications in the field of computer based communication/networking, information sharing, signal processing, web based systems, smart devices and communication technology.

[PSO.2]. Should be able to nail down the issues prevalent in the field of Computer and Communication Engineering.

[PSO.3]. Should be able to identify the existing open problems in the field of computing and propose the best possible solutions.

[PSO.4]. Should be able to apply the contextual knowledge in the field of computing and communication to assess social, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional engineering practice.

E. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Continuous assessment (Lab records, Performance in Lab, Viva-Voce and mini-project)	70
End Term Exam (Summative)	End Term Exam (2 Hr. Lab Exam including Viva-Voce)	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

PC to PC and PC to Peripherals Communication: Serial communication using RS-232C, RS-485, Parallel Communication using 8-bit parallel cable; LAN topologies: Star, Token bus and Token ring;
Signal Encoding Techniques: Analog and Digital Signals, Analog -To-Digital Conversion: Line Coding Schemes; Signal Modulation Techniques: ASK, PSK, FSK, Pulse Code Modulation and Delta Modulation;
Medium Access Control protocols: Aloha, Slotted Aloha, CSMA, CSMA/CD, CSMA/CA, Wireless LAN-IEEE 802.11, BLUETOOTH; Network Devices configuration: Hub, Repeaters, Bridges, Switches, Gateways and Routers.

G. Reference Books

1. Stallings, W.: Data and Computer Communications (9th Edition), Pearson Education, 2010

2. Forouzan, B.: Data communication & networking (5th Edition), TMH, 2012.

H. Laboratory Plan:

Lab 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/Discussion	NA	NA
2.	To analyze signal using Function Generator and Digital Storage Oscilloscope (DSO)	To get acquainted with the working of essential equipment (Function Generator and Digital Storage Oscilloscope (DSO))	Demonstration and Practically performing	CC1530.1	Internal Evaluation End Term Exam
3.	To analyze Frequency Division Multiplexing and De-multiplexing technique and draw its waveforms.	To visualize the FDM multiplexing technique by performing it experimentally	Demonstration and Practically performing	CC1530.4	Internal Evaluation End Term Exam
4.	To analyze a Sampling and reconstruction system and interpret the sampled and reconstructed waveforms.	To verify the correctness of sampling theorem and visualize the waveform of sampled signal and compare the original signal with reconstructed signal	Demonstration and Practically performing	CC1530.1	Internal Evaluation Project End Term Exam
5.	To analyze a PCM system and interpret the modulated and demodulated waveforms	To perform and visualize waveforms that occur at various steps involved in PCM; Sampling, Quantization and Encoding.	Demonstration and Practically performing	CC1530.2	Internal Evaluation Project End Term Exam
6.	To analyze a BPSK modulation system and interpret the modulated and demodulated waveforms.	To identify the need of analog modulation and visualize how the two different phases of carrier is used to represent the digital signal	Demonstration and Practically performing	CC1530.2	Internal Evaluation Project End Term Exam
7.	To analyze a DPCM system and interpret the modulated and demodulated waveforms.	To identify the need of DPCM as compared to PCM and visualize the DPCM modulated and demodulated signals.	Demonstration and Practically performing	CC1530.2	Internal Evaluation Project End Term Exam
8.	To analyze a Delta modulation system and interpret the modulated and demodulated waveforms.	To comprehend the advantages of Delta modulation over PCM, plot the waveforms of delta modulated and demodulated signals and understand the issues involved in Delta modulation.	Demonstration and Practically performing	CC1530.2	Internal Evaluation Project End Term Exam
9.	To understand working of packet tracer and various networking devices.	To get acquainted with the simulated environment of software tool by Cisco	Demonstration and Practically performing	CC1530.3	Internal Evaluation End Term Exam

10.	To create star topology using switch and check its connectivity.	To test and verify the working of a network topology that uses layer -1 and layer – 2 connecting devices and check connectivity using PING command	Demonstration and Practically performing	CC1530.3	Internal Evaluation End Term Exam
11.	To analyze a CDMA-DSSS modulation system and interpret the modulated and demodulated waveforms.	To firmly grasp the working principle of spread spectrum and visualize the use of PN Sequence to spread and de-spread the signal at transmitter and receiver respectively.	Demonstration and Practically performing	CC1530.4	Internal Evaluation End Term Exam

I. Course Articulation Matrix: (Mapping of COs with POs & 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
CC 1530.1	To visualize and analyze signals and working of basic equipment (Function Generator and Digital Storage Oscilloscope (DSO))	**3**				**3**	**2**			**3**			**3**	**3**	**2**		**2**
CC 1530.2	To perform various modulation, demodulation techniques in data communication and trace the corresponding waveforms.	**3**	**2**	**2**	**2**	**2**	**2**			**3**			**2**	**3**	**2**	**1**	**2**
CC 1530.3	To introduce packet tracer and simulate basic topologies to understand the functioning of Data Link Layer	**3**	**1**	**2**		**3**	**2**			**3**			**2**	**3**	**2**		**2**
CC 1530.4	To perform multiplexing and multiple accessing techniques and trace the corresponding waveforms.	**3**	**2**	**2**	**2**	**2**	**2**			**3**			**2**	**3**	**2**	**1**	**2**

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and IT

DEPARTMENT OF CCE

Course Hand-out

Web Technologies | CC1551| 3 Credits | 3 0 0 3

Session: July 19-Nov 19 | Faculty: Dr V S Dhaka | Class: B Tech V SEM

A. **Introduction:** This course is offered by the Department of Computer and Communication Engineering as Department Elective. The main objective of this course is to familiarize students with the basics of Web, Web clients and servers with working of HTTP. It also gives the insight of developing static and dynamic Web pages to serve as front-end to client/server applications, and effective server side programming while introducing event -driven system programming. The course also covers basics of XML and recent trends in the area of web technology. The course also covers application areas of Introduction of web technology in Electronic Commerce.

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

[CC 1551.1] Recognize fundamentals and working principles of web technology and web programming.

[CC 1551.2] Design and implement client-side web programming using HTML, Java Script and CSS.

[CC 1551.3] Implement server-side programming using PHP and JSP and Database interactions.

[CC 1551.4] Implement and deployment of Web based applications on web server and debugging.

[CC 1551.5] Developing skills for designing websites leads to entrepreneurship opportunities.

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

[PO.1] Engineering knowledge: 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 analyses complex engineering problems reaching substantiated conclusions using basic principles of mathematics, computing techniques and communication engineering principles.

[PO.3] Design/development of solutions: Upon analyzing, the B Tech CCE, CSE, IT graduate will be able to devise solutions for complex engineering problems and design system components or processes that meet the specified requirements with appropriate consideration for law, safety, cultural & societal obligations with environmental considerations.

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

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

[PO.6] The engineer and society: The engineers are called society builders and transformers. B. Tech CCE, CSE and IT graduate will 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 practiced in each action. Thus a B Tech CCE, CSE and IT will 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 will 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 will be able to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

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

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

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

Program Specific Outcomes (PSOs)

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

[PSO.1] Will be able to clearly understand the basic principles, concepts and applications in the field of computer based Communication/networking, information sharing, signal processing, web based systems, smart devices and communication technology.

[PSO.2] Will be able to nail down the issues prevalent in the field of Computer and Communication Engineering.

[PSO.3] Will be able to identify and devise solutions for the existing open problems in the field of computing and propose the best possible solutions.

[PSO.4] Will be able to apply the contextual knowledge in the field of computing and communication to assess social, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional engineering practice.

D. Assessment Plan:

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

E. SYLLABUS

Introduction: Overview of Internet and the sub network "the Web", History, and Other sub networks, Web System Architecture, Web Clients and Web Servers, Application Servers. HTTP– Basics of HTTP Request and Response, HTTP Methods, headers, content transport (PUSH and PULL), Drawbacks HTTP1.0, Introduction to HTTP1.1, HTTPS, SSL, and Generation of Dynamic Web pages, Extension Mechanisms;

Client side programming: Web application Design Life-cycle, Web Markup Languages – What is markup, why markup, Intro to HTML and Deficiencies of HTML, Using XHTML – Basic syntax and semantics, fundamental elements, URLs – Inter-page and Intra-Page Linking, Lists, Tables, Frames and Forms., HTML Document Object Model (DOM), Styling with CSS, Introduction to HTML5 and CSS3;

Scripting: Client side dynamic programming with JavaScript – Basics, Primitives, Loops, Decision Statements, Screen Output and Keyboard Input, Arrays and Functions, Event Handling, Pattern Matching and Form Validation with Regular Expressions;

Server side Programming: Three Tier Model, PHP –Basics, Form Validation, Sessions and Session Tracking techniques, ASP, JSP;

Advanced technologies*:* XML– Syntax and Semantics, Document Structure, DTDs, Need for Namespaces-e Commerce Basics, Models and Architecture; ecommerce - WAP and Mobile Agents.

F. REFERENCE BOOKS

R1. J. C. Jackson, "*Web Technologies: A Computer Science Perspective*", Pearson Education, 2007.

R2. H. Chan, R. Lee, T. Dillon, E. Chang, "*E-commerce, Fundamentals and Applications*", John Wiley & Sons, 2007.

R3. DT Editorial Services, "HTML 5 Black Book", 2nd Edition, Wiley India, 2016.

R4. Treese, G. Winfield, L. C. Stewart, "*Designing Systems for Internet Commerce*", 2nd Edition, Addison-Wesley Professional, 2003.

R5. X. Bai, M. Ekedahl, *"The Web Warrior Guide to Web Programming",* 1st Edition, Course Technology Inc, 2003.

G. Lecture Plan:

Class Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1	Overview of Internet and the sub network	To acquaint and clear teachers' expectations and understand student expectations.	Lecture	1551.1	Class Quiz and Mid Term-I
2	Web System Architecture	To understand physical structure of Web system	Lecture	1551.1	Class Quiz and Mid Term-I
3,4	Web Clients and Web Servers	Identify various methods to store, process and deliver web pages to the clients from server.	Lecture	1551.1	Class Quiz and Mid Term-I
5,6	Application Servers	To describe the application servers	Lecture	1551.1	Class Quiz and Mid Term-I Class Quiz and Mid Term-I
7,8,9	HTTP– Basics of HTTP Request and Response, HTTP Methods, headers, content transport (PUSH and PULL), Drawbacks HTTP1.0	Illustrate the basics of HTTP, methods, with Drawbacks	Lecture	1551.1	
10	Introduction to HTTP1.1, HTTPS, SSL	To analyse security aspects of HTTP and SSL	Lecture	1551.1	Class Quiz Mid Term I End Term Continuous Evaluation Class Quiz Mid Term I End term
11	Discussion of Project and Assignment	Understand the case study on the project	Group Discussion	1551.4/5	
12,13	Generation of Dynamic Web pages, Extension Mechanisms	To understand Basics of Web development.	Lecture	1551.2	
14,15	Web application Design Life-cycle, Web Markup Languages	To apply website enhancement methods.	Lecture	1551.2	Home Assignment Class Quiz Mid Term I End Term Continuous Evaluation Class Quiz Mid Term I End Term
16	Project Study presentation by students	To provide early project feedbacks	Flip Class	1551.4/5	
17,18	Intro to HTML and Deficiencies of HTML	To design static web pages and define approach of development	Lecture	1551.2	
19	XHTML– Basic syntax and semantics, fundamental elements,	To understand XHTML	Lecture	1551.2	Class Quiz Mid Term I End Term Class Quiz Mid Term I End Term Class Quiz and Mid Term-I
20	URLs – Inter-page and Intra-page Linking, Lists, Tables, Frames and Forms	To design HTML frames, lists, tables.	Lecture	1551.2	
FIRST SESSIONAL EXAM From 05-09-2019 to 09-09-2019					
21,22	HTML Document Object Model (DOM), Styling with CSS	To understand Web development	Lecture	1551. 2	Class Quiz Mid-Term II and End Term Class Quiz Mid-Term II and End Term Class Quiz Mid-Term II
23,24	Introduction to HTML5 and CSS3	To illustrate web design and development using HTML, CSS	Lecture	1551.2/4	
25,26	Client side dynamic programming with JavaScript-Basics	To understand Advance web designing and development with Javascript	Lecture	1551.2/4	

					and End Term
27,28	Primitives, Loops, Decision Statements, Screen Output and Keyboard Input .	To understand loops and decision statement in Javascript.	Lecture	1551.2/4	Class Quiz Mid-Term II and End Term
29,30	Arrays and Functions, Event Handling, Pattern Matching and Form Validation with Regular Expressions	To apply verification and validation of web development using regular expressions.	Lecture	1551.2/4	Class Quiz Mid-Term II and End Term Continuous Evaluation
31	Midterm Project Presentation by the students and discussion	To get feedback on project status.	Flip Class	1551.4/5	
32	Three Tier Model	To analyse of Tier system	Lecture	1551.2/4	Class Quiz Mid-Term II and End Term
33	PHP –Basics, Form Validation	To understand dynamic programing – through PHP	Lecture	1551.3/4	Class Quiz Mid-Term II and End Term
34,35	Sessions and Session Tracking techniques	To understand and apply session handling methodology of PHP using cookies and session	Lecture	1551.3/4	Class Quiz Mid-Term II and End Term
36,37	ASP, JSP	To explain basics of dynamic programming using ASP, JSP	Lecture	1551.3/4	Class Quiz Mid-Term II and End Term Class Quiz Mid-Term II and End Term Class Quiz Mid-Term II and End Term
SECOND SESSIONAL EXAM From 04-11-2019 to 06-11-2019					
38-39	XML – Syntax and Semantics	To understand basics of XML and its application	Lecture	1551.3/4	Class Quiz and End term
40	Document Structure, DTDs, Need for Namespaces	To explain needs of DTD and namespaces in XML	Lecture	1551.4/5	Class Quiz and End term
41	eCommerce Basics	To understand business web development in ecommerce domain	Lecture	1551.5	Class Quiz and End term
42	Models and Architecture of eCommerce	To illustrate physical structure of eCommerce	Lecture	1551.4/5	Class Quiz and End term
43	Ecommerce - WAP and Mobile Agents.	To analyze agent applications	Lecture	1551.4/5	Class Quiz and End term
44	End Term Project Evaluation presentation	To provide project feedback and evaluation	Flip Class	1551.4/5	Continuous Evaluation Class Quiz and End term

END TERM EXAM From 29-11-2019 to 13-12-2019

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

CO	STATEMENT	Correlation with Program Outcomes **(POs)**												Correlation with Program Specific Outcomes (PSOs)			
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO4
[CC 551.1]	Recognize fundamentals and working principles of web technology and web programming.	2				3		2	2			3		3	2		
[CC 1515.2]	Design and implement client-side web programming using HTML, Java Script and CSS.			3	3	1							3		2	2	2
[CC 1515.3]	Implement server-side programming using PHP and JSP and Database interactions.		2	3	2	1	1			2	2					3	
[CC 1515.4]	Implement and deployment of Web based applications on web server and debugging.					3			1	1				3		2	2
[CC 1515.5]	Developing skills for designing websites leads to entrepreneurship opportunities.			3	2						1	3	1	2		2	2

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and IT

DEPARTMENT OF COMPUTER AND COMMUNICATION ENGINEERING

Course Hand-out

Computer Networks | CS 1602| 4 Credits | 3 1 0 4

Session: Jan 20-May 20 | Faculty: Dr. Arvind Dhaka| ClassB.Tech CCE/CSE/IT VI SEM

A. Introduction: This course is offered by the Department of Computer Science Engineering . 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.

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

[CS1602.1] Configure and Implement various protocols stacks models such as OSI, TCP/IP model, IPv4, IPv6, IP addressing, Subnetting, IPV6 transitions in order to acquire more employability options.

[CS1602.2] Analyse and Implement the Routing and its types.

[CS1602.3] Analyse and Implement the Internet control protocols and congestion Control.

[CS1602.4] Analyse the Transport Layer and Its protocols, 3way handshake protocol

[CS1602.5] Describe the Application Layer, its protocols and Network Security.

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 analyse 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] Should be able to clearly understand the basic principles, concepts and applications in the field of computer based Communication/networking, information sharing, signal processing, web based systems, smart devices and communication technology.

[PSO.2] Should be able to nail down the issues prevalent in the field of Computer and Communication Engineering.

[PSO.3] Should be able to identify the existing open problems in the field of computing and propose the best possible solutions.

[PSO.4] Should be able to apply the contextual knowledge in the field of computing and communication to assess social, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional engineering practice.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	15
	Sessional Exam II (Closed Book)	15
	In class Quizzes and Assignments, MOOC courses, video assignment Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Closed Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

E. SYLLABUS

Introduction: IPv4 Addresses Classfull addressing, other issues, Sub-netting Classless, addressing, variable length blocks, Sub-netting, address allocation, IP Protocol: options, checksum, Types of messages, message format, error reporting, Query, Checksum, fragmentation, IP Package, ICMP Protocol: Messages, Debugging tools, Unicasting Protocols: Unicasting routing, RIP: RIP Message Format ,Requests and Responses, Timers in RIP , Introduction to OSPF and BGP, Multicasting Protocol: IGMP : Group Management, IGMP Messages, IGMP Protocol Applied to Host ,IGMP Protocol Applied to Router, Role of IGMP in Forwarding ARP package & : Introduction, packet format, Encapsulation, RARP: Introduction, datagram, UDP Protocol: Process to process communication, User datagram, checksum; UDP package, TCP Protocol :Introduction, TCP services, TCP features, segment, TCP connection, State transition diagram, Flow control, Error control, Congestion control, TCP timers, options, TCP package, Electronic mail: SMTP,IMAP,POP, MIME Network Management Protocol: SNMP Application layer protocol: HTTP, HTTPS, Security Goals: CIA, Attacks, firewall, DMZ.

F. REFERENCE BOOKS

1. A S Tanenbaum, Computer Networks, 5th Ed., Pearson, 2010.
2. B.A. Forouzan, TCP/IP Protocol Suite, 4th Ed., TMH, 2010.
3. W.R. Stevens, TCP/IP illustrated, Volume 1: The Protocols, 2nd Ed., Addison-Wesley, 2015.
4. D E. Comer, Internetworking with TCP/IP Principles, Protocols and Architecture, 6th Ed., Pearson , 2013.

G. Lecture Plan:

Class Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1	Introduction and Course Hand-out briefing Reading and understanding Poetry.	To acquaint and clear teachers expectations and understand student expectations	Interaction	-	NA
2	Network Layer Design Issues; Store-and-Forward Packet Switching, Services Provided to the Transport Layer,	Determine the objectives of TCP/IP Model, OSI Model, Understand Switching Techniques.	Interaction, Discussion & Question Answer Session	CO 1	In Class Quiz (Not Accounted)
3	Routing Algorithms; Characteristics and Types, The Optimality Principle.	Acquire the knowledge of routing algorithms, configure and implement.	Lecture Discussion	CO 1	1st Sessional ET Exam Home Assignment
4	Implementation of Connectionless Service, Implementation of Connection-Oriented Service	Differentiate between connectionless and connection oriented services.	Lecture Discussion	CO1	1st Sessional ET Exam Home Assignment
5	Shortest Path Routing	Understand the routing matric	Lecture Discussion	CO1	1st Sessional ET Exam Home Assignment
6	Classes and importance and functioning of Class full addressing	Knowledge of classful and classless addressing	Lecture Discussion	CO1	1st Sessional ET Exam Home Assignment
7	Method to do Sub-netting and Introduction to Classless addressing	Implementation of subnetting	Lecture	CO1	
8	Defining Variable length blocks	Configure the Variable length mask address	Discussion	CO1	
9	Numerical based on Sub-netting address allocation	Solve exercise in classroom	Lecture	CO1	1st Sessional ET Exam Home Assignment
10	Functionality of Network Address Translation	Understand NAT Protocol	Discussion	CO2	1st Sessional ET Exam

					Home Assignment
11	Numerical based on Network Address Translation	Solve exercise in classroom	Tutorial	CO2	1st Sessional ET Exam Home Assignment
12	Introduction to Routing and its types: Flooding	Understand routing algorithms and flood concept.	Lecture	CO2	1st Sessional ET Exam Home Assignment
13	Routing type: Distance Vector Routing	Differentiate between flooding and distance vector routing	Lecture	CO2	1st Sessional ET Exam Home Assignment
14	Routing type: Hierarchical Routing	Configuration and implementation of hierarchical routing based protocols.	Lecture	CO2	1st Sessional ET Exam Home Assignment
In the I-Sessional Exam students' knowledge will be assessed up to lecture number 14					
15	Introduction to Congestion control	Understand the congestion control requirement in networks	Lecture	CO3	2nd Sessional ET Exam Home Assignment
16	Functionality of Admission control to avoid congestion	Identify the different type of congestion control algorithms	Lecture	CO3	2nd Sessional ET Exam Home Assignment
17	Traffic Shaping methods: Leaky and token buckets	Will be able to solve the problems based on Leaky and token buckets	Lecture	CO3	2nd Sessional ET Exam Home Assignment
18	Choke packets for Network Maintenance and Quality Management	Describe the Network maintenance and quality management for various type of services.	Lecture	CO3	2nd Sessional ET Exam Home Assignment
19	Introduction to Dynamic routing protocols	Understand the dynamic routing and its need.	Lecture	CO3	

20	Dynamic Routing Protocol type: Routing Information Protocol (RIP), Open Shortest Path First (OSPF)	Configure and implement the RIP, OSPF protocols	Lecture	CO3	2nd Sessional ET Exam Home Assignment
21	Dynamic Routing Protocol: Border Gateway Protocol (BGP)	Implementation of BGP Protocol	Lecture	CO3	2nd Sessional ET Exam Home Assignment
22	Functionality of IPv4 datagram each field.	Understand the requirements of IPv4 datagram fields	Lecture	CO3	2nd Sessional ET Exam Home Assignment
23	Types of messages, message format of IPV4 datagram	Identify the different type of messages and their codes	Lecture	CO3	2nd Sessional ET Exam Home Assignment
24	IPV4 Error reporting, Query, Checksum	Identify the different type of messages and their codes	Lecture	CO3	2ndSessional ET Exam Home Assignment
25	Internet control protocols: ICMP	Identify the ICMP protocol's fields and their importance	Lecture	CO3	2ndSessional ET Exam Home Assignment
26	Address Resolution ARP & RARP	Understand the basic requirement of packet delivery mechanism and associated protocols such as ARP and RARP	Lecture	CO3	2ndSessional ET Exam Home Assignment
27	Multicasting Protocols: IGMP	Implement the IGMP protocol	Lecture	CO3	2nd Sessional ET Exam Home Assignment
28	Introduction to IPV6-header	Understand the Ipv6 requirement	Lecture	CO3	
29	Types and purpose of Extension headers	Identify different type of extension header	Lecture	CO3	2ndSessional ET Exam Home Assignment

30	Transition from IPv4-v6	Understand the transition of IPv4 to IPv6 and vis-a-versa	Lecture		
31	Transport services	Independently understand the requirement and services of Transport layer	Lecture	CO4	2nd Sessional
32	Explanation of State diagram of Transport Layer transmission	Familiarity with the basic state diagrams if TL	Lecture	CO4	
33	*Elements of Transport Protocols*: addressing	Understand the concept of Port addressing and requirements	Lecture	CO4	2nd Sessional ET Exam Home Assignment
34	Connection establishment, connection release	Clearly understand the concept of 3 way handshake protocol	Lecture	CO4	2nd Sessional
35	Functioning of Error control and Flow Control	Implementation of Error control techniques	Lecture	CO4	
36	Crash Recovery, Multiplexing	Configuration of crash recovery procedure on TL	Lecture	CO4	2nd Sessional ET Exam Home Assignment
37	*Congestion Control:* Bandwidth allocation	Describe the bandwidth allocation procedure	Lecture	CO4	
38	*Introduction to UDP and* UDP header	Differentiate between UDP and TCP services and their applications	Lecture	CO4	2nd Sessional
39	*TCP:* TCP service model, TCP segment header	Enumerate the TCP service model and its header fields	Lecture	CO4	2nd Sessional ET Exam Home Assignment
40	TCP connection establishment, TCP connection release,	Identify the Connection establishment procedure and connection release concept.	Lecture	CO4	2nd Sessional
41	TCP window management, Timer management.	Clearly understand the need of TCP window and traffic management	Lecture	CO4	
In the I-Sessional Exam students' knowledge will be assessed up to lecture number 41					
42	*Introduction to DNS:* Name space	Understand and Explain DNS and its working functionality	Lecture	CO5	End Term Exam
43	Domain resource records	Understand the basic concept of DRR	Lecture	CO5	End Term Exam
44	*Electronic Mail:* SMTP, POP, IMAP, MIME	Understand and Explain SMTP, POP, IMAP, MIME	Lecture	CO5	End Term Exam
45	Application Layer Protocols HTTP, HTTPS	Understand and Explain HTTP and HTTPS	Lecture	CO5	End Term Exam
46	Network Management Protocol: SNMP	Understand and Explain DNS and its working functionality	Lecture	CO5	End Term Exam

47	Security Goals of Computer Networks	Understand the security requirements in unsecure network	Lecture	CO5	End Term Exam
48	CIA, Types of Attacks	Understand different type of attacks	Lecture	CO5	End Term Exam
49	Attack prevention techniques	Identify different type of prevention techniques	Lecture	CO5	End Term Exam
50	Firewall, IDS, DMZ	Understand the IDS and DMZ	Lecture	CO5	End Term Exam
51	IPsec Protocol	**Understand IPsec Protocol**	Lecture	CO5	End Term Exam
END TERM EXAM					

H. Course Articulation Matrix: (Mapping of COs with POs & 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]	Configure and Implement various protocols stacks models such as OSI, TCP/IP model, IPv4, IPv6, IP addressing, Subnetting, IPV6 transitions in order to acquire more employability options.	2		3		3								3	1	2	
[CS1602.2]	Analyse and Implement the Routing and its types.			2										1	1	3	
[CS1602.3]	Analyse and Implement the Internet control protocols and congestion Control.					1								1	1		
[CS1602.4]	Analyse the Transport Layer and Its protocols, 3way handshake protocol					1								1	1		1

[CS1602.5]	Describe the Application Layer, its protocols and Network Security.													1	1		1

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

MANIPAL UNIVERSITY JAIPUR

School of Computing & Information Technology

DEPARTMENT OF COMPUTER & COMMUNICATION ENGG.

Course Hand-out

Wireless Communication | CC1601| 4 Credits | 3 1 0 4

Session: Jan 2020-May 2020 | Faculty: Dr Amita Nandal and Dr Gulrej Ahmed| Class: B.Tech VI SEM

A. **Introduction:** The objective of this course is to introduce the concepts of wireless communication using cellular environment. The course is designed to impart in-depth understanding of technologies & contribution of wireless communication to overall scientific growth. The main objectives of this course are to provide the knowledge of the different types of wireless communication systems, requirements for the wireless services & cellular radio fundamental concepts, to review the analog/digital modulation & different types of signal processing techniques like equalization, diversity used in wireless communication, to analyse the advanced transceiver schemes; Cellular Code Division Multiple Access systems, Orthogonal Frequency Division Multiplexing, 3rd , 4th Generation wireless networks & standards.

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

[CC1601.1] Find solutions for the technical challenges in wireless communication systems and various types of wireless services.

[CC1601.2] Formulate the radio propagation models, path loss models, signal fading and large scale effects of radio propagation in many operating environment.

[CC1601.3] Formulate mathematical relationships for frequency reuse, handoff, Co-channel interference and capacity of cellular systems.

[CC1601.4] Analyse modulation/demodulation & signal-processing techniques in wireless communication systems.

[CC1601.5] Analyse the wireless transceiver schemes; Cellular Code Division Multiple Access systems, Orthogonal Frequency Division Multiplexing, 3rd, 4th Generation networks & standards.

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

D. PROGRAM SPECIFIC OUTCOMES

[PSO.1]. Should be able to clearly understand the basic principles, concepts and applications in the field of computer based Communication/networking, information sharing, signal processing, web based systems, smart devices and communication technology.

[PSO.2]. Should be able to nail down the issues prevalent in the field of Computer and Communication Engineering.

[PSO.3]. Should be able to identify the existing open problems in the field of computing and propose the best possible solutions.

[PSO.4]. Should be able to apply the contextual knowledge in the field of computing and communication to assess social, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional engineering practice.

E. Assessment Plan:

<table>
<tr><th>Criteria</th><th>Description</th><th>Maximum Marks</th></tr>
<tr><td rowspan="3">Internal Assessment
(Summative)</td><td>Sessional Exam I (Closed Book)</td><td>15</td></tr>
<tr><td>Sessional Exam II (Closed Book)</td><td>15</td></tr>
<tr><td>In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)</td><td>30</td></tr>
<tr><td>End Term Exam
(Summative)</td><td>End Term Exam (Closed Book)</td><td>40</td></tr>
<tr><td></td><td>Total</td><td>100</td></tr>
<tr><td>Attendance
(Formative)</td><td colspan="2">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.</td></tr>
<tr><td>Make up Assignments
(Formative)</td><td colspan="2">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.</td></tr>
<tr><td>Homework/ Home Assignment/ Activity Assignment
(Formative)</td><td colspan="2">There are situations where a student may have to work at for activity/assignment. However, a student is expected to participate and perform these assignments with full zeal since the activity participation by a student will be assessed and marks will be awarded.</td></tr>
</table>

F. SYLLABUS

Introduction: Types of Services, Requirements for the services, Multipath propagation, Parameters of mobile multipath channels, Spectrum Limitations, Noise and Interference limited systems, Principles of Cellular networks, Multiple Access Schemes. Large scale path loss, Path Loss Models, Signal Fading: Fast Fading, Slow Fading, Fading due to Doppler Spread. Wireless Propagation Channels: Propagation Mechanisms (Qualitative treatment), Propagation effects with mobile radio, Channel Classification, Link calculations, Narrowband and Wideband models;

Wireless Transceivers: Structure of a wireless communication link, Modulation and demodulation – Quadrature Phase Shift Keying (QPSK), p/4Differential Quadrature Phase Shift Keying (DQPSK), Offset-Quadrature Phase Shift Keying, Binary Frequency Shift Keying, Minimum Shift Keying, Gaussian Minimum Shift Keying, Power spectrum and Error performance in fading channels;

Signal Processing in Wireless Systems: Principle of Diversity, Macro diversity, Micro-diversity, transmitter diversity, receiver diversity, spatial multiplexing, Signal Combining Techniques, Transmit diversity, Equalizers- Linear and Decision Feedback equalizers, Review of Channel coding and Speech coding techniques;

Advanced Transceiver Schemes: Spread Spectrum Systems- Cellular Code Division Multiple Access Systems- Principle, Power control, Effects of multipath propagation on Code Division Multiple Access, Orthogonal Frequency Division Multiplexing – Principle, Cyclic Prefix, Transceiver implementation, 2nd Generation (GSM, IS–95), 3rd Generation and 4th Wireless Networks and Standards.

G. TEXT BOOKS

1. Molisch, A. F.: Wireless Communications (2nd Edition), John Wiley – India, 2013.
2. Stallings, W.: Wireless Communication and Network (2nd Edition), Prentice Hall of India, 2010.

H. REFERENCE BOOKS

1. Agrawal, D. P. and Zeng, Q. A.: Introduction to Wireless and Mobile Systems (3rd Edition), Cengage Learning, 2017.
2. Rappaport, T. S.: Wireless Communications - Principle and Practice (2nd Edition), Prentice Hall of India, 2015

G. Lecture Plan:

Class Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1-5	Introduction: Types of Services, Requirements for the services, Multipath propagation, Parameters of mobile multipath channels, Spectrum Limitations, Noise and Interference limited systems	To find solutions for the technical challenges in wireless communication systems and various types of wireless services.	Lecture Interaction	[CC1601.1]	1st Sessional Exam, Quiz-1, End Term
6-12	Principles of Cellular networks, Multiple Access Schemes. Large scale path loss, Path Loss Models, Signal Fading: Fast Fading, Slow Fading, Fading due to Doppler Spread.	To acquaint with the fundamentals of cellular systems and wireless fading	Lecture Interaction	[CC1601.2]	1st Sessional Exam, Quiz-1, End Term
13-20	Wireless Propagation Models: Propagation Mechanisms (Qualitative treatment), Propagation effects with mobile radio, Channel Classification, Link calculations, Narrowband and Wideband models;	To formulate mathematical models for radio propagation environment	Lecture Interaction	[CC1601.2], [CC1601.3]	2nd Sessional, Quiz-2, End Term

21-25	Wireless Transceivers: Structure of a wireless communication link, Modulation and demodulation – Quadrature Phase Shift Keying (QPSK), p/4Differential Quadrature Phase Shift Keying (DQPSK),	To analyse modulation/demodulation & signal-processing techniques in wireless communication systems.	Lecture Interaction	[CC1601.4]	2nd Sessional, Quiz-3, End Term
26-30	Offset-Quadrature Phase Shift Keying, Binary Frequency Shift Keying, Minimum Shift Keying, Gaussian Minimum Shift Keying, OFDM, Power spectrum and Error performance in fading channels;	To analyse modulation/demodulation & signal-processing techniques in wireless communication systems.	Lecture Interaction	[CC1601.4], [CC1601.5]	2nd Sessional, Quiz-3, End Term
31-37	Signal Processing In Wireless Systems: Principle of Diversity, Macro diversity, Micro-diversity, transmitter diversity, receiver diversity, spatial multiplexing, Signal Combining Techniques, Transmit diversity,	To acquaint with signal processing principles in wireless communication systems	Lecture Interaction	[CC1601.4], [CC1601.5]	2nd Sessional, Quiz-4, Assignment, End Term
38-45	Advanced Transceiver Schemes: Spread Spectrum Systems- Cellular Code Division Multiple Access Systems- Principle, Power control, Effects of multipath propagation on Code Division Multiple Access	To acquaint with spread spectrum systems	Lecture Interaction	[CC1601.4], [CC1601.5]	Assignment, Quiz-5, End Term
45-50	2nd, 3rd and 4th Generation Wireless Networks and Standards.	To analyse 3rd, 4th Generation networks & standards	Lecture Interaction	[CC1601.5]	End Term, Assignment, Quiz-5, End Term

H. Course Articulation Matrix: (Mapping of COs with POs & 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
CC1601.1	To find solutions for the technical challenges in wireless communication systems and various types of wireless services.	3	3	3									3	3	3	3	
CC1601.2	To formulate the radio propagation models, path loss models, signal fading and large scale effects of radio propagation in many operating environment.	3	3	3	3	3							3	3	3	3	
CC1601.3	To formulate mathematical relationships for frequency reuse, handoff, Co-channel interference and capacity of cellular systems.	3	3	3	3	3							3	3	3	3	
CC1601.4	To analyse modulation/demodulation & signal-processing techniques in wireless communication systems.	3	3	3	3	3							3	3	3	3	
CC1601.5	To analyse the wireless transceiver schemes; Cellular Code Division Multiple Access systems, Orthogonal Frequency Division Multiplexing, 3rd, 4th Generation networks & standards.	3	3	3	3	3							3	3	3	3	

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

MANIPAL UNIVERSITY JAIPUR

School of Computing & Information Technology

DEPARTMENT OF COMPUTER & COMMUNICATION ENGG.

Course Hand-out

Computer Networks Lab | CS1631| 1 Credits | 0 0 2 1

Session: Jan 20-May 20 | Faculty: Dr. Arvind Dhaka| Class: B.Tech CCE VI SEM

A. Introduction: This course is offered by the Department of Computer Science Engineering . 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.

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

[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. Should be able to clearly understand the basic principles, concepts and applications in the field of computer based Communication/networking, information sharing, signal processing, web based systems, smart devices and communication technology.

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

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

PSO4. Should be able to apply the contextual knowledge in the field of computing and communication to assess social, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional engineering practice.

D. Assessment Plan:

Criteria	**Description**	**Maximum Marks**
Internal Assessment (Summative)	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.	

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. REFERENCE BOOKS

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

G. Lecture 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	CO1	Continuous Evaluation End Term Examination
2	Router Mode, Switch/Router basic commands	Understand router and switch basic modes	Lecture Demonstration at system	CO1 CO2	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	CO3	Continuous Evaluation End Term Examination
4	DHCP configuration	Understand DHCP and configuration	Lecture Demonstration at system	CO3	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	CO3	Continuous Evaluation End Term Examination
8	Configuration of VLAN and troubleshooting	Understand VLAN configuration and troubleshooting	Lecture Demonstration at system	CO4	Continuous Evaluation End Term Examination
9	NAT Protocol Configuration and troubleshooting	Understand NAT and its configuration	Lecture Demonstration at system	CO5	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	CO6	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	CO7	Continuous Evaluation End Term Examination

H. Course Articulation Matrix: (Mapping of COs with POs & 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	PSO4
[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

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

MANIPAL UNIVERSITY JAIPUR

School of COMPUTING & INFORMATION TECHNOLOGY

DEPARTMENT OF COMPUTER AND COMMUNICATION ENGG

Course Hand-out

Unix Shell Programming | CC16301 | 41Credits | 0 0 2 1

Session: Jan-20 -May 20 | Faculty: Gaurav Prasad, Dr.Muthukumaran | Class VI SEM

A. **Introduction:** This course is offered by the Department of computer and communication engineering as lab for the students is to familiarize students with introduction to UNIX as a development platform. This course provides an introduction to the full range of UNIX user commands and utilities. It also discuss about the shell programming concept and deals with in detail about the shell programming in UNIX shell environment. Overall the course covers, through basic shell commands to shell programming.

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

[CC 1630.1] The basic knowledge and concept of UNIX as a development platform with importance on basic commands with its usage in the field of computing.

[CC 1630.2] Use tools and utilities in UNIX, performing and understanding the working and usage of these tools for real world applications.

[CC 1630.3] Identifying and applying appropriate technique to solve real time problems.

[CC 1630.4] Perform experiments to analyse the performance and applicability of learned utilities and shell programming.

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 techniqu es and communication engineering principles.

[PO.3]. **Design/development of solutions:** Upon analysing, the B Tech CCE graduate should be able to devise solutions for complex engineering problems and design system components or processes that meet the specified requirements with appropriate consideration for law, safety, cultural & societal obligations with environmental considerations.

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

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

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

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

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

[PO.9]. **Individual and team work:** United we grow, divided we fall is a culture at MUJ. Thus an outgoing student should be able to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

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

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

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

[**PSO.1] Understand :** Should be able to clearly understand the basic principles, concepts and applications in the field of computer based Communication/networking, information sharing, signal processing, web based systems, smart devices and communication technology.

[PSO.2] Critically analyse and interpret Should be able to nail down the issues prevalent in the field of Computer and Communication Engineering.

[PSO.3] Write Should be able to identify the existing open problems in the field of computing and propose the best possible solutions.

[PSO.4] Develop. Should be able to apply the contextual knowledge in the field of computing and communication to assess social, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional engineering practice.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Two Test	40
	Viva	20
	File/Record	10
	Total	70
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

General Unix Commands: as cal, date, echo, printf, bc, script, mailx, passwd,who; File System: file handling commands such as cat, cp, rm, mv, more, wc, cmp, diff, gzip ,gunzip, tar, zip, unzip, mkdir, rmdir, pwd, cd, File attributes, ownerships, permissions; The Process Basics, ps, Internal an d external commands, Process states and zombies, nice, at, mesg, cron, time, top; Network Commands: Telnet, ipconfig, ping, netstat, firewalls, System configurations. The vi editor Basics, Input mode and The ex mode, Navigation, Editing text; The Shell and Shell programming: The Shell's interpretive cycle, Shell offering, Pattern Matching, Three Standard Files, Two special files, pipes, tee, Shell scripts. Debuggers and compilers.

F. REFERENCE BOOKS

1. S. Das, "Unix Concepts and Applications", 4th Edition, McGraw Hill, 2006
2. Y Kanitkar, "Unix shell programming", BPB Publications; 1st edition 2003.
3. W. R. Stevens, S. A. Rago, "Advanced Programming in the UNIX Environment", 3rd Edition, Addison-Wesley, 2013.

G. Lecture Plan:

LEC NO	TOPICS	Session Outcome Corresponding	Mode of Delivery	Corresponding CO	CO Mode of Assessing the Outcome
1	Basic Commands: cal, date, echo, who. Working with files: ls, cat, wc, cp, mv, rm. Working with Directories: pwd, cd, mkdir, rmdir.	Understand basic commands used for working in Unix Environment	Lecture Demonstration at system	CC1630.1 CC1630.3	Test 1 Viva
	File Compression/Decompression: gzip, bzip2, zip, tar, gunzip, bunzip2, unzip	• Working of Compression & Un compression	Demonstration of Compression & Un compression	CC1630.2 CC1630.4	Test 1 Viva
2	File attributes: ownerships, permissions; The Process Basics, ps, Internal and external commands, Process states and zombies, nice, at, mesg, cron, time, top.	• To identify the processes running at foreground, background and to kill the process	Demonstration and explanation about process	CC1630.2 CC1630.3 CC1630.4	Test2 Viva
3	Regular Expressions: The period(.), dollar($), caret(^), asterisk(*). cut, paste, sed, grep, sort, uniq.	• Identify the use of tools which is provided by Unix environment	Experimental demonstration and usage of the regular expression	CC1630.2 CC1630.4	Test2 Viva End Term Examination
4	Passing Arguments: The $#, $*, program to look up, add, remove entries in phonebook	• Understand passing of arguments	demonstration and usage of the parameter passing	CC1630.2 CC1630.3	Test2 Viva End Term Examination
5-7	Parameter substitution: ${parameter}, ${parameter:-value}, ${parameter:=value} and ${parameter:?value}. pattern matching constructs: ${variable%%pattern} ${variable#pattern} and ${variable##pattern}	• Use of passing arguments in the function	demonstration and usage of the parameter passing	CC1630.3 CC1630.4	Test2 Viva End Term Examination
8	Decisions: test: string, integer, file and logical operators, else, exit, elif and case.	• Understand working of decision making and if else statement in Unix shell programming Environment	Program execution of logical operators and usage of the parameter passing	CC1630.3 CC1630.4	Test2 Viva End Term Examination

9	Loops: For, while until. Breaking out from loop, Executing loop in background, I/O redirection, piping data into and out of loop.	• Usage of loops in Unix shell programming and also redirection	Program execution of loops operators and usage of the parameter passing	CC1630.3 CC1630.4	Test2 Viva End Term Examination
10	Reading and printing data: read, program to copy files, mycp, printf commands.	•Working on copy files and reading, writing on to the files	Demonstration of working with files	CC1630.3 CC1630.4	Test2 Viva End Term Examination
11-13	Network Commands: Telnet, ipconfig, ping, netstat, firewalls, System configurations. The vi editor Basics, Input mode and The ex mode, Navigation, Editing text;	• Understand basic commands related to networking in Unix Environment	Demonstration and experiments of usage of network utility tools	CC1630.2 CC1630.3 CC1630.4	Test 2 Viva End Term Examination

H. Course Articulation Matrix: (Mapping of COs with POs & 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
[CC1630.1]:	The basic knowledge and concept of UNIX as a development platform with importance on basic commands with its usage in the field of computing.	2		1		1			1	2	1	1	1	2			1
[CC1630.2]:	Usage of tools and utilities in UNIX performing and understanding the working and usage of these tools for real world applications.	2	1	1	1	3								1			
[CC1630.3]:	Identifying and applying appropriate technique to solve real time problems.		2	1	1	1								1	2	3	1
[CC1630.4]:	Perform experiments to analyse the performance and applicability of learned utilities and shell programming.		2	2	3						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 COMPUTER AND COMMUNICATION ENGINEERING

Course Hand-out

Minor Project | CC 1634 | 3 Credits | 3 0 0 3

Session: Jan 20-May 20 | Faculty: Dr. Punit Gupta | Class: VI SEM

A. **Introduction:** This course is offered by the Department of Computer and Communication Engineering as in this practical course, each group consisting of two/three members is expected to design and develop practical solutions to real life problems related to industry, institutions and computer science research. Software life cycle should be followed during the development. The theoretical knowledge, principles and practices gained from various subjects would be applied to develop effective solutions to various computing problems. The knowledge gained to work with various software tools, Designing tools, programming languages, operating systems, etc. would be utilized in various stages of project. Structured/ Object Oriented design techniques may be used for the project. Software Requirements Specification (SRS), Modeling Techniques, Design and Testing strategies would be part of document of the work. A committee consisting of minimum three faculty members shall perform internal assessment of the minor projects. A report on minor project would be submitted for evaluation, Project work would be presented and demonstrated before the panel of examiners.

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

[CC 1634.1] Identify the basic of the concepts related to the selected topics of the project and also identify the open issues.

[CC 1634.2] Identify the depth of the problem and to propose the solution.

[CC 1634.3] Analyse the use of software tools, reporting and implementation.

[CC 1634.4] Solve real time problem and contribute to open community with ethical values by understanding systematic study.

[CC 1634.5] Plan the work in team with proper contribution from individual and managing lifelong learning.

[CC 1634.5] Demonstrate software development skills and practices.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

[PO.3]. **Design/development of solutions:** Upon analysing, the B Tech CCE graduate should be able to devise solutions for complex engineering problems and design system components or processes that meet the specified requirements with appropriate consideration for law, safety, cultural & societal obligations with environmental considerations.

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

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

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

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

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

[PO.9]. Individual and team work: United we grow, divided we fall is a culture at MUJ. Thus an outgoing student should be able to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

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

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

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

[PSO.1]. Should be able to clearly understand the basic principles, concepts and applications in the field of computer based Communication/networking, information sharing, signal processing, web based systems, smart devices and communication technology.

[PSO.2]. Should be able to nail down the issues prevalent in the field of Computer and Communication Engineering. Should be able to identify the existing open problems in the field of computing and propose the best possible solutions.

[PSO.3]. Should be able to identify the existing open problems in the field of computing and propose the best possible solutions.

[PSO.4]. Should be able to apply the contextual knowledge in the field of computing and communication to assess social, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional engineering practice.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	I progress Presentation	15
	II progress Presentation	15
	Guide Marks	30
End Term Exam (Summative)	End Term Presentations	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work at home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

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

CO	STATEMENT	Correlation with Program Outcomes **(POs)**												Correlation with Program Specific Outcomes (**PSOs**)			
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
[CC1634.1]	Identify the basic of the concepts related to the selected topics of the project and also identify the open issues.	**2**	**2**		**2**									**2**	**2**	**1**	**1**
[CC1634.2]	To identify the depth of the problem and to propose the solution.		**1**	**1**	**1**											**1**	**1**
[CC1634.3]	Solve real time problem and contribute to open community with ethical values by understanding systematic study.	**1**	**1**	**1**	**1**	**3**									**1**		
[CC1634.4]	Design and execute the web based solutions pertaining to any real life need.				**1**	**1**		**1**									
[CC1634.5]	Work in team with proper contribution from individual and managing lifelong learning.					**1**	**1**		**1**	**1**	**1**	**1**	**1**				
[CC1634.6]	Learning software development skills and practices.	**1**	**2**	**3**											**1**	**1**	**1**

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

DEPARTMENT OF COMPUTER AND COMMUNICATION ENGINEERING

Course Hand-out

Advanced Internet Technology | CC 1652| 3 Credits | 3 0 0 3

Session: Jan 20-May 20 | Faculty: Dr. Punit Gupta | Class: VI SEM

A. **Introduction:** This course is offered by the Department of Computer and Communication Engineering as the main objective of this course is to familiarize students with the basics of Web, Web clients and servers with working of HTTP. It also gives the insight of developing static and dynamic Web pages to serve as front-end to client/server applications, and effective server side programming while introducing event-driven system programming. The course also covers basics of XML, Ajax, JavaScript, and recent trends in the area of web technology.

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

[CC 1652.1] Identify and describe various basic concepts of Advanced Internet technology.

[CC 1652.2] Design client /server program.

[CC 1652.3] Identify and perform various kinds of data validation to foster the processing

[CC 1652.4] Design and execute the web based solutions pertaining to any real life need.

[CC 1652.5] Relate working of web in real world with recent trends.

[CC 1652.5] Design and execute advanced web development techniques.

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

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

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

[PO.3]. **Design/development of solutions:** Upon analysing, the B Tech CCE graduate should be able to devise solutions for complex engineering problems and design system components or processes that meet the specified requirements with appropriate consideration for law, safety, cultural & societal obligations with environmental considerations.

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

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

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

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

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

[PO.9]. Individual and team work: United we grow, divided we fall is a culture at MUJ. Thus an outgoing student should be able to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

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

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

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

[PSO.1]. Should be able to clearly understand the basic principles, concepts and applications in the field of computer based Communication/networking, information sharing, signal processing, web based systems, smart devices and communication technology.

[PSO.2]. Should be able to nail down the issues prevalent in the field of Computer and Communication Engineering. Should be able to identify the existing open problems in the field of computing and propose the best possible solutions.

[PSO.3]. Should be able to identify the existing open problems in the field of computing and propose the best possible solutions.

[PSO.4]. Should be able to apply the contextual knowledge in the field of computing and communication to assess social, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional engineering practice.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	15
	Sessional Exam II (Closed Book)	15
	In class Quizzes and/or Assignments , Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Open Handwritten Notes)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work at home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

Introduction: Need for web, Basic concepts, web design fundamentals, website Strategy and planning, web testing tools, web server structure, maintenance, Criteria for navigation of web pages, development and development of the web pages, AJAX, Web sockets, WebRTC;

Client side technologies: Client Side Architecture, Browsers (IE, Mozilla, Firefox), Browser Extensions – Mime Types, Plugins, Controls, add-ons, XHTML, CSS, JavaScript, Generation and Handling of Dynamic Web pages, Action script, Silver light, HTML5 and CSS3, Ajax, Session Tracking Techniques on Client-side, Security issues, Rich Internet Applications;

XML: Xml basics, document object model, DTD and schemas, xml namespaces, xml for representation and for display – path and XSLT, xml DOM, XML manipulation, XML Ajax, xml DTD XSD schema XSD, complex XSD data;

Web/Application/Database Servers: Structure, Architecture of web servers with working (IIS , Apache) , Installation and configuration of Web Servers, Security Aspects, Deployment of Web Pages, Maintenance and monitoring of Web pages; Case study: IIS / Apache / Tomcat / MSSQL/Apache/ LAMP/ WAMP/ MySQL Servers. App development issues, challenges, solutions, simulators, Tools for designing web applications;

Advanced topics: E-Commerce Basics, Models and Architecture; m-Commerce: WAP and Mobile Agents, Search Engines and Search Engine Optimization, Introduction to Web Services.

F. REFERENCE BOOKS

1. Jackson, Jeffrey C. "Web Technologies: a computer science perspective", Pearson Prentice Hall, 2006.
2. R. Kamal, "Web Technology", 2nd Edition, McGraw-Hill, 2001.

G. Lecture Plan:

Class Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1	Introduction and Course Hand-out briefing	To acquaint and clear teachers expectations and understand student expectations	Lecture	NA	NA
2,3	Introduction of Web Development process: Need for web, Basic concepts, web design fundamentals, website Strategy and planning,	Inderstanding web development principal and basics	Lecture	1652.1	Class Quiz Mid Term I
4,5	Client side programming - Web application Design Lifecycle, Web page design and production, Web Markup Languages – What is markup, why markup,	describe and identify various web development platforms and programming languages	Lecture	1652.1	Class Quiz Mid Term I
6,7	Intro to HTML and Deficiencies of HTML, Using XHTML – Basic syntax and semantics, fundamental elements, URLs –Interpage and Intrapage	learn and design html pages	Lecture	1652.1	Class Quiz Mid Term I
8	Linking, Lists, Tables, Frames and Forms.,	learn html table and form tags	Lecture	1652.2	Class Quiz Mid Term I End Term
9,10,11	HTML Document Object Model (DOM), Styling with CSS, Introduction to HTML5 and CSS3,	Learn CSS for designing web pages	Lecture	1652.2	Class Quiz Mid Term I End Term

12,13	AJAX: Introduction, Ajax XMLHttp, AJAX request,	Learn dynamic web page design concepts.	Lecture	1652.2	Class Quiz	Mid Term I	
14,15	Client side dynamic programming with JavaScript – Basics, Primitives, Loops, ,	Understanding scripting language.	Lecture	1652.2	Class Quiz	Mid Term I	End Term
16,17	Decision making and event handling	Understanding scripting language for event handling.	Lecture	1652.2	Class Quiz	Mid Term I	
18,19	Screen Output and Keyboard Input, Arrays and Functions, Event Handling, Pattern Matching	Understanding scripting language and its various functionality	Lecture	1652.2	Class Quiz	Mid Term II	End Term
20	Java Script and event handling	Understanding scripting language for event handling.	Lecture	1652.2	Class Quiz	Mid Term II	
21	Form Validation with Regular Expressions, ajax with java script	learn and design form validation in javascript	Lecture	1652.3	Class Quiz	Mid Term II	
22	Server side programming - Three Tier Model, PHP – Basics, Form Validation,	Understanding scripting language for server side scripting	Lecture	1652.3	Class Quiz	Mid Term II	
23,24	PHP database connection validation	Learning php and data base	Lecture	1652.3	Class Quiz	Mid Term II	
25,26	Transactions in php	Understanding transaction in PHP	Lecture	1652.4	Class Quiz	Mid Term II	
27-28	looping & event handling	Design and execute the concept of looping	Lecture	1652.4	Class Quiz	Mid Term II	
29-30	Emailing Form Data Addressing the Stateless Nature of HTTP -Sessions and Session Tracking techniques	understanding session management using php	Lecture	1652.4	Class Quiz	Mid Term II	End Term
31-32	XML – Syntax and Semantics, Document Structure,	learn and design XML messages	Lecture	1652.4	Class Quiz	Mid Term II	
33	DTDs, Need for Namespaces, XML Schemas,	learn and design DTD for XML	Lecture	1652.4	Class Quiz		End Term

34-35	Navigating XML documents with XPath, Displaying XML documents with CSS and XSLT.	learn and design N documents XPath XML	Lecture	1652.5	Class Quiz	End Term
36-37	Jquery: Introduction	learn and design Jquery for dynamic cntent	Lecture	1652.5	Class Quiz	End Term
38	Jquery and its functioning	describe and identify jquery components	Lecture	1652.5	Class Quiz	End Term
39-40	Angular JSP, NodeJS, JSON	learn and design NodeJS	Lecture	1652.5	Class Quiz	End Term
41-42	Bootstrap	learn and design Bootstrap	Lecture	1652.5	Class Quiz	End Term

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

CO	STATEMENT	Correlation with Program Outcomes **(POs)**												Correlation with Program Specific Outcomes (**PSOs**)			
		PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
[CC1652.1]	To identify and describe various basic concepts of Advanced Internet technology.	**1**												**1**			
[CC1652.2]	To practice client /server programming	**2**	**2**	**2**	**1**										**1**		
[CC1652.3]	To identify and perform various kinds of data validation to foster the processing		**1**												**2**		
[CC1652.4]	To design and execute the web based solutions pertaining to any real life need.			**2**	**1**							**1**	**2**		**2**	**2**	
[CC1652.5]	To identify working of web in real world and recent trends.	**1**			**1**	**1**							**2**	**2**		**1**	
[CC1652.6]	To design and execute advanced web development techniques.	**2**	**2**	**2**	**1**	**3**							**1**	**3**	**2**	**3**	

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and IT

DEPARTMENT OF COMPUTER AND COMMUNICATION ENGINEERING

Course Hand-out

Internet of Things| CC 1653 | 3 Credits | 2 1 0 3

Session: Jan 20 – May 2018 | Faculty: Dr Kusum Lata Jain | Class: B.Tech. CCE IV SEM

A. **Introduction:** The future Internet will comprise not only millions of computing machines and software services but also billions of personal and professional devices, diminutive sensors and actuators, robots, and so on, and trillions of sentient, smart, and digitized objects. It is an overwhelmingly accepted fact that the fast-emerging and evolving Internet of Things (IoT) idea is definitely a strategic and highly impactful one to be decisively realized and passionately sustained with the smart adoption of the state of-the-art information communication technology (ICT) infrastructures, a bevy of cutting-edge technologies, composite and cognitive processes, versatile and integrated platforms, scores of enabling tools, pioneering patterns, and futuristic architectures. Industry professionals and academicians are constantly looking out for appropriate use and business and technical cases in order to confidently and cogently proclaim the transformational power of the IoT concept to the larger audience of worldwide executives, end users, entrepreneurs, evangelists, and engineers.

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

[CC 1653.1] To explain the vision of IoT from a global context.

[CC 1653.2] To demonstrate sensors and embedded systems work.

[CC 1653.3] To demonstrate how the IoT devices communicate.

[CC 1653.4] To explain storage, analysis and visualize sensor data.

[CC 1653.5] To design end-to-end IoT applications.

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

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

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

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

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

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

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

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

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

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

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

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

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

[PSO.1]. Should be able to clearly understand the basic principles, concepts and applications in the field of computer based Communication/networking, information sharing, signal processing, web based systems, smart devices and communication technology.

[PSO.2]. Should be able to nail down the issues prevalent in the field of Computer and Communication Engineering.

[PSO.3]. Should be able to identify the existing open problems in the field of computing and propose the best possible solutions.

[PSO.4]. Should be able to apply the contextual knowledge in the field of computing and communication to assess social, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional engineering practice.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	15
	Sessional Exam II (Closed Book)	15
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Closed Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

E. SYLLABUS

Introduction: read data sheet, analog and digital signals, serial communication, RF and sensors; Introduction to JSON/XML; Database Basics: create database, tables, SQL queries; Programming on Development Boards: Understanding of the board, tool chain and development environment setup; Sensors and Actuators: Understanding and using analog, digital, SPI, UART, I2C; Nodes and communication protocols: Understanding usage of nodes and gateways for sensor communication and external communication, RF, Zigbee, BT, WI-FI, GSM; IoT Cloud Platform, Cloud using Web Services, Cloud Computing Services for Sensor Management, Python Script; Big Data Analytics: Mongo DB, Map Reduce, Using cloud APIs for analytics, Visualization, NVD3, Mobile interfacing.

F. REFERENCE BOOKS

1. V. Madisetti, A. Bahga, "Internet of Things: A Hands-On- Approach", 1st Edition, VPT, 2014.
2. Rajkumar Buyya, Amir Vahid Dastjerdi, "Internet of Things Principles and Paradigms", 2016.
3. Hwaiyu Geng, "Internet of Things Principles and Data Analytics Handbook", Wiley, 2017.
4. Pethuru Raj, Anupama C. Raman, "The Internet of Things Enabling Technologies, Platforms, and Use Cases", CRC Press, 2017.

G. Lecture Plan:

Class Number	Topics	Sessional Outcomes	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1.	Introduction to IoT, definition and characteristics of IoT	To Define IoT	Lecture	CO1	Ist Sessional , Quiz & ET Exam
2.	Physical design of IoT, Things in IoT, IoT Protocols	To Identify Physical Design of IoT	Lecture	CO1	Ist Sessional , Quiz & ET Exam
3.	Logical design of IoT, IoT Functional Blocks, IoT Communication Models	To Identify Logical and Functional Design of IoT	Lecture	CO1	Ist Sessional , Quiz & ET Exam
4.	IoT Communication APIs, Brief about IoT Enabling Technologies-Wireless Sensor Networks, Cloud	To Explain Basic Components of IoT	Lecture	CO1	Ist Sessional , Quiz & ET Exam
5.	IoT Levels and Deployment Templates, IoT Level 1, IoT Level 2, IoT Level 3, IoT Level 4, IoT Level 5, IoT Level 6.	To Identify Level of IoT	Lecture	CO1	Ist Sessional , Quiz & ET Exam
6.	Domain Specific IoTs & their applications- Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health and Lifestyle.	To Explain IoT Application	Flipped Class	CO1	Ist Sessional , Quiz & ET Exam
7.	Domain Specific IoTs: Agriculture, Industry, Health and Lifestyle.	To Explain IoT Application	Flipped Class	CO1	Ist Sessional , Quiz & ET Exam
8.	Introduction, Difference between IoT and M2M	To Explain M2M	Lecture	CO2	Ist Sessional , Quiz & ET Exam
9.	SDN and NFV for IoT	To Explain SDN and NFV	Lecture	CO2, CO3	Ist Sessional , Quiz & ET Exam
10.	IoT Design Methodology- Purpose and Requirements Specifications, Process Specification	To identify Purpose and Requirement	Lecture	CO3, CO5	Ist Sessional , Quiz & ET Exam

11.	IoT Level Specification, Functional View Specification,	To define Level Specification , Functional and operational view	Lecture	CO3, CO5	Ist Sessional , Quiz
12.	Application Development & Introduction to Node	To define Application development for IoT and Node requirement	Lecture	CO3, CO5	Ist Sessional , Quiz, Assignment & ET Exam
13.	IoT Systems- Logical Design using Python, Python Data Types and Data Structure	To define python data type & structure	Lecture	CO3, CO5	Ist Sessional , Quiz & ET Exam
14.	Python control flow, functions, packages, File Handling, Date/Time Operations.	To define Operations in Python	Lecture	CO3, CO5	Ist Sessional , Quiz & ET Exam
15.	Python Packages of Interest for IoT : JSON, XML, HTTPLib & URLLib, SMTPLib	To describe python packages for IoT	Activity	CO3, CO5	Ist Sessional , Quiz & ET Exam
16.	Arduino. Arduino Interfaces: Serial	To demonstrate Ardunio	Lecture & Activity	CO3, CO5	Ist Sessional , Quiz & ET Exam
FIRST SESSIONAL EXAM(14-18, Feb 2020)					
17.	Programming Arduino: Controlling LED, Interfacing various sensors with Arduino	To programme Ardunio	Lecture & Activity	CO3, CO5	IInd Sessional , Quiz, Assignment & ET Exam
18.	Interfacing various sensors with Arduino	To Demonstrate interfacing of sensor with Ardunio	Lecture & Activity	CO3, CO5	IInd Sessional , Quiz & ET Exam
19.	Interfacing various sensors with Arduino	To Demonstrate interfacing of sensor with Ardunio	Lecture & Activity	CO3, CO5	IInd Sessional , Quiz & ET Exam
20.	Raspberry pi Interfaces: Serial	To demonstrate Raspberry Pi Interfacing	Lecture & Activity	CO3, CO5	IInd Sessional , Quiz & ET Exam
21.	Interfaces: I2C	To demonstrate Raspberry Pi Interfacing	Lecture & Activity	CO3, CO5	IInd Sessional , Quiz & ET Exam

22.	Programming Raspberry pi: Controlling LED	To programme Raspberry pi	Lecture & Activity	CO3, CO5	IInd Sessional , Quiz & ET Exam
23.	Interfacing various sensors with Raspberry pi	To Demonstrate interfacing of sensor with Raspberry pi	L Lecture & Activity	CO3, CO5	IInd Sessional , Quiz
24.	Interfacing various sensors with Raspberry pi	To Demonstrate interfacing of sensor with Raspberry pi	Lecture & Activity	CO3, CO5	IInd Sessional , Quiz & ET Exam
25.	Introduction to cloud storage	To define Cloud Storage	Lecture	CO4	IInd Sessional , Quiz & ET Exam
26.	Cloud storage models	To explain storage Model	Lecture	CO4	IInd Sessional , Quiz & ET Exam
27.	communication APIs	To explain communication API	Lecture	CO4	IInd Sessional , Quiz & ET Exam
28.	ThinkSpeak, Xively, AWS, Azure	To explain communication API	Lecture	CO4	IInd Sessional , Quiz & ET Exam
SENCOND SESSIONAL EXAM(3-7 APR 2020)					
29.	Python Web Application Framework- Django, MongoDB	To Explain Web Application Framework	Lecture	CO4	Quiz & ET Exam
30.	Django Architecture and development with Django	To Explain Web Application Framework	Lecture	CO4	Quiz & ET Exam
31.	Amazon Web Services for IoT	To Explain Web Service for IoT	Lecture	CO4	Quiz & ET Exam
32.	Amazon Web Services for IoT	To Explain Web Service for IoT	Lecture	CO4	Quiz & ET Exam
33.	Data Analytics for IoT: Apache Hadoop, MapReduce programming Model	To Explain Data Analytics	Lecture	CO4	Quiz, Assignment & ET Exam

34.	Different tools for IoT: Chef	To Explain Data Analytics	Lecture	CO4	Quiz & ET Exam
35.	Case Study of IoT Design- Home Automation, Cities, Environment,	To Identify IoT design	Flipped Class	CO5	Quiz & ET Exam
36.	Case Study of IoT Design Energy, Retail, Logistics, Agriculture,	To Identify IoT design	Flipped Class	CO5	Quiz & ET Exam
37.	Case Study of IoT Design- Industry, Health and Lifestyle.	To Identify IoT design	Flipped Class	CO5	Quiz & ET Exam
38.	Conclusion and Course Summarization	NA	Discussion	All	Quiz & ET Exam
END TERM EXAM (27-13 MAY, 2019)					

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

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES			
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
[CC 1653.1]	To explain the vision of IoT from a global context.	3		3		1						1		3			
[CC 1653.2]	To demonstrate sensors and embedded systems work	3	3	2	3						2		3		2		
[CC 1653.3]	To demonstrate how the IoT devices communicate			3	3					1				1		2	
[CC 1653.4]	To explain storage, analysis and visualize sensor data						2										3
[CC 1653.5]	To design end-to-end IoT applications			3						3		3				2	3

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

MANIPAL UNIVERSITY JAIPUR

School of COMPUTING & INFORMATION TECHNOLOGY

DEPARTMENT OF COMPUTER AND COMMUNICATION ENGG

Course Hand-out

Principles of software Engineering | CC1654 | 3 Credits | 3 0 0 3

Session: Jan 20 - May 20 | Faculty: Dr.Arjun Singh | Class VI SEM

A. **Introduction:** This course is offered by the Department of computer and communication engineering as elective subject for the students to familiarize students with the concepts, steps and building block of software engineering.it also provides knowledge about basic working of the organization, importance of requirement engineering. It helps them to analyse the requirement and create proper design document with the help of tools. The course also deals with testing to check whether software meets the requirements and also to estimate cost to build the software

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

[CC 1654.1] The basic knowledge and concept of Software Engineering and importance of requirement engineering to solve the real time problems

[CC 1701.2] Use of tools and utilities to create proper design document and also to check the quality of code.

[CC 1701.3] Design and develop the software based on the requirements.

[CC 1701.4] Identifying and applying appropriate technique to solve real time problems

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 techniqu es and communication engineering principles.

[PO.3]. **Design/development of solutions:** Upon analysing, the B Tech CCE graduate should be able to devise solutions for complex engineering problems and design system components or processes that meet the specified requirements with appropriate consideration for law, safety, cultural & societal obligations with environmental considerations.

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

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

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

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

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

[PO.9]. **Individual and team work:** United we grow, divided we fall is a culture at MUJ. Thus an outgoing student should be able to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

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

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

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

[**PSO.1] Understand :** Should be able to clearly understand the basic principles, concepts and applications in the field of computer based Communication/networking, information sharing, signal processing, web based systems, smart devices and communication technology.

[PSO.2] Critically analyse and interpret Should be able to nail down the issues prevalent in the field of Computer and Communication Engineering.

[PSO.3] Write Should be able to identify the existing open problems in the field of computing and propose the best possible solutions.

[PSO.4] Develop. Should be able to apply the contextual knowledge in the field of computing and communication to assess social, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional engineering practice.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	15
	Sessional Exam II (Closed Book)	15
	Video Assignment & Presentation	30
End Term Exam (Summative)	End Term Exam (Closed Book)	40
	Total	100
Attendance	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: Defining Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models. Basic Concept of Software Requirement Specifications (SRS): Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, information Modeling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, Software Quality Assurance (SQA): Verification and Validation, SQA Plans, Basic Concept of Software Design, Architectural Design, Low Level Design Modularization, Design Structure Charts, Pseudo Codes, Flow Chart. Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Testing: Testing Objectives, Unit Testing, integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products. Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code inspection, Compliance with Design and Coding Standards. Software Maintenance: Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance.

F. REFERENCE BOOKS

1. R. S. Pressman, "Software Engineering: A Practitioners Approach", McGraw Hill,2009
2. K.K. Aggarwal and Y. Singh, "Software Engineering", New Age International Publishers, 2008
3. P. Jalote, "Software Engineering", Wiley, 2010
4. I. Sommerville, "Software Engineering", Addison Wesley, 2013

G. Lecture Plan:

Lec No	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1-4	Introduction: Defining Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes.	Identify the need of Software Engineering, Identify about Software Crisis and Software Quality Attributes	Lecture	CC1654.1	Quiz
5-10	Software Development Life Cycle (SDLC) Models: Water Fall Model, Evolutionary model Prototype Model, Spiral Model, Iterative Enhancement , Component based model ,RAD (rapid application development),Agile model.	To identify & apply the Software model for the appropriate Project	Lecture	CC1654.1	Quiz MTE 1,2 End sem
11-15	Models Basic Concept of Software Requirement Specifications (SRS):Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, information Modeling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Documents	Identify the importance and relevance of Requirement Analysis To Draw the different diagrams which will lead to Design Development	Lecture	CC1654.1 CC1654.2 CC1654.3 CC1654.4	Quiz MTE 1,2 End sem
16-18	SoftwareQualityAssurance (SQA): Verification and Validation:	Identify and apply the Quality Assurance	Lecture	CC1654.1 CC1654.2 CC1654.3 CC1654.4	Quiz MTE 1,2 End sem
19-25	Basic Concept of Software Design: Architectural Design, Low Level Design Modularization, Coherence & coupling, Design Structure Charts, Pseudo Codes, Flow Chart. UML.Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Design patterns, General process to be followed for quality of code understanding MVC architecture.	Identify ,Apply the design to the real time Application Project	Lecture	CC1654.1 CC1654.2 CC1654.3 CC1654.4	Quiz MTE 2 End sem
26-30	Cost estimation: Product Metric and different estimation technique based on Functional Point, Loc and calculation time and cost based on size using COCOMO model	To Calculate the Cost incurred to develop the software and their techniques	Lecture	CC1654.1 CC1654.2 CC1654.3	Quiz MTE 2 End sem
31-36	Software Testing: Testing Objectives, Unit Testing, integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top Down and Bottom Up Testing	Apply testing techniques and identify the bugs and importance of testing phase	Lecture	CC1654.1 CC1654.2 CC1654.3 CC1654.4	Quiz MTE 2 End sem

	Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products. Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code inspection, Compliance with Design and Coding Standards.				
37-41	Software Configuration Management: An SCM Scenario, Elements of a Configuration Management System, Baselines, Software Configuration, SCM Repository, SCM Process, Configuration Audit	Identify the need of Software Configuration and management	Lecture	CC1654.1 CC1654.3 CC1654.4	Quiz End sem
42-46	Software Maintenance: Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance	To apply the techniques for Software Maintenance	Lecture	CC1654.1 CC1654.3 CC1654.4	Quiz End sem

H. Course Articulation Matrix: (Mapping of COs with POs & 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
[CC1654.1]:	The basic knowledge and concept of Software Engineering and importance of requirement engineering to solve the real time problems	2	1	1	1						1	1		1			1
[CC1654.2]:	Usage of tools and utilities to create proper design document and also to check the quality of code.		1	1	1	1											
[CC1654.3]:	. Design and develop the software based on the requirements		2	2	2		1				1	1	1			1	1
[CC1654.3]:	Identifying and applying appropriate technique to solve real time problems	2	2	2		1				1	1	1			1	1	

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

MANIPAL UNIVERSITY JAIPUR

School of COMPUTING & INFORMATION TECHNOLOGY

DEPARTMENT OF COMPUTER AND COMMUNICATION ENGG

Course Hand-out

Network Security | CC1701 | 4 Credits | 3 1 0 4

Session: July 19-Dec 19 | Faculty: Gaurav Prasad, Somya Goyal | Class VII SEM

A. **Introduction:** This course is offered by the Department of computer and communication engineering as core subject for the students who wish to pursue research & development in Network Security or higher studies in the field of Information Security, Network Security and Cryptography. Course offers in depth knowledge of Network attacks, network Security applications, internet security, issues in network security and the techniques to mitigate these attacks. Students are expected to have background knowledge on cryptography for the better understanding of subject.

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

[CC 1701.1] Identify some of the factors driving the need for network security and classify particular examples of attacks.

[CC 1701.2] Experiment different type of network security Applications and tools.

[CC 1701.3] Analyse and deploy network security devices to stop the attacks on the network

[CC 1701.4] Design security applications in the field of Information technology

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 techniqu es and communication engineering principles.

[PO.3]. **Design/development of solutions:** Upon analysing, the B Tech CCE graduate should be able to devise solutions for complex engineering problems and design system components or processes that meet the specified requirements with appropriate consideration for law, safety, cultural & societal obligations with environmental considerations.

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

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

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

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

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

[PO.9]. Individual and team work: United we grow, divided we fall is a culture at MUJ. Thus an outgoing student should be able to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

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

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

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

[**PSO.1]** Should be able to clearly understand the basic principles, concepts and applications in the field of computer based Communication/networking, information sharing, signal processing, web based systems, smart devices and communication technology.

[PSO.2] Should be able to nail down the issues prevalent in the field of Computer and Communication Engineering.

[PSO.3 should be able to identify the existing open problems in the field of computing and propose the best possible solutions.

[PSO.4] Should be able to apply the contextual knowledge in the field of computing and communication to assess social, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional engineering practice.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	15
	Sessional Exam II (Closed Book)	15
	Video Assignment & Presentation	30
End Term Exam (Summative)	End Term Exam (Closed Book)	40
	Total	100
Attendance	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

Basics of Network Security: Attacks, services and mechanisms; Network Security Applications: Kerberos, IPSec, SSL, TLS and VPN; Internet Security: Digital Certificate, PKI, Secure Electronic Payment System and Protocols, iKP protocol; Issues in Network Security and Tools: Man in the middle attack, Replay, ARP poisoning, DNS poisoning, web based attacks ; Firewalls and IDS: Need of firewalls, firewall characteristics and access policy, type of firewall, firewall basing, firewall location and configuration, Types of Intrusion detection System, working of IDS and policies; Malware, Virus, Worm, Trojan Horse: Introduction and working of malwares, Identifications and remedies.

F. REFERENCE BOOKS

1. W. Stallings, "Cryptography and Network Security Principles and Practice", 7th Edition, Pearson education, 2017.
2. Y. Qian, D. Tipper, P. Krishnamurthy, J. Joshi, "Information Assurance Dependability & Security in Networked Systems", 1st Edition, Morgan Kaufmann, 2010.

G. 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	Network Attacks, services and mechanism	Recall the network attacks and preventive Mechanism	Lecture	1701.1	MID term 1
4-6	Network Security Applications: Kerberos	Understanding of the Kerberos as KDC and Authentication protocol	Lecture	1701.2	Mid term-1, End Term, Video & Presentation
7-9	IPsec, Modes of IPSec	Understanding of IPSec architecture, operational modes	Lecture	1701.2	Video & Presentation Mid term-1
I Mid Term Examination					
10-12	IPSec Security Protocol, AH vs ESP, Services provided by ESP	Understanding of two security protocols (AH & ESP)	Lecture	1701.2	Mid term-1 End Term Video & Presentation
13	Security Association, Security association database	Recall IPSec Security association and database	Lecture	1701.2	Mid Term 1 End Term Video & Presentation
14-16	SSL introduction , SSL Architecture, Key exchange algorithm, Cryptographic parameter generation	Understand the need of security at TL layer, Structure of SSL	Lecture	1701.2	Mid Term 1 End term Video & Presentation
17	SSL Handshake protocol	Recall the handshake protocol functionality	Self-learning	1701.2	Video & Presentation End term
18-20	TLS version, cipher suite, generation of cryptographic secrets	Highlight the general structure of TLS and difference between SSL and TLS	Lecture and Activity (Think Pair Share)	1701.2	Mid Term 1 End Term Video & Presentation
21-24	Digital Certificate: Hash function, MD hash Family, whirlpool, SHA-512	Understand the process of creating Hash function, illustration of structure of whirlpool with example	Group Discussion	1701.2	Mid Term 1 End Term Video & Presentation

25-27	Digital Signature, differences between conventional signature and digital signature	Compare between conventional signature and digital signature, understand the process of digital signature	Flipped class	1701.2	Mid Term-I End Term
28-29	Public key Infrastructure, PKI Tust model, Mesh Model, hijacking	Infer the concept of PKI and key distribution	Lecture	1701.2	Mid Term II End Term
30-34	Secure Electronic Transaction (SET), SET participants, SET Process, SET Internals, Payment Authorization, Payment Capture, SET model	Describe the SET process and issues	Lecture	1701.2	Mid Term-11, End Term Video & Presentation
II Mid Term Examination					
35-37	Issues in Network Security: Man in middle attack, Replay Attack	Describe the working of MIM attack in different environment.	Lecture, Activity	1701.3	Mid Term II End Term Video & Presentation
38-41	ARP Poisoning, web based attacks	Simulation of ARP poisoning and web attacks	Lecture, Activity	1701.3	Mid Term II End Term Video & Presentation
41-43	Firewalls, type of firewalls, Firewall configurations, DMZ zones	Describe working of firewall and its deployment process	Lecture, activity	1701.4	Mid Term II End Term Video & Presentation
44-46	Intrusion Detection System, Signature based vs Anomaly based IDs	Infer the knowledge of IDS and working	Activity	1701.4	End Term
47-51	Introduction and working of malwares, warms, viruses , Identifications and remedies	Understanding the difference among various type of malicious code, and their neutralization process	Flipped Class	1701.4	End Term
52	Conclusion and Course Summarization	NA	NA		NA
END Term Examination					

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

CO	STATEMENT	Correlation with Program Outcomes **(POs)**												Correlation with Program Specific Outcomes (**PSOs**)			
		PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PS O4**
[CC1701.1]	Identify some of the factors driving the need for network security and classify particular examples of attacks.	**2**	**2**											**2**			
[CC1701.2]	Experiment different type of network security Applications and tools.		**2**	**2**	**1**									**1**			
[CC1701.3]	Analyse and deploy network security devices to stop the attacks on the network.				**1**			**2**								**2**	
[CC1701.4]	Design security applications in the field of Information technology												**3**				**3**

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and IT

DEPARTMENT OF COMPUTER AND COMMUNICATION ENGINEERING

Course Hand-out

Machine Learning | CC1702 | 4 Credits | 3 1 0 4

Session: Jul 19- Dec 19 | Faculty: Dr Sunil Kumar| Class: B Tech CCE VII SEM

A. Introduction: This course is offered by Dept. of Computer & Communication Engineering as a department core, targeting students who wish to pursue research & development in industries or higher studies in field of Artificial Intelligence, including supervised machine learning, unsupervised learning & reinforcement learning. Offers in depth knowledge of use Machine Learning for personal purpose, handle specific topics like Reinforcement Learning, NLP and Deep Learning, handle advanced techniques like Dimensionality Reduction, know which Machine Learning model to choose for each type of problem, build an army of powerful Machine Learning models and know how to combine them to solve any problem.

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

[CC 1702.1] List the machine learning algorithms along with their strengths and weaknesses.

[CC 1702.2] Describe the basic theory underlying machine learning.

[CC 1702.3] Apply a variety of learning algorithms to data.

[CC 1702.4] Select proper learning algorithms and models.

[CC 1702.5] Develop machine learning models for different applications.

[CC 1702.6] Validate the machine learning models for accuracy and speed.

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]. Outline the basic principles, concepts and applications in the field of computer based Communication/networking, information sharing, signal processing, web based systems, smart devices and communication technology.

[PSO.2]. Identify the issues prevalent in the field of Computer and Communication Engineering.

[PSO.3]. Examine the existing open problems in the field of computing and propose the best possible solutions.

[PSO.4]. 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. and control/validate phases.

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 (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 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 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: Introduction and applications of machine learning; **Supervised learning:** perceptron network, Adaptive linear neuron, multiple Adaptive linear neuron, Back propagation network, Generative learning algorithms. Gaussian discriminant analysis, Naive Bayes, Support vector machine, KNN algorithm, basic/variance tradeoff, linear regression and feature selection; **Neural network**: forward/backward network, Deep learning; **Unsupervised learning**: clustering, K-means algorithm, Kohonen self-organizing map, learning vector quantization, Counter propagation network; Introduction to Reinforcement learning, Optimization technique, Gradient descent method**,** Introduction to natural language processing, Decision making and Expert system.

F. REFERENCE BOOKS

1. M. Mohri, A. Rostamizadeh, A. Talwalker: Foundations of Machine Learning. MIT Press, 2012.
2. T.M. Mitchell: Machine learning. McGraw-Hill India, 2013.
3. T. Hastie, R. Tibshirani, J. Friedman: The Elements of Statistical Learning. Springer, 2009.
4. C.M. Bishop: Pattern Recognition and Machine Learning. Springer Verlag, 2010.
5. S. N. Sivanandam, S.N. Deepa: Principles of Soft Computing. Wiley, 2011.

G. Lecture Plan:

	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1	Machine Learning – Introduction	Importance of Machine learning in the current scenario, convey teachers expectations and understand student expectations	Lecture	CC1702.2	Class Quiz
2	Data, pre-processing, Training & Testing of Machine Learning Model	Data pre-processing, Training and evaluating on a test dataset, cross validation, over fit and under fit, metrics	Lecture	CC1702.2/6	Home Assignment Class Quiz Mid Term I End Term
3-4	Linear Regression	To understand simple linear regression model and estimation of slope and intercept, gradient decent	Lecture	CC1702.1/3/5	Class Quiz Mid Term I End Term
5	Multivariate Regression	Multi variate regression	Lecture	CC1702.1/3/5	Class Quiz Mid Term I End Term
6	Logistic Regression	Regression, Estimating Probability, Decision Boundaries, Softmax regression	Lecture	CC1702.1/3/5	Class Quiz Mid Term I End Term
7	Naïve Bayes Classifier	Learning Classifiers based on Bayes Rule, Discrete Inputs, Continuous Input, Conditional independence Multinomial Naive Bayes	Lecture	CC1702.1/3/5	Class Quiz Mid Term I End Term
8-9	Belief Network	Gaussian Bayes classifiers, Document classification Bayesian belief Network	Lecture	CC1702.3/4/5	Class Quiz Mid Term I End Term
10-11	Decision Tree	Training & visualizing, making prediction, CART training algorithm, Computational Complexity, Entropy, Regularization hyper parameter.	Lecture	CC1702.3/4/5	Class Quiz Mid Term I End Term
12-13	Ensemble Learning & Random Forest	Voting Classifiers Bagging Random Forest Boosting	Lecture	CC1702.3/4/5	Class Quiz Mid Term I End Term
First Sessional (5-9 Sept. 2019)					
14 -16	Support Vector Machine	Linear SVM Soft Margin Classifier Non Linear SVM SVM Regression	Lecture	CC1702.3/4/5	Class Quiz Mid Term II End Term
17	Instance Based Learning	k-Nearest Neighbours KNN algorithm How do we choose the factor K	Lecture	CC1702.3/4/5	Class Quiz Mid Term II End term
18-19	Artificial Neural Network	Introduction, Neuron, Model, Perceptron	Lecture	CC1702.3/4/5	Class Quiz Mid Term II End Term
20-23	Multilayer Perceptron & Backpropagation.	Activation Function, Hidden Layers, Weights, Bias	Lecture	CC1702.3/4/5	Class Quiz Mid Term II End Term
24	Deep Learning	Concept of Deep Neural Networks, Requirements	Lecture	CC1702.2	Class Quiz Mid Term II

		and challenges			End Term
25-27	Convolution Neural Network	Architecture Convolution Layer Pooling Layer CNN Architecture	Lecture	CC1702.5	Class Quiz Mid Term II End Term
Second Sessional(4-6 Nov 2019)					
28-30	Recurrent Neural Network	Recurrent Neurons Basic RNN Deep RNN LSTM GRU	Lecture	CC1702.5	Class Quiz End Term
31-33	Natural Language Processing	Introduction and application of NLP. Processing Raw text Learning to classify text	Lecture	CC1702.3	Class Quiz End Term
34-38	Unsupervised Learning	Concept of clustering with some example, K-means algorithm Kohonen Self-Organizing Feature Map with their architecture and algorithm Learning Vector Quantization (LVQ) architecture and algorithm Counter Propagation Networks (CPN) with their training and testing algorithm	Lecture	CC1702.2/4/5	Class Quiz End Term
39	Reinforcement Learning	Learning Task Markov Decision Process Learning to optimize rewards	Lecture	CC1702.3/4	Class Quiz End Term
40	Decision making and Expert Systems	Machine learning models vs expert systems		CC1702.4	End Term
End Term Exam(29 Nov. -13 Dec. 2019)					

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

CO	STATEMENT	Correlation with Program Outcomes (**POs**)												Correlation with Program Specific Outcomes (**PSOs**)			
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
[CC 1702.1]	**List** the machine learning algorithms along with their strengths and weaknesses.	3	2											3			
[CC 1702.2]	**Describe** the basic theory underlying machine learning.				2										2		
[CC 1702.3]	**Apply** a variety of learning algorithms to data.	3	2	1	1												3
[CC 1702.4]	**Select** proper learning algorithms and models.		3		3											3	
[CC 1702.5]	**Develop** machine learning models for different applications.	2		3		3	2		1	2			1		2	1	1
[CC 1702.6]	**Validate** the machine learning models for accuracy and speed.		3		2	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 & COMMUNICATION ENGINEERING

Course Hand-out

Network Security Lab| CC1730 1 Credits | 0 0 2 1

Session: Jul 19-Dec 19 | Faculty: Gaurav Prasad, Somya Goyal| Class: (CORE) VII SEM

A. Introduction: This course is meant to offer to computer & communication engineering undergraduate students in their seventh semester to have a broad overview of the field of security. Students will learn the basic concepts in security like security attacks, scanning, analysis and defence, networking and wireless security with cryptography. Students will also learn the fundamental methodology for how to design and analyse security critical systems.

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

[CC1730.1] Identify basic factors driving the need for network security and identify physical points of vulnerability in simple networks

[CC1730.2] Identify and perform different attacks and their mitigation techniques.

[CC1730.3] Use of software tools for performing scanning, attack and to mitigate the attacks.

[CC1730.4] Identify the depth of the problem and to propose the solution.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

[PO.3]. Design/development of solutions: Upon analysing, the B.Tech CCE graduate should be able to devise solutions for complex engineering problems and design system components or processes that meet the specified requirements with appropriate consideration for law, safety, cultural & societal obligations with environmental considerations.

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

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

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

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

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

[PO.9]. Individual and team-work: United we grow, divided we fall is a culture at MUJ. Thus an outgoing student should be able to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

[PO.10]. <u>Communication</u>: 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]. <u>Project management and finance</u>: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in varied environments.

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

[PSO.1]. <u>Understand</u> the basic principles, concepts and applications in the field of computer-based Communication/networking, information sharing, signal processing, web based systems, smart devices and communication technology.

[PSO.2]. <u>Critically analyse and interpret</u> the issues prevalent in the field of Computer and Communication Engineering.

[PSO.3]. <u>Identify</u> the existing open problems in the field of computing and propose the best possible solutions.

[PSO.4]. <u>Apply</u> the contextual knowledge in the field of computing and communication to assess social, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional engineering practice.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Weekly evaluation (record+execution+viva)	40
	Tool Analysis	30
End Term Exam (Summative)	End Term Exam	30
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

E. SYLLABUS

Implementation of Symmetric Key Algorithms: SDES, DES, AES; Implementation of Asymmetric Key Algorithms: RSA, Elgamal; Implementation of Key Management Algorithms: Diffie Helman, Certification Authority; Implementation of Security Protocols: Mutual Authentication, Digital Signature, Hash Functions, MAC; Open Source Security Tools: Wireshark, Ethercap, Penetration Testing tools; Mini project Implementation.

F. REFERENCE BOOKS

1. W. Stallings, "Cryptography and Network Security Principles and Practice", 6th Edition, Pearson Education, 2014
2. D. Hook, "Beginning Cryptography with Java", 1st Edition, John Wiley & Sons, 2005.

G. Lecture Plan:

Class 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	Packet tracer	To identify different Protocols, Analyse packets flowing in real network and also to identify the structure, contents of packets, in the network.	Demonstration	CC1730.1 CC1730.2 CC1730.3	Internal Evaluation
2-6	Cryptographic Algorithms	To implement the Cryptographic Algorithms both Classical /Traditional & Modern	Lecture Demonstration	CC1730.1 CC1730.2 CC1730.3 CC1730.4	Internal Evaluation End Sem Exam
7-11	Security Tool	To install, analyse and perform different attacks using different tools available in Kali Linux	Lecture Demonstration	CC1730.1 CC1730.2 CC1730.3 CC1730.4	Internal Evaluation End Sem Exam
12-14	Firewall	Demonstrate the use of Firewall using iptables	Demonstration	CC1730.1 CC1730.2 CC1730.3 CC1730.4	Internal Evaluation End Sem Exam

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

CO	STATEMENT	Correlation with Program Outcomes **(POs)**												Correlation with Program Specific Outcomes (**PSOs**)			
		PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
[CC1730.1]	Identify basic factors driving the need for network security and identify physical points of vulnerability in simple networks	**1**		**1**	**1**								**2**				**1**
[CC1730.2]	Identify and perform different attacks and their mitigation techniques.	**1**	**1**	**1**	**1**	**2**								**1**			
[CC1730.3]	Use of software tools for performing scanning, attack and to mitigate the attacks.	**1**	**1**		**1**	**2**							**1**		**1**		**1**
[CC1730.4]	To identify the depth of the problem and to propose the solution.	**1**	**1**	**1**	**2**	**2**							**1**	**2**	**2**		**1**

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and IT

DEPARTMENT OF COMPUTER AND COMMUNICATION ENGINEERING

Course Hand-out

Machine Learning Lab | CC1731 | 1 Credits | 0 0 2 1

Session: Jul 19- Dec 19 | Faculty: Dr Sunil Kumar| Class: B Tech CCE VII SEM

A. **Introduction:** This course is designed to study and design the algorithms that allow computers to automatically learn from data or past experience, how to improve their performance at some tasks (e.g. recognition of spoken words, robot navigation, medical diagnosis). Students will also learn the fundamental methodology for how to design and analyse machine learning systems.

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

[CC1731.1]: Identify the fundamental principles and concepts of Machine Learning.

[CC1731.2]: Apply algorithms and techniques focusing on strengths and weaknesses and appropriateness for learning problems.

[CC1731.3]: Use of Software tools to design, implement, and evaluate Machine Learning algorithms.

[CC1731.4]: Evaluate the performance of machine learning algorithms to design the solution efficiently & effectively.

[CC1731.5]: Design the solution of the real world practical applications using Machine Learning.

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

[PSO.1]. <u>Outline</u> the basic principles, concepts and applications in the field of computer based Communication/networking, information sharing, signal processing, web based systems, smart devices and communication technology.

[PSO.2]. <u>Identify</u> the issues prevalent in the field of Computer and Communication Engineering.

[PSO.3]. <u>Examine</u> the existing open problems in the field of computing and propose the best possible solutions.

[PSO.4]. <u>Apply</u> 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. and control/validate phases.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Weekly evaluation (Record + execution + viva)	40
	Mini project	30
End Term Exam (Summative)	End Term Exam	30
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

E. SYLLABUS

Implementation of supervised learning Algorithms: Support vector machine, Naïve bayes, linear regression, decision tree, KNN algorithm; Implementation of neural network with basic concepts, with perceptron and with back propagation network; Implementation of unsupervised learning Algorithms: K-mean algorithm; Implementation of deep neural network: Deep Convolutional Neural Network.

F. REFERENCE BOOKS

1. Andres C. Muller, Sarah Guido: Introduction to Machine Learning with Python. O'REILLY, 2016.
2. Aurelien Geron: Hands On Machine Learning with Scikit-Learn & TensorFlow. O'REILLY, 2017.

G. Lab Plan:

	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1-2	Write a program to Load Machine Learning Data. Write a program to scale Machine Learning Data	How to load a CSV file. How to convert strings from a file to floating point numbers. How to convert class values from a file to integers. How to normalize your data How to standardize your data When to normalize as opposed to standardize data.	Learn by doing	NA	NA
3-4	Write a program to Implement	How to implement classification accuracy.	Learn by doing	CC1731.1 CC1731.2	Internal Evaluation

	Machine Learning Algorithm Performance Metrics Write a program to Implement Simple Linear Regression.	How to implement and interpret a confusion matrix. How to implement mean absolute error for regression. How to implement root mean squared error for regression. How to estimate statistical quantities from training data. How to estimate linear regression coefficients from data. How to make predictions using linear regression for new data.		CC1731.3	
5-6	Write a program to implement the Logistic Regression Algorithm.	How to make predictions for multivariate linear regression. How to implement linear regression with stochastic gradient descent to make predictions on new data.	Learn by doing	CC1731.1 CC1731.2 CC1731.3	Internal Evaluation Project End Sem Exam
7-8	Write a program to implement the Bayes Classifier.	How to use Bayes Classifier.	Learn by doing	CC1731.4 CC1731.5 CC1731.2 CC1731.3	Internal Evaluation Project End Sem Exam
9	Write a program to implement Decision Tree Algorithm	How to calculate and evaluate candidate split points in a data. How to arrange splits into a decision tree structure. How to apply the classification and regression tree algorithm to a real problem.	Learn by doing	CC1731.4 CC1731.5 CC1731.2 CC1731.3	Internal Evaluation Project End Sem Exam
10	Write a program to implement k-Nearest Neighbors	The implementation will be specific for classification problems and will be demonstrated using the Iris flowers classification problem.	Learn by doing	CC1731.4 CC1731.5 CC1731.2 CC1731.3	Internal Evaluation Project End Sem Exam
11	Write programs to Implement the Perceptron Algorithm Write a program to implement the Backpropagation Algorithm.	How to implement Neural Networks	Learn by doing	CC1731.4 CC1731.5 CC1731.2 CC1731.3	Internal Evaluation Project End Sem Exam
12	Implement CNN for object	Implementing Deep learning	Learn by doing	CC1731.4 CC1731.5	Internal Evaluation

	classification			CC1731.2 CC1731.3	Project End Sem Exam
1-2	Write a program to Load Machine Learning Data. Write a program to scale Machine Learning Data	How to load a CSV file. How to convert strings from a file to floating point numbers. How to convert class values from a file to integers. How to normalize your data How to standardize your data When to normalize as opposed to standardize data.	Learn by doing	NA	NA
End Term Exam(25-29 Nov. 2019)					

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

CO	**STATEMENT**	Correlation with Program Outcomes **(POs)**												Correlation with Program Specific Outcomes (**PSOs**)			
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
[CC1731.1]:	Identify the fundamental principles and concepts of Machine Learning	1		1	1				1					2			1
[CC1731.2]:	Identify and perform algorithms and techniques focusing on strengths and weaknesses and appropriateness for learning problems.	1	1	1	1			1							1		
[CC1731.3]:	Use of Software tools to design, implement, and evaluate Machine Learning algorithms	1	1		1	2				1		1		1		1	1
[CC1731.4]:	Use of transfer learning to design the solution efficiently & effectively.	1	1	1	1	2	1			1				1	2	2	1

[CC1731.5]:	Identify the solution about the real world practical applications of Machine Learning	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 COMPUTER AND COMMUNICATION ENGG.

Course Hand-out

Compiler Design | CC1751| 3 Credits | 3 0 0 3

Session: Jul 19-Dec 19 | Faculty: Dr. Deepak Sinwar| Class: B. Tech VII SEM

A. **Introduction:** This course is offered by Dept. of Computer and Communication Engineering as a program elective course, targeting students who wish to pursue research & development or higher studies in field of Compiler Design. The objective of this course is to make students familiar with core area of Compilers which will enable students to focus on abstract models of computation. The course exposes students to the computability theory, as well as to the complexity theory. The objective is to make students familiar with the Compiler Design 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 understand in detail about compilers and how works.

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

[CC 1751.1] Identify the basic concepts and importance of Compiler Design.
[CC 1751.2] Critically analyse the performances of each parser and comprehend compilation process.
[CC 1751.3] Developing skills to construct optimized compiler using the concepts of intermediate code generation and code optimization.

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

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

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

[PO.3]. **Design/development of solutions**: Upon analysing, the B Tech CCE graduate should be able to devise solutions for complex engineering problems and design system components or processes that meet the specified requirements with appropriate consideration for law, safety, cultural & societal obligations with environmental considerations.

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

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

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

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

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

[PO.9]. **Individual and team work:** United we grow, divided we fall is a culture at MUJ. Thus an outgoing student should be able to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

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

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

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

[PSO.1]. Should be able to clearly understand the basic principles, concepts and applications in the field of computer based Communication/networking, information sharing, signal processing, web based systems, smart devices and communication technology.

[PSO.2]. Should be able to nail down the issues prevalent in the field of Computer and Communication Engineering.

[PSO.3]. Should be able to identify the existing open problems in the field of computing and propose the best possible solutions.

[PSO.4]. Should be able to apply the contextual knowledge in the field of computing and communication to assess social, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional engineering practice.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	15
	Sessional Exam II (Closed Book)	15
	In class Quizzes (Accumulated and Averaged)	10
	Assignments, Activity feedbacks	15
	Video assignment	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 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

Computability and Complexity Theory, Introduction to Compilers: Analysis of the source program, phases of a compiler; Lexical Analysis: The role of lexical analyzer, specification and recognition of tokens; Syntax Analysis: Various types of parsing, Syntax Directed Translations and Type Checking; Runtime Environments: Storage organization and allocation strategies, Intermediate code generation; Code generation: Issues in design of a code generator; Code Optimization : The principle sources of optimization, optimization of basic blocks, loops in flow graphs, efficient data flow algorithms.

F. REFERENCE BOOKS

1. A. V. Aho, M. S. Lam, R. Sethi, J. D. Ullman, "Compilers – Principles, Techniques and Tools", 2nd Edition, Pearson Education, 2007
2. M. Sipser, "Introduction to the Theory of Computation", 3rd Edition, Cenage Learning, 2013.
3. J. Martin, "Introduction to Languages and the Theory of Computation", 4th Edition, Tata McGraw Hill, 2010.
4. A. I. Holub, "Compiler Design in C", Pearson Education, 2015.

G. Lecture Plan:

Lect. No.	Topics	Session Outcome	Mode of Delivery	Correspon ding Couse outcome	Mode of Assessing the Outcome
1.	Introduction and Course Hand-out briefing	To acquaint and clear teachers expectations and understand student expectations	Lecture	NA	NA
2-3	Analysis of the source program, phases of a compiler, Structure of a Compiler	Identification of needs and structure of compiler design	Lecture, Activity	CC1751.1	Class Quiz Mid Term-1 End Term
4-6	The Role of the Lexical Analyzer, Input Buffering, Specification of Tokens, Recognition of Tokens	Outline the role and working of lexical analysis	Lecture, Activity	CC1751.1	Class Quiz Mid Term-1 End Term
7-9	Role of Parser, Error-Recovery Strategies, Context Free Grammars, Parse Tree and Derivations, Ambiguity, Elimination of Ambiguity/ Left Recursion/ Left Factoring	Identifying the roles of syntax analysis in Compiler Design and its preliminaries	Lecture, Activity	CC1751.1	Class Quiz Mid Term-1 End Term
FIRST SESSIONAL EXAM					
10-16	Top down parsers and their types – an overview, Recursive Descent Parsing – may involve backtracking, Predictive Parsing – does not involve backtracking, non-recursive Predictive Parsing: Computing FIRST and FOLLOW, Construction of LL(1) parsing table to identify LL(1) grammar, LL(1) Parsing Algorithm with examples.	Understanding about working of Top-Down parsers	Lecture, Problem based learning, Flipped Class	CC1751.2	Class Quiz Mid Term-2 End Term
17-22	Bottom-up parsing and its type – and Overview, Shift Reduce parsing, Operator Precedence Parsing – Operator grammar, LR(k) parsers: LR(0) item-set construction, LR(0) parsing technique, SLR parsing technique, LR(1) item-set construction, CLR and LALR parsing technique	Understanding about working of Bottom-up parsers	Lecture, Problem based learning, Flipped Class	CC1751.2	Class Quiz Mid Term-2 End Term
SECOND SESSIONAL EXAM					
23-25	Syntax Directed Definitions: Synthesized attributes, Inherited attributes, Dependency Graphs; Construction of syntax trees; Top-Down Translation; Type Checking	Knowledge of semantic analysis phase of compiler design	Lecture, Problem based learning, Flipped Class	CC1751.3	Class Quiz Mid Term-2 End Term
26-28	Storage Organization, Storage Allocation strategies: Static, Stack, Heap; of Space;	Understanding the storage allocation of run time environments of compilers	Lecture, Flipped Class	CC1751.3	Class Quiz Mid Term-2 End Term

29-30	Graphical representations, Three-Address Code: Quadruples, Triples and Indirect Triples	Knowledge of various types of intermediate code representations	Lecture, Activity, Flipped Class	CC1751.3	Class Quiz Assignment End Term
30-31	Issues in the Design of a Code Generator	Recall the general issues faced by code generation phase	Lecture, Activity, Flipped Class	CC1751.3	Class Quiz Assignment End Term
32-35	The principle sources of optimization, optimization of basic blocks, loops in flow graphs, efficient data flow algorithms.	Identify the optimized code after code generation	Lecture, Activity, Flipped Class	CC1751.3	Class Quiz End Term
END TERM EXAM					

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

CO	**STATEMENT**	Correlation with Program Outcomes **(POs)**												Correlation with Program Specific Outcomes (**PSOs**)			
		PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
[CC1751.1]	Identify the basic concepts and importance of Compiler Design	**2**	**1**	**1**	**1**		**1**							**2**	**1**		
[CC1751.2]	Critically analyse the performances of each parser and comprehend compilation process		**1**	**1**	**1**									**2**	**1**		
[CC1751.3]	Developing skills to construct optimized compiler using the concepts of intermediate code generation and code optimization.	**1**	**2**	**2**	**2**		**1**	**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 COMPUTER AND COMMUNICATION ENGG.

Course Hand-out

Networks on Chip | CC1752 | 3 Credits | 3 0 0 3

Session: July 19 – Nov 19 | Faculty: Manoj K Bohra | Class:VII CCE

A. Introduction: Networks on Chip (NoCs) course is offered by Department of Computer and Communication Engg., targeting students who wish to pursue research in industries or higher studies in field of Computer Science, IT and Communication Engineering. This course will form the base of doing research in field of NoCs, student will be able to write review paper on the latest published papers in NoC routing and selection methods. This course will help student who want to pursue higher studies (MS/M. TECH).

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

[CC 1752.1] Explain basic concepts of various NoCs

[CC 1752.2] Describe routing and selection strategies for NoCs

[CC 1752.3] Prepare review/survey paper for the certain topics of interest

[CC 1752.4] Apply knowledge to analyze published work and design new techniques based on existing

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

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E. SYLLABUS

Introduction: The Advent of the Multi-core, Communication Demands of Multi-Core Architectures , On-chip vs. Off-Chip Networks; **Network Basics:** A Quick Primer Evolution to On-Chip Networks; **Shared Memory Networks in Chip Multiprocessors:** Impact of Coherence Protocol; **Design Requirements for On-Chip Network :**NoC Synthesis, Case Studies; **Routing:** Types of Routing Algorithms, Deadlock Avoidance, turn models ; **Logic Based Distributed Routing; Selection Methods**; **Flow Control:** Basis units of flow control, different typre of flow control, Virtual Channels Deadlock-Free Flow Control, Escape VCs, Buffer, Backpressure; **Router Microarchitecture:** Virtual Channel Router Microarchitecture, Pipeline; **Switch Design:**Crossbar Designs,Crossbar Speedup; **Fault tolerance in router**; **Simulations of various strategies of on chip networks by varying different parameters.**

F. REFERENCE BOOKS

1. N. D. E. Jerger and L.S. Peh, *"On-chip Networks"*, 2e, Morgan & Claypool Publishers, 2016
2. M. Palesi , M. Daneshtalab, *"Routing algorithms in networks-on-chip"*, Springer, 2014.
3. W. J. Dally, B. P. Towels, *"Principles and Practices of Interconnection Networks"*, 2e, Morgan Kaufmann, 2004.
4. J. Duato, S. Yalamanchili, L. Ni, *"Interconnection Networks: An Engineering Approach"*, 2e, Morgan Kaufmann, 2003.

G. Lecture Plan:

Class Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1.	**NoC Introduction**	NoC Topologies and related work discussion	Lecture	CC1752.1 CC1752.2	Class Quiz Home Assignments I Sessional End Term
2.	**Topology**	Direct Topologies and related work discussion	Lecture	CC1752.1 CC1752.2	Class Quiz Home Assignments I Sessional End Term
3.		Indirect Topologies and related work discussion	Lecture	CC1752.1 CC1752.2	Class Quiz Home Assignments I Sessional End Term
4.	**Router Architecture & Switching**	NoC Router: Generic Architecture and related work discussion	Lecture	CC1752.1 CC1752.2	Class Quiz Home Assignments I Sessional End Term
5.		Switching Methods and related work discussion	Lecture	CC1752.1 CC1752.2	Class Quiz Home Assignments I Sessional End Term
6.		Circuit Switching and related work discussion	Lecture	CC1752.1 CC1752.2	Class Quiz Home Assignments I Sessional End Term
7.		Store-and-Forward Switching and related work discussion	Lecture	CC1752.1 CC1752.2	Class Quiz Home Assignments I Sessional End Term
8.		Virtual Cut-Through Switching and related work discussion	Lecture	CC1752.1 CC1752.2	Class Quiz Home Assignments I Sessional End Term
9.		Wormhole Switching and related work discussion	Lecture	CC1752.1 CC1752.2	Class Quiz

					Home Assignments I Sessional End Term
10.	**Routing**	Routing Algorithms and related work discussion	Lecture	CC1752.1 CC1752.2	Class Quiz Home Assignments I Sessional End Term
11.		Deadlocks in Routing and related work discussion	Lecture	CC1752.1 CC1752.2	Class Quiz Home Assignments I Sessional End Term
12.		Livelocks in Routing and related work discussion	Lecture	CC1752.1 CC1752.2	Class Quiz Home Assignments I Sessional End Term
13.		Classification of Routing Algorithms and related work discussion	Lecture	CC1752.1 CC1752.2	Class Quiz Home Assignments I Sessional End Term
14.		Source vs Distributed Routing and related work discussion	Lecture	CC1752.1 CC1752.2	Class Quiz Home Assignments I Sessional End Term
15.		Unicast vs Broadcast vs Multicast Routing and related work discussion	Lecture	CC1752.1 CC1752.2	Class Quiz Home Assignments I Sessional End Term
16.		Deterministic vs Adaptive routing and related work discussion	Lecture	CC1752.3	Class Quiz Home Assignments I Sessional End Term
17.		Minimal vs Non-minimal Routing and related work discussion	Lecture	CC1752.3	Class Quiz Home Assignments I Sessional End Term
18.		Congestion-aware vs Congestion-oblivious Routing and related work discussion	Lecture	CC1752.3	Class Quiz

					Home Assignments I Sessional End Term
19.		Topology Dependent vs Topology Independent and related work discussion	Lecture	CC1752.1 CC1752.3	Class Quiz Home Assignments II Sessional End Term
20.		Routing and related work discussion	Lecture	CC1752.1 CC1752.2	Class Quiz Home Assignments II Sessional End Term
21.		Turn Model based Routing Algorithms and related work discussion	Lecture	CC1752.3	Class Quiz Home Assignments II Sessional End Term
22.		Partially Adaptive Algorithms and related work discussion	Lecture	CC1752.3	Class Quiz Home Assignments II Sessional End Term
23.		Fully Adaptive Algorithms and related work discussion	Lecture	CC1752.3	Class Quiz Home Assignments II Sessional End Term
24.		Recent Research Works like LBDR and its variations and related issues	Lecture	CC1752.3	Class Quiz Home Assignments II Sessional End Term
25.	**Selection Methods**	Different Selection methods	Lecture	CC1752.1 CC1752.2	Class Quiz Home Assignments II Sessional End Term
26.		DBAR and its Implementation details discussion	Lecture	CC1752.1 CC1752.2	Class Quiz Home Assignments II Sessional End Term
27.		DBAR and its Implementation details discussion	Lecture	CC1752.3	Class Quiz

					Home Assignments II Sessional End Term
28.		DBAR and its Implementation details discussion	Lecture	CC1752.4	Class Quiz Home Assignments II Sessional End Term
29.		BARP and its Implementation details discussion	Tutorial	CC1752.1 CC1752.2	Class Quiz Home Assignments II Sessional End Term
30.		BARP and its Implementation details discussion	Lecture	CC1752.3	Class Quiz Home Assignments II Sessional End Term
31.		BARP and its Implementation details discussion	Lecture	CC1752.4	Class Quiz Home Assignments II Sessional End Term
32.		CATRA and its Implementation details discussion	Lecture	CC1752.1 CC1752.2	Class Quiz Home Assignments II Sessional End Term
33.		CATRA and its Implementation details discussion	Lecture	CC1752.3	Class Quiz Home Assignments End Term
34.		CATRA and its Implementation details discussion	Lecture	CC1752.4	Class Quiz Home Assignments End Term
35.		Ant Colony Optimization-Based Adaptive Network-on-Chip Routing Framework Using Network Information Region and its Implementation details discussion	Lecture	CC1752.1 CC1752.2	Class Quiz Home Assignments End Term
36.		Ant Colony Optimization-Based Adaptive Network-on-Chip Routing Framework Using Network Information Region and its Implementation details discussion	Lecture	CC1752.3	Class Quiz Home Assignments End Term

37.		Ant Colony Optimization-Based Adaptive Network-on-Chip Routing Framework Using Network Information Region and its Implementation details discussion	Lecture	CC1752.4	Home Assignments End Term
38.		Ant Colony Optimization-Based Fault-Aware Routing in Mesh-Based Network-on-Chip Systems and its Implementation details discussion	Lecture	CC1752.1 CC1752.2	Home Assignments End Term
39.		Ant Colony Optimization-Based Fault-Aware Routing in Mesh-Based Network-on-Chip Systems and its Implementation details discussion	Lecture	CC1752.3	Home Assignments End Term
40.		Ant Colony Optimization-Based Fault-Aware Routing in Mesh-Based Network-on-Chip Systems and its Implementation details discussion	Lecture	CC1752.3	Home Assignments End Term
41.		Ant Colony Optimization-Based Fault-Aware Routing in Mesh-Based Network-on-Chip Systems and its Implementation details discussion	Lecture	CC1752.4	Home Assignments End Term
42.		Doubt Solving Class			

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

CO	**STATEMENT**	CORRELATION WITH PROGRAM OUTCOMES **(POs)**												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES **(PSOs)**			
		PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
[CC1752.1]	Explain basic concepts of various NoCs	3	2											3			2
[CC1752.2]	Describe routing and selection strategies for NoCs		1	2											2	2	
[CC1752.3]	Prepare review/survey paper for the certain topics of interest		1	2						2					2	2	
[CC1752.4]	Apply knowledge to analyze published work and design new techniques based on existing		1	2	2											1	2

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

DEPARTMENT OF COMPUTER AND COMMUNICATION ENGINEERING

Course Hand-out

Principles of Web Services | CC 1753| 3 Credits | 3 0 0 0

Session: July 19 20-Nov 19 | Faculty: Dr. Punit Gupta and DR. Rohit Verma | Class: VIII SEM

A. **Introduction:** This course is offered by the Department of Computer and Communication Engineering as this course focuses on propagate communication between the client and server applications on the World Wide Web. Principles of Web Services allows student to learn popular service protocols like SOAP, WSDL, REST and other standard languages and architecture of web service deployment. Web services provide a common platform that allows multiple applications built on various programming languages to have the ability to communicate with each other

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

[CC 1753.1] Identify and describe various web services technologies like WSDL, UDDI, SOAP

[CC 1753.2] Practice xml technology and message passing

[CC 1753.3] Identify various web service models and messaging techniques

[CC 1753.4] Summarize SOA design implementation and managing SOA environment

[CC 1753.5] Evaluate and identify suitable service for a business model.

[CC 1753.5] Design and develop web service models using beans and spring framework

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

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

E. SYLLABUS

Evolution and Emergence of Web Services: Evolution of distributed computing, emergence of Web Services and Service Oriented Architecture (SOA). Introduction to Web Services – The definition of web services, basic operational model of web services, tools and technologies enabling web services, benefits and challenges of using web services;

Web Service Architecture: Web services Architecture and its characteristics, , web services communication, basic steps of implementing web services. Describing Web Services – WSDL introduction, non-functional service description, WSDL1.1

Vs. WSDL 2.0, WSDL document, WSDL elements, WSDL binding, WSDL tools, WSDL port type, limitations of WSDL; Brief Over View of XML: XML technologies – XML, XML Document structure, XML namespaces, Defining structure in XML, documents, Reuse of XML schemes, Document navigation ,DTD, XSD, XSLT, X-Query-Path Web services technologies - Web services and SOA, WSDL, SOAP, UDDI Standards (WS-*) - Web services and Service- oriented enterprise (SOE), WS-Coordination and WS-Transaction, transformation WS-Security and the Web services security specifications, WS-Reliable Messaging, WSPolicy, WS-Attachments;

SOA Design implementation, Managing SOA Environment: service-oriented design process, design activities, determine services and tasks based on business process model, choosing appropriate standards, articulate architecture, mapping business processes to technology, designing service integration environment (e.g., ESB, registry), implementing SOA, security implementation, implementation of integration patterns, services enablement, quality assurance,impact of changes to services in the SOA lifecycle;

SOAP : Simple Object Access Protocol Inter-application communication and wire protocols, SOAP as a messaging protocol, Structure of a SOAP message, SOAP envelope, Encoding, Service Oriented Architectures, SOA revisited, Service roles in a SOA, Reliable messaging, The enterprise Service Bus, SOA Development Lifecycle, SOAP HTTP binding, SOAP communication model, Error handling in SOAP.

F. REFERENCE BOOKS

1. Coyle, Frank P., "XML, Web services, and the data revolution", 1st Edition, Addison-Wesley,2002..
2. S. Graham "Building web Services with Java", 2nd Edition, Pearson Education, 2004.
3. McGovern, "Java web Services Architecture", 1st Edition, Morgan Kaufmann , 2005.
4. Ethan Cerami, "Web Services Essentials: Distributed Application with XML – RPC, SOAP, UDDI & WSDL", O' Reilly, 2000.
5. Thomas Erl, "Service-Oriented Architecture: A Field Guide to Integrating XML and Web Services", Prentice Hall, 2004.

G. Lecture Plan:

Class Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1	Introduction and Course Hand-out briefing	To acquaint and clear teachers expectations and understand student expectations	Lecture	NA	NA
2,3	Introduction to web services	understand web services	Lecture	CO 1	Class Quiz Mid Term I
4,5	Type of Sevices & difference between distributed system and web services	describe and identify various web service models	Lecture	CO 1	Class Quiz Mid Term I
6,7	Emergence of Web Services and Service Oriented Architecture (SOA) fundamentals.	understand web services models using SOA	Lecture	CO 1	Class Quiz Mid Term I
8	QoS, Web service interportability, SLA.	describe and identify various web service performance parameters	Lecture	CO 2	Class Quiz Mid Term I End Term
9,10,11	Distributed computing Infrastructure and	distinguish between distributed model and web services.	Lecture	CO 2	Class Quiz Mid Term I End Term

	communication models.						
12,13	Brief Over View of XML: XML technologies	learn and design XML messages	Lecture	CO 2	Class Quiz	Mid Term I	
14,15	XML DTD & XSD	design XML using XSD	Lecture	CO 2	Class Quiz	Mid Term I	End Term
16,17	SOAP Protocol, communication protocol.	learn SOAP messaging protocol for web services	Lecture	CO 2	Class Quiz	Mid Term I	
18,19	SOAP Message Structure, SOAP encoding	learn SOAP messaging protocol design and architecture	Lecture	CO 2	Class Quiz	Mid Term II	End Term
20	Describing web services	understand need of WSDL in web services	Lecture	CO 2	Class Quiz	Mid Term II	
21	WSDL services	learn WSDL protocol and its design	Lecture	CO 3	Class Quiz	Mid Term II	
22	WSDL binding.	understand WSDL binding with soap protocol	Lecture	CO 3	Class Quiz	Mid Term II	
23,24	Register and discovery services	learn various phases of deploying web services.	Lecture	CO 3	Class Quiz	Mid Term II	
25,26	WSDL to UDDI, maping & services.	learn UDDI protocol	Lecture	CO 4	Class Quiz	Mid Term II	
27-28	SOA, service composition	explain the complete layered architecture of web services.	Lecture	CO 4	Class Quiz	Mid Term II	
29-30	WS- BPEL process	learn and design business models in web services	Lecture	CO 4	Class Quiz	Mid Term II	End Term
31-32	Service Transactions, distributed transaction, nected transactions	design service transaction in SOAP	Lecture	CO 4	Class Quiz	Mid Term II	
33	SOAP Scurity policies	understand need of security in services	Lecture	CO 4	Class Quiz		End Term
34-35	xml secuity standards	understand ways to implement security in XML	Lecture	CO 5	Class Quiz		End Term
36-37	service policies	understand various service policies	Lecture	CO 5	Class Quiz		End Term
38	Service transactions	describe transactions in web services and rollback	Lecture	CO 5	Class Quiz		End Term

39-40	EJB service architecture, Beans model	to design and deploy EJB based web services and its various model	Lecture	CO 6	Class Quiz End Term
41-42	REST protocol	Design and deploy RESTful services on HTTP	Lecture	CO 6	Class Quiz End Term

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

CO	STATEMENT	Correlation with Program Outcomes **(POs)**												Correlation with Program Specific Outcomes (**PSOs**)			
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
[CC1753.1]	To identify and describe various web services technologies like WSDL, UDDI, SOAP	**2**		**2**	**2**								**2**				
[CC1753.2]	To practice xml technology and message passing	**2**			**3**								**2**		**1**		
[CC1753.3]	To identify various web service models and messaging techniques	**2**		**1**		**3**							**2**	**2**			
[CC1753.4]	To summarize SOA design implementation and managing SOA environment	**3**	**1**	**3**									**2**	**3**			
[CC1753.5]	To evaluate and identify suitable service for a business model.	**3**		**3**	**2**								**3**	**3**			
[CC1753.6]	To design and develop web service models using beans and spring framework	**3**		**3**		**3**							**1**	**1**			

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Department of Computer and Communication
Course Hand-out

Software Testing | CC 1754 | 3 Credits | 3 0 0 3

Session: Jul 29-Nov 30| Faculty: Dr. Shivani Gupta | Class: Departmental Elective Course

A. Introduction: This course presents the knowledge about Testing background such introduction of Bug, cause of Bug, how it effects on cost of project, role of STLC cycle realities of software testing. This subject also gives the knowledge software testing fundamentals, under the study of types of testing this subject enlighten the Configuration testing, Compatibility testing, Foreign language testing, Usability testing, Testing the documentation, testing for software security, Web site testing and more.

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

[1754.1]. Demonstrate the various software testing issues and solutions in software unit test; integration, regression, and system testing.

[1754.2]. Examine the test project, design test cases and data, conduct testing operations, manage software problems and defects, generate a testing report.

[1754.3]. Illustrate advanced software testing topics, such as object-oriented software testing methods, and component-based software testing issues, challenges, and solutions

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

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

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

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

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

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

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

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

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

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

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

[PSO.1]. Should be able to clearly understand the basic principles, concepts and applications in the field of computer based Communication/networking, information sharing, signal processing, web based systems, smart devices and communication technology.

[PSO.2]. Should be able to nail down the issues prevalent in the field of Computer and Communication Engineering.

[PSO.3]. Should be able to identify the existing open problems in the field of computing and propose the best possible solutions.

[PSO.4]. Should be able to apply the contextual knowledge in the field of computing and communication to assess social, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional engineering practice.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	15
	Sessional Exam II (Closed Book)	15
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Closed Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
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 (Software Engineering)

Syllabus:

Software Metrics: Definition, categories of Metrics, Token Count, Data Structure Metrics, Informational Flow Metrics, Object Oriented Metrics, Project Metrics, Metrics Analysis; Case Study on Metrics ; **Software Reliability**: Basic concept, Failures and Faults, Reliability Models- Basic Execution Time Model, Logarithmic Poisson Execution Time Model, Calendar Time component, The Jelinski-Moranda Model. Reliability Metrics, Case Study on Reliability; **Software Testing**: Introduction to software Testing, Principle of Testing, Type of Testing, Verification, Validation Model, Test Oracle, Handling Defects, Defect Life Cycle, Testing Methods: Whilte Box (Structural) Testing, Black Box (Functional) Testing, Non-functional Testing, Testing in Object Oriented Systems, Test Management, Test Automation, Case Study on software testing;

Text Books:

1. S. Desikan, G. Ramesh, *"Software Testing: Principles and Practices"*, Pearson Education, 2006.
2. A. P. Mathur, *"Fundamentals of Software Testing"*, Pearson Education, 2008.

Reference Books:

1. K. K. Aggarwal, Y. Singh, "*Software Engineering*", Third Edition, New Age International Publication, 2008.
2. R. Mall," *Fundamentals of Software Engineering*", PHI, India 2004

F. Lecture Plan:

LEC NO	TOPICS	Session Outcomes	Mode of Delivery	Corresponding CO	Mode Of Assessing CO
1.	Basics of software testing: Introduction to software Testing, Testing and debugging,	Discuss the Basics of software testing	Lecture	CC 1754.1	Mid Term I, Quiz I
2.	Data Structure Metrics, Informational Flow Metrics	Discuss the various parameters of software	Lecture	CC 1754.1	Mid Term I, Quiz & End Term
3.	Verification, Validation and Testing,	To Learn about software validity	Lecture	CC 1754.1 and CC 1754.5	Mid Term I, Quiz & End Term
4.	Object Oriented Metrics	Discuss the types	Lecture	CC 1754.1	Mid Term I, Quiz & End Term
5.	Project Metrics	Discuss the defects	Lecture	CC 1754.1 and CC 1754.5	Mid Term I, Quiz & End Term
6.	Case Study on Metrics:	Demonstrate the testing techniques	Lecture	CC 1754.2	Mid Term I, Quiz & End Term
7.	Software Reliability: Basic concept, Failures and Faults, Reliability	Demonstrate the testing techniques	Lecture	CC 1754.2	Mid Term I, Quiz & End Term
8.	Models- Basic Execution Time Model	Demonstrate the testing techniques	Lecture	CC 1754.2	Mid Term I, Quiz & End Term
9.	Logarithmic Poisson Execution Time Model,	Demonstrate the testing techniques	Lecture	CC 1754.2	Mid Term I, Quiz & End Term
10.	Calendar Time component, The Jelinski-Moranda Model	Demonstrate the testing techniques	Lecture	CC 1754.2	Mid Term I, Quiz & End Term
11.	Reliability Metrics, Case Study on Reliability;	Discuss the graph metrics	Lecture	CC 1754.2	Mid Term I, Quiz & End Term
12.	Path testing,	Demonstrate the data flow graph and testing	Lecture	CC 1754.1	Mid Term I, Quiz & End Term
13.	Path testing,	Demonstrate the about functional testing	Lecture	CC 1754.3	Mid Term I, Quiz & End Term
14.	DD-Paths,	Demonstrate the boundary values	Lecture	CC 1754.1	Mid Term I, Quiz & End Term
15.	Cyclomatic Complexity,	Demonstrate the equivalence classes in software	Lecture	CC 1754.2	Mid Term I, Quiz & End Term

16.	Graph Metrics,	Demonstrate the n and identification of decision table	Lecture	CC 1754.2	Mid Term I, Quiz & End Term
17.	Cause Effect Graphing Technique	Demonstrate the graphing techniques	Lecture	CC 1754.2	Mid Term I, Quiz & End Term
18.	Ad hoc Testing;	Discuss and learn Ad hoc testing	Lecture	CC 1754.2	Mid Term I, Quiz & End Term
19.	Top down and Bottom up integration:	Demonstrate the about testing	Lecture	CC 1754.2 and CC 1754.3	Mid Term II, Quiz & End Term
20.	Bi-directional integration,	Demonstrate the bidirectional integration	Lecture	CC 1754.2	Mid Term II, Quiz & End Term
21.	System integration,	Demonstrate the system testing	Lecture	CC 1754.3	Mid Term II, Quiz & End Term
22.	Scenario Testing,	Demonstrate the scenario testing	Lecture	CC 1754.3	Mid Term II, Quiz & End Term
23.	Defect Bash,	Demonstrate the identify defect	Lecture	CC 1754.3	Mid Term II, Quiz & End Term
24.	Design/Archiecture verification,	Demonstrate the identify defect architecture	Lecture	CC 1754.3	Mid Term II, Quiz & End Term
25.	Deployment testing,	Demonstrate the testing techniques	Lecture	CC 1754.3 and CC 1754.2	Mid Term II, Quiz & End Term
26.	Beta testing,	Demonstrate the testing techniques	Lecture	CC 1754.3	Mid Term II, Quiz & End Term
27.	Scalability testing,	Demonstrate the testing techniques	Lecture	CC 1754.3	Mid Term II, Quiz & End Term
28.	Reliability testing,	Demonstrate the testing techniques	Lecture	CC 1754.1	Mid Term II, Quiz & End Term
29.	Stress testing;	Demonstrate the testing techniques	Lecture	CC 1754.3	Mid Term II, Quiz & End Term
30.	Acceptance testing;	Demonstrate the testing techniques	Lecture	CC 1754.3 and CC 1754.1	Mid Term II, Quiz & End Term
31.	Regression testing,	Demonstrate the testing techniques	Lecture	CC 1754.4 and CC 1754.3	Mid Term II, Quiz & End Term
32.	Test Planning,	Demonstrate the testing techniques	Lecture	CC 1754.4 and CC 1754.5	Mid Term II, Quiz & End Term
33.	Software Test Automation: Scope of automation,	Demonstrate the testing techniques	Lecture	CC 1754.4 and CC 1754.5	Mid Term II, Quiz & End Term
34.	Design & Architecture for automation,	Demonstrate the testing techniques	Lecture	CC 1754.4 and CC 1754.2	Mid Term II, Quiz & End Term
35.	Design & Architecture for automation,	Demonstrate the testing techniques	Lecture	CC 1754.2 and CC 1754.4	Mid Term II, Quiz & End Term

36.	Generic requirements for test tool framework,	Demonstrate the testing techniques	Lecture	IT 1754.4	Mid Term II, Quiz & End Term
37.	Test tool selection,	Demonstrate the testing techniques	Lecture	CC 1754.1 and CC 1754.2	Mid Term II, Quiz & End Term
38.	Testing in Object Oriented Systems,	Demonstrate the testing techniques	Lecture	CC 1754.5 and CC 1754.6	Mid Term II, Quiz & End Term
39.	Case Study on software testing;	Discuss case study	Lecture	CC 1754.5 and CC 1754.6	Quiz & End Term
40.	Advanced Topics on Testing:.	Discuss advanced topics	Lecture	CC 1754.1 and CC 1754.3	Quiz & End Term
41.	Functional and Non-Functional	Demonstrate the testing techniques	Lecture	CC 1754.4	Quiz & End Term
42.	Testing, Priotizing the Test cases,	Demonstrate the testing techniques	Lecture	CC 1754.4 and CC 1754.6	Quiz & End Term
43.	Testing Web Applications,	Demonstrate the testing techniques	Lecture	CC 1754.6	Quiz & End Term
44.	Testing Web Applications,	Demonstrate the testing techniques	Lecture	CC 1754.4 and CC 1754.	Quiz & End Term
45.	Testing Off-the-shelf component, ,	Demonstrate the testing techniques	Lecture	CC 1754.5	Quiz & End Term
46.	Testing security,	Demonstrate the testing techniques	Lecture	IT 1754.6	Quiz & End Term
47.	Testing Data warehouse	Discuss testing warehouses	Lecture	CC 1754.6	Quiz & End Term
48.	Revision Class-I	Discussion	Lecture	CC 1754.6	Quiz & End Term
49.	Revision Class-II	Discussion	Lecture	CC 1754.5 and CC 1754.6	Quiz & End Term

G. Course Articulation Matrix: (Mapping of COs with POs & 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
[CC 1754.1]	Demonstrate the various software testing issues and solutions in software unit test; integration, regression, and system testing.	2			2	3								1			
[CC 1754.2]	Examine the test project, design test cases and data, conduct testing operations, manage software problems and defects, generate a testing report.		2		3	2							1		1	1	1
[CC 1754.3]	Illustrate advanced software testing topics, such as object-oriented software testing methods, and component-based software testing issues, challenges, and solutions	2	3	2		1	1			1	1			1	1		1

MANIPAL UNIVERSITY JAIPUR

School of Computing and IT

Department of Computer and Communication Engineering

Course Hand-out

Wireless Sensors and Adhoc Networks | **CC1755** | 3 Credits | 3 0 0 3

Session: Jul 19 – Dec 19 | Faculty: Dr. Vijay Kr. Sharma| Dr. Dilbagh | Dr. Prakash Sharma | Class: CCE VII SEM (Department Elective)

A. **Introduction:** This course is offered by Dept. of Computer and Communication Engineering for seventh semester students as department elective course. The core objective of this course is to make the students understand the concepts of Ad Hoc Networks as well as Wireless Sensor Networks (WSN), their characteristics, novel applications, and technical challenges. The prerequisites are to have basic understanding of infrastructured networks, basic protocols used on computer networking.

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

[1755.1]- Describe the concept of wireless ad hoc networks and specialized ad hoc networks like sensor networks.

[1755.2]- Analyse different categories of routing protocols in ad hoc networks and main design issues.

[1755.3]- Analyse design issues of Wireless sensor networks such as Energy consumption, Clustering of Sensors, QoS and applications.

[1755.4]- Describe the basic concepts of MAC layer, routing layer and high level application layer in WSN.

[1755.5]- Illustrate Security issues in wireless ad hoc networks, cooperation in MANETs, Intrusion detection systems.

[1755.6]- Build the required skills to read and research the current literature in ad hoc and sensor networks.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

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

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

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

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

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

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

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

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

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

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

[PSO.1] Should be able to clearly understand the basic principles, concepts and applications in the field of computer based Communication/networking, information sharing, signal processing, web based systems, smart devices and communication technology.

[PSO.2] Should be able to nail down the issues prevalent in the field of Computer and Communication Engineering.

[PSO.3] Should be able to identify the existing open problems in the field of computing and propose the best possible solutions.

[PSO.4] Should be able to apply the contextual knowledge in the field of computing and communication to assess social, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional engineering practice.

D. Assessment Plan:

Criteria	Description	Date	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	Sept 5- Sept 9	15
	Sessional Exam II (Closed Book)	Nov 4- Nov 6	15
	Quizzes and Assignments (Accumulated and Averaged)	Regularly	30
End Term Exam (Summative)	End Term Exam (Closed Book)	Nov 29 – Dec 13	40
	Total		100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.		

E. SYLLABUS

Introduction to Ad Hoc Wireless Networks: Characteristics of Mobile Ad-hoc Networks (MANETs), Applications of MANETs, Challenges; **Routing in MANETs:** Topology-based versus Position-based approaches, Topology based routing protocols, Position based routing, Other Routing Protocols; **Data Transmission in MANETs, TCP over Ad Hoc Networks. Basics of Wireless Sensors and Applications:** Design issues, Energy consumption, Clustering of Sensors, Applications; **Data Retrieval in Sensor Networks:** Classification of WSNs, MAC layer, Routing layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs; **Security:** Security in Ad hoc Wireless Networks, Key Management, Secure Routing, Cooperation in MANETs, Intrusion Detection Systems; **Sensor Network Platforms and Tools:** Sensor Network Hardware, Sensor Network Programming Challenges, Node-Level Software Platforms.

F. TEXT BOOKS

T1. C.S.R. Murthy, B.S. Manoj, *"Adhoc Wireless Networks — Architectures and Protocols"*, 1st Edition, Pearson Education, 2006.

T2. C. M. Cordeiro, D. P. Aggarwal, *"Ad Hoc and Sensor Networks — Theory and Applications"*, 2nd Edition, World Scientific Publications, 2011

G. REFERENCE BOOKS

R1. F. Zhao,L. Guibas, "Wireless Sensor Networks: An Information Processing Approach", 1st Edition, Morgan Kauffman Publishers, 2004

R2. F. Hu,X. Cao, "Wireless Sensor Networks — Principles and Practice", An Auerbach Publications, CRC Press, Taylor & Francis Group, 2010.

R3. C.E. Perkins, "Ad hoc Networking", Addison-Wesley, 2008.

Lecture Plan:

Lecture No.	Major Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1.	Introduction and Course Hand-out briefing	To acquaint and clear teachers expectations and understand student expectations	Lecture	NA	NA
2.	Introduction to basic of Ad Hoc Network	To acquaint infrasture-based and infrastructure-less network and fundamental concepts used in ad hoc networks	Lecture	1755.1	Mid Term I, Quiz & End Term
3.	Characteristics and Applications of MANETs	Describe the need of MANET, its characteristics and different applications of MANET and finding different scenarios of its applicability	Lecture	1755.1	Mid Term I, Quiz & End Term
4.	Challenges in Ad Hoc Networks	Identify different design issues of ad hoc networks in realistic environment	Lecture	1755.1	Mid Term I, Quiz & End Term
5.	Data Transmission in MANETs	Describe the process of data transmission in MANETs	Lecture	1755.1	Mid Term I, Quiz & End Term
6.	Issues in Designing routing Protocols	Illustrate different design issues in routing of Ad hoc networks	Lecture	1755.2	Mid Term I, Quiz & End Term
7.	Classification of Routing Protocols	Describe various parameters for classification of routing protocols	Lecture	1755.2	Mid Term I, Quiz & End Term
8.	Distance vector and Link state routing protocols	Recall distance vector and link state routing protocols and their applications	Flipped Class	1755.2	Mid Term I, Quiz & End Term
9.	Destination Sequenced distance vector routing protocol	Describe Destination Sequenced distance vector routing protocol	Lecture	1755.2	Mid Term I, Quiz & End Term
10.	Destination Sequenced distance vector routing protocol	Describe working and applications of DSDV	Lecture	1755.2	Mid Term I, Quiz & End Term
11.	Wireless routing protocol, Cluster-head gateway switch routing	Describe WRP and CGSR routing and applicability in real world	Lecture	1755.2	Mid Term I, Quiz & End Term

	protocol				
12.	On demand routing protocols	Recall on-demand routing protocols and its advantages over table-driven routing protocols	Flipped Class	1755.2	Mid Term I, Quiz & End Term
13.	Dynamic source routing protocol	Describe DSR routing protocol and its working and advantages	Lecture	1755.2	Mid Term I, Quiz & End Term
14.	Ad hoc on demand distance vector routing protocol	Describe AODV routing protocol and its working and advantages	Lecture	1755.2	Mid Term I, Quiz & End Term
15.	Location-aided routing	Describe LAR routing protocol and its working and advantages	Lecture	1755.2	Mid Term I, Quiz & End Term
16.	Hybrid routing protocols, Zone routing protocol	Describe Hybrid routing protocol and its working and advantages. Illustrate the trade-off among all routing protocols in realistic environment	Lecture	1755.2	Mid Term I, Quiz & End Term
17.	Transport layer Design issues for Ad Hoc Networks	Describe different design issues at transport layer in ad hoc networks	Lecture	1755.4& 1755.6	Mid Term I, Quiz & End Term
18.	Transport layer Goals for Ad Hoc Networks	Describe design goals of transport layer protocol for ad hoc wireless networks.	Lecture	1755.4& 1755.6	Mid Term I, Quiz & End Term
19.	TCP performance in Ad Hoc	Revisit to traditional TCP and recount the performance of traditional TCP protocols in wireless ad hoc networks	Lecture	1755.4& 1755.6	Mid Term I, Quiz & End Term
20.	Feedback based TCP	Describe Feedback based TCP	Lecture	1755.4& 1755.6	Mid Term II, Quiz & End Term
FIRST SESSIONAL EXAM					
21.	TCP –BUS , Ad Hoc TCP	Describe TCP- BUS, Ad Hoc TCP and compare with traditional TCP	Lecture	1755.4& 1755.6	Mid Term II, Quiz & End Term
22.	Ad Hoc TCP , Split TCP	Describe Split TCP and compare with traditional TCP	Lecture	1755.4& 1755.6	Mid Term II, Quiz & End Term
23.	Comparative study of various protocols	Analyse various transport layer protocols in Ad hoc environment	Flipped Class	1755.4& 1755.6	Mid Term II, Quiz & End Term

24.	Other Transport layer Protocols	Trade-off study of various protocols at transport layer	Activity	1755.4& 1755.6	Mid Term II, Quiz & End Term
25.	Issues and challenges in Security of Ad Hoc Networks	Describe the need of security in ad hoc networks due to its unique characteristics	Lecture	1755.5	Mid Term II, Quiz & End Term
26.	Security attacks	Describe issues and challenges in security provisioning in wireless ad hoc networks	Flipped Class	1755.5	Mid Term II, Quiz & End Term
27.	Key Management algorithms	Describe symmetric and Asymmetric kay algorithms	Lecture	1755.5	Mid Term II, Quiz & End Term
28.	Key Management approaches in Ad Hoc Networks	Describe various key management approaches used in Wireless Ad Hoc Networks	Lecture	1755.5	Mid Term II, Quiz & End Term
29.	Secure Routing	Describe the requirement of secure routing protocol for ad hoc network and elaborate security versions of studied routing protocols	Lecture	1755.5	Mid Term II, Quiz & End Term
30.	Cooperation in MANET	Describe the need of cooperation in security provisioning of mobile ad hoc networks	Lecture	1755.5	Mid Term II, Quiz & End Term
31.	Intrusion Detection System	Describe intrusion detection system for Ad hoc networks	Lecture	1755.5	Mid Term II, Quiz & End Term
SECOND SESSIONAL EXAM					
32.	Design issues, Clustering of Sensors	Describe different design issues and challenges of wireless sensor network	Lecture	1755.3 & 1755.6	Quiz & End Term
33.	Clustering of Sensors	Describe clustered architecture of wireless sensor network	Lecture	1755.3 & 1755.6	Quiz & End Term
34.	Energy consumption	Describe small minimum energy communication network	Lecture	1755.3 & 1755.6	Quiz & End Term
35.	Applications	Describe various applications of wireless sensor network	Lecture	1755.3 & 1755.6	Quiz & End Term
36.	Classification of WSNs	Classify Wireless Sensor Networks based on various parameters	Flipped Class	1755.3 & 1755.6	Quiz & End Term

37.	MAC layer, Routing layer	Describe MAC and routing layer design issues of Wireless Sensor Networks	Lecture	1755.3 & 1755.6	Quiz & End Term
38.	High-level application layer support	Describe application layer architecture of WSN	Lecture	1755.3 & 1755.6	Quiz & End Term
39.	Adapting to the inherent dynamic nature of WSNs	Identify the impact of different parameters on solutions designed for WSN	Lecture	1755.3 & 1755.6	Quiz & End Term
40.	Sensor Network Hardware	Identify the hardware components required for WSN and their characteristics	Lecture	1755.3 & 1755.6	Quiz & End Term
41.	Sensor Network Programming Challenges, Node-Level Software Platforms.	Build solutions in WSN using node level software platforms	Lecture	1755.3 & 1755.6	Quiz & End Term
END TERM EXAM					

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

CO	STATEMENT	Correlation with Program Outcomes **(POs)**												Correlation with program specific outcomes **(POs)**			
		PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
[1755.1]	Describe the concept of wireless ad hoc networks and specialized ad hoc networks like sensor networks.	**2**	**1**										**1**	**2**			
[1755.2]	Analyse different categories of routing protocols in ad hoc networks and main design issues	**3**	**2**										**1**		**2**		
[1755.3]	Analyze design issues of Wireless sensor networks such as Energy consumption, Clustering of Sensors, QoS and applications.	**2**	**2**	**1**		**3**							**1**	**1**			**1**
[1755.4]	Describe the basic concepts of MAC layer, routing layer and high level application layer in WSN.	**3**	**2**			**3**							**2**			**1**	
[1755.5]	Illustrate Security issues in wireless ad hoc networks, cooperation in MANETs, Intrusion detection systems.	**3**	**2**	**1**									**2**	**1**	**1**	**1**	**1**
[1755.6]	Build the required skills to read and research the current literature in ad hoc and sensor networks.												**2**	**1**		**1**	**1**

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

DEPARTMENT OF COMPUTER AND COMMUNICATION ENGINEERING

Course Hand-out

Major Project | CC 1881 | 12 Credits | 0 0 24 12

Session: Jan 20-May 20 | Faculty: Dr. Deepak Sinwar | Class: VIII SEM

A. **Introduction:** This course is offered by the Department of Computer and Communication Engineering as in this practical course, in which each student is expected to design and develop practical solutions to real life problems related to industry, institutions and computer science research. Software life cycle should be followed during the development. The theoretical knowledge, principles and practices gained from various subjects would be applied to develop effective solutions to various computing problems. The knowledge gained to work with various software tools, Designing tools, programming languages, operating systems, etc. would be utilized in various stages of project. Structured/ Object Oriented design techniques may be used for the project. Software Requirements Specification (SRS), Modeling Techniques, Design and Testing strategies would be part of document of the work. A committee consisting of minimum three faculty members shall perform internal assessment of the minor projects. A report on minor project would be submitted for evaluation, Project work would be presented and demonstrated before the panel of examiners.

B.

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

[CC 1881.1] Identify the basics of the concepts related to the selected topic of the project and also identify the open issues

[CC 1881.2] To identify the depth of the problem and to propose the solution

[CC 1881.3] Solve real time problems and contribute to open community with ethical values by undergoing systematic study and to communicate the proposed solution

[CC 1881.4] Work in team with proper contribution from individuals and managing the project with lifelong learning

D. **PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES**

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

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

[PO.3]. **Design/development of solutions:** Upon analysing, the B Tech CCE graduate should be able to devise solutions for complex engineering problems and design system components or processes that meet the specified requirements with appropriate consideration for law, safety, cultural & societal obligations with environmental considerations.

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

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

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

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

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

[PO.9]. Individual and team work: United we grow, divided we fall is a culture at MUJ. Thus an outgoing student should be able to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

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

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

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

[PSO.1]. Should be able to clearly understand the basic principles, concepts and applications in the field of computer based Communication/networking, information sharing, signal processing, web based systems, smart devices and communication technology.

[PSO.2]. Should be able to nail down the issues prevalent in the field of Computer and Communication Engineering. Should be able to identify the existing open problems in the field of computing and propose the best possible solutions.

[PSO.3]. Should be able to identify the existing open problems in the field of computing and propose the best possible solutions.

[PSO.4]. Should be able to apply the contextual knowledge in the field of computing and communication to assess social, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional engineering practice.

E. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Progress I	30
	Progress II	40
End Term Exam (Summative)	End Term Exam	30
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.	

H. Course Articulation Matrix: (Mapping of COs with POs & 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
[CC1882.1]	Identify the basics of the concepts related to the selected topic of the project and also identify the open issues	2	2		2									2	2	1	1
[CC1882.2]	To identify the depth of the problem and to propose the solution		1	1	1											1	1
[CC1882.3]	Solve real time problems and contribute to open community with ethical values by undergoing systematic study and to communicate the proposed solution	1	1	1	1	3									1		
[CC1882.4]	Work in team with proper contribution from individuals and managing the project with lifelong learning					1	1		1								

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