MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

DEPARTMENT OF INFORMATION TECHNOLOGY

PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

B.Tech - INFORMATION TECHNOLOGY | ACADEMIC YEAR 2018-19

PROGRAM OUTCOMES

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

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

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

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

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

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

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

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

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

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

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

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

PROGRAM SPECIFIC OUTCOMES

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

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

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

ARTICULATION MATRIX, 2018-19

Semester	Course Code	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
I & II	CS1101	3	1	3	-	-	-	-	-	-	-	-	3	-	3	1
	CY1101	3	1	3	-	-	-	-	-	-	-	-	3	-	3	1
	PY1101	3	3	2	3	3	2	2	-	3	2	3	3	-	3	3
	ES1103	2	2	2	-	3	-	3	2	-	3	-	3	-	2	2
	EC1101	3	3	1	2	3	3	3	3	3	-	1	3	-	3	3
	EE1101	2	-	2	-	3	-	3	2	-	3	-	3	-	2	-
	HS1102	3	3	3	2	2	1	1	-	-	-	-	2	-	3	3
	MA1101	3	2	1	-	-	1	1	-	-	-	-	3	-	3	2
	ME1130	-	1	-	-	-	1	-	2	2	2	-	-	-	-	1
	ES1102	3	3	2	3	3	-	-	-	3	-	3	1	-	3	3
	MA1201	3	3	3	2	-	2	2	-	-	-	-	1	-	3	3
	ES1101	3	3	3	2	3	-	-	-	-	-	-	2	-	3	3
III	CS1301	3	2	1	-	-	-	-	-	-	-	-	2	2	3	2
	CS1302	3	3	2	-	-	-	-	-	-	-	-	3	3	3	3
	CS1303	3	2	2	-	-	-	-	-	-	-	-	2	3	3	2
	CS1304	3	2	2	2	-	-	-	-	1	1	1	2	3	3	2
	CS1331	3	2	2	-	-	-	-	-	-	-	-	2	3	3	2
	CS1332	1	2	2	1	1	-	-	-	-	-	-	-	1	1	2
	MA1307	3	3	3	2	2	-	-	-	1	1	2	3	3	3	3
	BB1101	-	-	-	-	-	1	3	2	1	2	1	2	-	-	-
IV	CS1401	2	2	3	1	1	-	-	-	-	1	1	2	1	2	2
	CS1402	2	1	1	1	1	1	1	1	1	1	1	1	2	2	1
	CS1403	2	2	3	2	2	2	-	-	1	-	2	1	1	2	2
	CS1431	1	1	2	2	1	1	-	1	1	1	1	-	1	1	1
	CS1432	2	1	1	1	1	1	1	1	1	1	1	1	2	2	1
	CS1433	3	3	1	2	-	-	-	-	-	-	-	1	3	3	3
	HS1401	-	3	-	-	1	-	-	-	2	-	-	-	3	-	3
	MA1406	3	3	3	3	2	2	-	1	-	-	1	2	3	3	3
	CS1501	1	3	3	2	1	2	1	2	2	2	2	-	1	1	3
	CS1505	2	2	2	3	3	2	2	1	1	1	1	2	2	2	2

ARTICULATION MATRIX, 2018-19

	IT1502	3	3	3	2	-	-	-	-	-	-	-	2	3	1	3
	IT1504	3	2	1	-	-	-	-	-	1	2	-	1	3	2	1
V	CS1530	2	3	3	2	1	2	-	-	-	-	-	2	-	1	3
	IT1532	3	2	2	2	3	2	-	-	3	-	-	3	3	2	1
	IT1551	2	2	3	3	3	1	2	2	2	2	3	3	3	2	3
	CS1602	-	-	2	-	3	-	1	-	1	-	-	-	3	1	2
	IT1603	1	2	2	1	1	1	-	1	2	1	1	-	2	1	2
	CS1631	2	2	2	3	3	-	-	1	2	1	1	1	2	2	3
VI	IT1693	3	3	3	2	1	1	1	2	1	-	1	2	2	2	1
	IT1653	1	2	1	-	1	-	-	-	-	-	1	1	-	1	1
	IT1654	3	1	3	2	2	2	2	2	3	2	1	1	3	2	2
	IT1701	2	2	1	2	2	1	1	-	1	-	1	1	1	1	1
	IT1702	1	3	3	3	-	1	-	2	2	-	2	2	3	3	3
	IT1732	1	1	1	1	2	1	1	1	1	-	1	-	2	2	2
	IT1733	2	2	2	2	-	1	1	1	1	-	1	1	2	1	1
VII	IT1753	2	2	1	2	2	2	-	-	2	-	-	-	2	2	1
	IT1759	3	1	3	3	3	-	-	-	-	-	-	3	3	1	-
	IT1760	2	1	1	-	-	-	1	-	1	1	-	1	2	1	1
	IT1761	2	2	2	2	2	2	2	1	1	2	1	2	2	2	2
	IT1762	2	2	1	1	3	1	-	-	1	-	-	3	3	3	-
	IT1792	2	2	2	1	2	1	1	-	-	-	-	2	1	-	1
VII	IT1881	3	2	2	1	1	1	2	1	2	2	3	1	1	-	1

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Course Handout

Programming in C | CS 1101 | 4 Credits | 2 1 2 4

Session: January 2019 – May 2019 | Faculty: Dr. Manoj Kumar Sharma | Class: First Year B. Tech. II Semester

A. Introduction:

The main objective of this course is for students to be aware with basic computer fundamentals, number systems and to enhance problem solving and logic design skills through writing set of instructions to solve a real world problem through C programming. Students will spend a significant time on each topic to understand their essential requirements and to use them differently with distinct programmable problems.

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

[CS1101.1]: Described a deep knowledge of computer for better understanding of devices, basic fundamental of computer comprises in this course.

[CS1101.2]: Design flow chart, Write algorithm and pseudo code parallel with Control Statements to understand flow of program execution.

[CS1101.3]: Understand bitwise operations and conversion of numbers in different representations through Number System.

[CS1101.4]: Developing skills in students to learn memory oriented operation using pointers and understating programming skills by Array, Structure, Union, Enum and String are added.

[CS1101.5]: Students learned the concept of re-usability by means of functions in C and to illustrate the concept of data base using file handling.

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 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

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/or Assignments , Activity feedbacks (Accumulated and Averaged)	10
End Term Exam (Summative)	End Term Exam (Open Handwritten Notes)	40
Lab	Practical Lab	20
	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

CS1101 PROGRAMMING IN C

Computer Fundamentals: The von Neumann Architecture, flowcharts and algorithms, operating system fundamentals (Linux), programs, assembly language, high level programming languages;

Number System: Binary, decimal, octal, hexadecimal.

C Programming: Data types, variables, operators, expressions, statements, control structures, functions, recursion, arrays and pointers, records (structures), files, input/output, standard library functions and elementary data structures.

A. TEXT BOOKS

T1. E. Balagurusamy, "Computer Fundamentals & C Programming", TMH, 2008.

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

B. REFERENCE BOOKS

R1. B. W. Kernighan, D. M. Ritchie, "The C Programing Language", 2nd Edition, Prentice Hall of India, 1988.

R2. B. Gottfired, "Schaum's Outline Series: Programming with C", 3rd Edition, McGraw Hill Publication, 2004.

F. Lecture Plan

Lecture No.	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1.	Awareness with course objectives, outcomes and applications	Basic Terminology, Flow Chart Designing, Algorithm Writing Styles, Applications of an Algorithm	Practical Applications, Real world problems	[1101.1]	Mid Term - I End Term
2.	The von Neumann Architecture		Lecture	[1101.1]	Mid Term - I End Term
3.	Flowcharts and algorithms		Lecture & Activity	[1101.1]	Mid Term - I End Term
4.			Lecture	[1101.1]	Mid Term - I End Term
5. 6.	Operating system fundamentals (Linux)	Basic terminology, examples and commands	Lecture & Problem Solving Practice	[1101.1]	Mid Term - I End Term
7. 8.	Programs, assembly language, high level programming languages;	Discussion, examples and facts	Lecture & Problem Solving Practice	[1101.1]	Mid Term - I End Term
9.	Data types	Concept discussion, programming examples	Lecture &	[1101.2]	Mid Term - I End Term

10.	Variables		Problem Solving Practice	[1101.2]	Mid Term - I End Term
11.	Operators			[1101.2]	Mid Term - I End Term
12.	Expressions	Concept discussion, programming examples	Lecture & Problem Solving Practice	[1101.2]	Mid Term - II End Term
13.	Statements		Lecture & Problem Solving Practice	[1101.2]	Mid Term - II End Term
14. 15. 16. 17. 18. 19.	**Number System:** Binary, decimal, octal, hexadecimal	Concept discussion, number system conversion, programming examples	Lecture & Problem Solving Practice	[1101.3]	Mid Term - I End Term
20. 21. 22.	Control structures	Concept discussion, programming examples	Lecture & Problem Solving Practice	[1101.4]	Mid Term - II End Term
23. 24. 25.	Functions	Function writing, parameter passing, types of functions and their flexible use	Lecture & Problem Solving Practice	[1101.4]	Mid Term - II End Term
26. 27. 28.	Recursion, arrays	Recursive functions and parameter passing, array defining and use	Lecture & Problem Solving Practice	[1101.4]	Mid Term - II End Term
29. 30. 31. 32.	Pointers	Dynamic use of memory address, pointer as array, function argument passing through pointers etc.	Lecture & Problem Solving Practice	[1101.4]	Mid Term - II End Term
33. 34. 35. 36.	Records (structures), files, input/output,	Data file creation, different types of file operations etc.	Lecture & Problem Solving Practice	[1101.4]	Mid Term - II End Term
37. 38. 39. 40. 41. 42.	Standard library functions and elementary data structures	Exploration of inbuilt library functions, user define data structures	Lecture & Problem Solving Practice	[1101.4]	Mid Term - II End Term

G. 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
[CS1101.1]	Described a deep knowledge of computer for better understanding of devices, basic fundamental of computer comprises in this course.	3	3							1	2		1				
[CS1101.2]	Design flow chart, Write algorithm and pseudo code parallel with Control Statements to understand flow of program execution.	2	2	1		1				1	1						
[CS1101.3]	Understand bitwise operations and conversion of numbers in different representations through Number System.	3	2	1							1						
[CS1101.4]	Developing skills in students to learn memory oriented operation using pointers and understating programming skills by Array, Structure, Union, Enum and String are added.	2	3	3						1	2	2	2				
[CS1101.5]	Students learned the concept of re-usability by means of functions in C and to illustrate the concept of data base usingCfile handling.	2		2				1	1				1				

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

MANIPAL UNIVERSITY JAIPUR

School of Automobile Mechanical and Mechatronics Engineering

Department of Automobile Engineering
Course Hand-out

Engineering Chemistry | CY1101 | 4 Credits | 2 1 1 4

Session: Jan 18 – Jun 18 | Coordinator: Arunava Agarwala | Class: B.Tech. (I and II Sem)

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

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

- **[CY1101.1].** Understand and apply concepts of various types of fuel technology
- **[CY1101.2].** Develop new methods to produce soft water for industrial use.
- **[CY1101.3].** Understand the synthesis and applications of polymer science and polymer technology.
- **[CY1101.4].** Develop skills to synthesis, analysis and use of composite materials.
- **[CY1101.5].** Understand and apply the concepts in electrochemistry and corrosion science in protecting metallic objects.
- **[CY1101.6].** Acquire basic knowledge of Nanochemistry to appreciate its applications in the fields like medicine, opto-electronics, and electronics.

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)	Sessional Exam I (Open Book)	15
	Sessional Exam II (Open Book)	15
	Quizz tests (Accumulated and Averaged)	10
	Laboratory Sessions	20
End Term Exam (Summative)	End Term Exam (Open Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. Syllabus

Chemical Fuels: Classification; Calorific value and its determination; Analysis of solid fuel;Liquid Fuel: Distillation of petroleum, Petroleum cracking, Reforming of petrol, Octane numberand Cetane value, Synthetic petrol, Combustion based numerical; **Water Technology**: Hardnessof water; Units of hardness; Ion exchange water softening technique; Boiler feed water: scale &sludge, priming and foaming; **Polymers & Composites**: Molecular weight determination; Glasstransition temperature; Methods of polymerization; Mechanism of polymerization reactions;Compounding of plastics; Vulcanization; Conducting polymers; Synthesis, properties andapplications of some polymers; Composition and characteristic properties of composites; **Nano Chemistry:** Synthesis, properties and applications of selected nanomaterials; **Corrosion and its Control**: Theories alrd Mechanism of Corrosion; Types of corrosion; Factors affecting corrosion,Protection against gorrosion, Paints and Coatings: Antifouling Coating, Fire retardant paintsand Case studies.

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

None

H. Lecture Plan:

Lec No	**Topics**	**Session Outcome**	**Mode of Delivery**	**Corresponding CO**	**Mode of Assessing the Outcome**
1.	**Chemical fuels:** Introduction, Classification, Units of heat, Calorific value: Gross calorific value and Net calorific value.	To acquaint and clear teachers expectations and understand student expectations	Lecture	1101.1	Class Quiz End Term
2.	Description of working of Bomb calorimeter for detection of caloric value of solid /non-volatile liquid fuel; Discussion about all corrections.	Recall working of the calorimeter	Lecture	1101.1	Class Quiz Mid Term I
3.	Numerical problems based on Bomb calorimeter.	Analyze and solve numerical problems	Activity	1101.1	Class Quiz End Term
4.	Description of working of Boy's calorimeter for detection of caloric value of gaseous fuel; Numerical problems based on Boy's calorimeter.	Describe calorimeter and its working principle	Lecture	1101.1	Home Assignment End Term
5.	Dulong's Formula; Numerical problems based on Dulong's Formula; Coal analysis: Proximate analysis.	Analyze and solve numerical problems	Lecture, Activity	1101.1	Class Quiz End Term
6.	Coal analysis: Ultimate analysis; Numerical problems related to Proximate and Ultimate analysis.	Analyze and solve numerical problems	Lecture, Activity	1101.1	Class Quiz Mid Term I End Term
7.	Liquid Fuels: Fractional Distillation, Petroleum Cracking - Fixed Bed catalytic cracking.	Recall principles of distillation, cracking	Lecture	1101.1	Class Quiz Mid Term I End term
8.	Moving bed Catalytic Cracking; Knocking, Octane number, Anti-knocking agents, Unleaded petrol and power alcohol, Cetane number.	Recall principles of cracking, knocking	Lecture	1101.1	Class Quiz Mid Term I End Term
9.	Reforming of Gasoline: Thermal and Catalytic reforming, Synthetic Petrol, Bergius process, Fisher Tropsch method.	Recall basic principles of fuels	Lecture, Activity	1101.1	Class Quiz Mid Term I End Term
10.	Numerical based on Combustion (By Weight Type).	Analyze and solve numerical problems	Activity	1101.1	Class Quiz Mid Term I End Term
11.	Numerical based on Combustion (By Volume Type).	Analyze and solve numerical problems	Activity	1101.1	Class Quiz End Term
12.	**Water Technology:** Introduction, Hardness of water, Important units of hardness.	Describe the properties of water and its aplication	Lecture	1101.2	Class Quiz Mid Term II End Term
13.	Numerical problems based on hardness.	Analyze and solve numerical problems	Lecture, Activity	1101.2	Class Quiz Mid Term II

					End Term
14.	Estimation of hardness: Soap solution method and EDTA method.	Describe working hardness/softness of water	Lecture	1101.2	Class Quiz Mid Term II End Term
15.	Softening of water: cold and hot Lime soda process and numerical problems (calculation of amount of lime and soda).	Analyze and solve numerical problems	Lecture, Activity	1101.2	Class Quiz Mid Term II End Term
16.	Softening of hard water by Ion exchange method and zeolite method.	Describe the conversion of hard water to soft water	Lecture	1101.2	Class Quiz End Term
17.	Internal treatment: Phosphate conditioning and Calgon conditioning.	Recall the conversion of hard water to soft water	Lecture	1101.2	Class Quiz End Term
18.	Boiler problems: scale and sludge formation,priming and foaming and preventive methods.	Recall the conversion of hard water to soft water	Lecture	1101.2	Class Quiz End Term
19.	**Polymers and Composites:** Definition and classification of polymers: based on structure, origin, tacticity, and heating behavior (thermo plastic/ thermosetting).	Describe the working of polymer	Lecture, Activity	1101.3	Class Quiz End Term
20.	Functionality; Degree of polymerization; Co-polymerization: alternating, random, block and graft polymers.	Describe the properties of polymer	Lecture	1101.3	Class Quiz End Term
21.	Molecular weight of polymers: Number average and weight average molecular weights, polydispersity index; Numerical problems based on average molecular weight.	Describe the properties of polymer, Analyze and solve numerical problems	Lecture, Activity	1101.3	Class Quiz End term
22.	Mechanism of free radical polymerization and ionic (both cationic and anionic) polymerization.	Recall the properties of polymer	Lecture, Activity	1101.3	Class Quiz End Term
23.	Mechanism of coordination polymerization (Zieglar Natta Catalyst), Condensation polymerization: definition and examples.	Identify alternative ways to synthesize polymers	Lecture	1101.3	Class Quiz Mid Term II End Term
24.	Polymerization techniques: Bulk, Solution, Suspension and Emulsion.	Identify alternative ways to synthesize polymers	Lecture	1101.3	Class Quiz Mid Term II End Term
25.	Glass transition temperature & factors affecting it.	Identify alternative ways to synthesize polymers	Lecture	1101.3	Class Quiz Mid Term II End Term
26.	Elastomer: Natural rubber, Vulcanization, Synthetic rubbers.	Identify alternative ways to synthesize polymers	Lecture	1101.3	Class Quiz End Term
27.	Preparation, properties and applications ofPolythene (LDPE and HDPE) and Nylon: 6, 6:6, 6:10, 11.	Identify alternative ways to synthesize polymers	Lecture, Activity	1101.3	Class Quiz End Term

28.	Preparation, properties and applications of Phenol Formaldehyde resins (Novolacs / Resols).	Identify alternative ways to synthesize polymers	Lecture	1101.3	Class Quiz End Term
29.	Composites and its Classification.	Describe the properties of composites	Lecture	1101.4	Class Quiz End Term
30.	Characteristic Properties of Composites.	Describe the properties of composites	Lecture	1101.4	Class Quiz End Term
31.	Corrosion and its Control:Introduction, Significance, Chemical Corrosion, Pilling Bedworth Rule (Pilling–Bedworth ratio (P–B ratio).	Describe corrosion and its preventions	Lecture, Activity	1101.4	Class Quiz End Term
32	Electrochemical Corrosion.	Describe corrosion	Lecture	1101.5	Class Quiz End Term
33	Types of corrosion: Galvanic corrosion, Pitting corrosion.	Recall properties of corrosion	Lecture	1101.5	Class Quiz End Term
34	Water line Corrosion; Drop Corrosion; Stress corrosion (caustic embrittlement).	Recall properties of corrosion	Lecture	1101.5	Class Quiz End Term Practical End Term Theory
35	Factors affecting corrosion: the nature of the metal and environment.	Describe corrosion and its reasons	Lecture	1101.5	Class Quiz
36	Corrosion prevention by material selection and design; Protection against corrosion: Sacrificial anodic protection, Impressed current method, anodic protection; Corrosion inhibitors (cathodic/anodic).	Describe corrosion and its preventions	Lecture	1101.5	
37	Electroplating, galvanization, tinning and other metal coating methods.	Describe corrossion prevention	Lecture, Activity	1101.5	Class Quiz
38	Paints and Coatings: Antifouling Coating, Fire Retardants Paints.	Describe corrossion prevention	Lecture	1101.5	Class Quiz
39	**Nano-Chemistry**: Introduction, Synthesis of Nano Materials: Top down and Bottom up approach.	Describe nanochemistry	Lecture	1101.6	Class Quiz End Term Theory
40	Synthesis, properties and applications of Fullerenes and Carbon Nano tube.	Recall basics of nanochemistry	Lecture	1101.6	Class Quiz
41	General Properties of Nano Materials.	Recall nanomaterials	Lecture	1101.6	Class Quiz End Term Theory
42	Revision.	Recall and recap the lessons learnt during the semester	Activity	1101.1-6	Class Quiz Mid Term I Mid Term II End Term Theory
LAB SESSIONS	Lab sessions based on Alternative Fuel Synthesis, testing and fabrication of after exhaust device	Experiment and test different fuels on engines and analyse their impact on pollution reduction	Lab Sessions	1101.1-6	End Term Practical

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
CY 1101.1	Understand and apply concepts of various types of fuel technology.	2						1			1		1			
CY 1101.2	Develop new methods to produce soft water for industrial.			1					1				1			
CY 1101.3	Understand the synthesis and applications of polymer science and polymer technology.	2				1					1		1			
CY 1101.4	Develop skills to synthesis, analysis and use of composite materials.						1		1				1			
CY 1101.5	Understand and apply the concepts in electrochemistry and corrosion science in protecting metallic objects.		1		1	1			1				1			
CY 1101.6	Acquire basic knowledge of Nanochemistry to appreciate its applications in the fields likemedicine, opto-electronics, and electronics.	2				1			1				1			

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

MANIPAL UNIVERSITY JAIPUR
School of Basic Sciences

Department of Physics
Course Hand-out

Engineering Physics | PY 1101 | 5 Credits | 3 1 1 5

Session: Jan- May, 2019| Faculty: Dr. Saikat | Class: B.Tech. II 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

[PY1101.1] understand the wide range of diversity in science and technology with the help of knowledge of basic Physics along with practical approach of Engineering Physics.
[PY1101.2] explain various processes involved in understanding the nature of light.
[PY1101.3] identify the problems and applications of Quantum mechanics.
[PY1101.4] impart the knowledge of empirical laws based on Solid state Physics and Atomic and Molecular Physics.
[PY1101.5] achieve perfectness in experimental skills and the study of practical applications in Physics.
[PY1101.6] develop skills to impart practical knowledge in real time solution.

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

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

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

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

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

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

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

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

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

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

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

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

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

Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Open Handwritten Note Book)	15
	Sessional Exam II (Open Handwritten Note Book)	15
	In class Quizzes (Accumulated and Averaged)	10
End Term Exam (Summative)	End Term Exam (Open Handwritten Note Book)	40
Lab Evaluation	Regular Lab Performance & viva-voce, laboratory end term exam	20
	Total	100
Attendance (Formative)	A minimum of 75% attendance separately for each component (Theory lectures and Practical) 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.	

D. SYLLABUS

OPTICS: Two source interference, Double slit interference, Coherence, Intensity in Double slit interference, interference from thin films, 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 speed, ground speed), the uncertainty principle.

QUANTUM MECHANICS : An interpretation of quantum mechanics, Wave function and its significance, Schrodinger equation, particle in a box, Particle in a well of finite height (qualitative), Tunnelling 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-Types, Moseley 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 Super conductors, Meisner effect, BCS Theory (Introductory) and applications of Superconductivity.

E. TEXT BOOKS

T1. Halliday, Resnick, Krane, PHYSICS, Volume 2, 5th edition, John Wiley & Sons, Inc, 2011 *(For Optics)*
T2. Beiser & Mahajan, Modern Physics, Mc Graw Hill, 6th edition., 2009 *(For Quantum Physics, Quantum Mechanics, Atomic Physics, Solid State Physics)*

F. REFERENCE BOOKS

R1. Serway & Jewett, PHYSICS for Scientists and Engineers with Modern Physics; Volume 2,6th edition,

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	**1101.1**	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	**1101.1 & 1101.2**	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	**1101.2**	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	**1101.2**	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	**1101.2**	Class Quiz – I Home Assignment - I Mid Term I End Term
6	TUTORIAL:1		Activity (Think Pair Share)	**1101.2**	
7	Interference in wedge shaped air film	Understand the concept of interference in wedge shaped films and introduction to Newton's ring	Lecture	**1101.2**	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	**1101.2**	Class Quiz – I Home Assignment-I Mid Term I End Term
9	**TUTORIAL: 2**		Activity (Think Pair Share)	**1101.2**	
10-11	Michelson interferometer – construction & theory (Qualitative approach only), Applications of Michelson interferometer (determination of wavelength)	Description of Michelson interferometer and derivation of the formula for determination of wavelength using it.	Lecture	**1101.2**	Class Quiz – I Home Assignment -I Mid Term I End Term
12	**TUTORIAL: 3**		Activity (Think Pair Share)	**1101.2**	
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	**1101.2**	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	**1101.2**	Class Quiz – 2 Home Assignment - 2 Mid Term I End Term
17	**TUTORIAL:4**		Activity (Think Pair Share)	**1101.2**	
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	**1101.2**	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	**1101.2**	Class Quiz – 3 Home Assignment- 2 Mid Term I End Term
20	**TUTORIAL:6**		Activity (Think Pair Share)	**1101.2**	
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	**1101.2**	Class Quiz – 3 Home Assignment-2 Mid Term I End Term
22	**TUTORIAL:7**		Activity (Think Pair Share)	**1101.2**	
23-24	Polarization of EM Waves, Polarizing sheets, Polarization by reflection, Double refraction, Malus law & Brewsters law	Understand the phenomena of polarisation and different approaches to polarise EM waves	Lecture	**1101.2**	Class Quiz – 3 Home Assignment - 3 Mid Term I End Term

25	**TUTORIALS: 8**		Activity (Think Pair Share)	**1101.2**	
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	**1101.1 & 1101.3**	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	**1101.1 & 1101.3**	Class Quiz – 4 Home Assignment - 4 Mid Term II End Term
30	**TUTORIAL:9**		Activity (Think Pair Share)	**1101.3**	
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	**1101.1 & 1101.3**	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	**1101.3**	Class Quiz – 5 Home Assignment - 5 Mid Term II End Term
34	**TUTORIAL: 10**		Activity (Think Pair Share)	**1101.3**	
35	An Interpretation of Quantum mechanics, Wave function and its physical significance, SchrŐdinger wave equation	Introduction to wave function and Schrodinger wave equation	Lecture	**1101.3**	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	**1101.3**	Class Quiz – 6 Home Assignment - 5 Mid Term II End Term
37	**TUTORIAL: 11**		Activity (Think Pair Share)	**1101.3**	
38-39	Particle in a well of finite height (qualitative), Tunnelling through a potential barrier (	Qualitatively describe the phenomena of particle in a finite well and the phenomena of tunnelling	Lecture	**1101.3**	Class Quiz – 6 Home Assignment -5 Mid Term II End Term

	qualitative) and its applications				
40	Quantum mechanical simple harmonic oscillator (Qualitative)	Qualitative discussion of the wave function and energy of a harmonic oscillator	Lecture	**1101.3**	Class Quiz – 6 Home Assignment - 5 Mid Term II End Term
41	**TUTORIAL: 12**		Activity (Think Pair Share)	**1101.3**	
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	**1101.1 & 1101.4**	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	**1101.4**	Class Quiz – 7 Home Assignment - 6 End Term
46	**TUTORIAL: 13**		Activity (Think Pair Share)	**1101.4**	
47	Lasers-Spontaneous and stimulated transitions, Population inversion and metastable state,	Understand the lasers and the related optical phenomena.	Lecture	**1101.4**	Class Quiz – 7 End Term
48-49	Construction and working of Ruby laser , Construction and working of He-Ne laser, Energy level diagram of He-Ne laser, Application of Laser	Description of Ruby laser and He-Ne laser and understand their working	Flipped Classroom, Lecture	**1101.4**	Class Quiz – 7 End Term
50	**TUTORIAL: 14**		Activity (Think Pair Share)	**1101.4**	
51	Band Theory of solids, Electrical conduction in Metals, Insulators, and Semiconductors	Understand qualitatively the band theory of solids	Lecture	**1101.4**	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	**1101.4**	Class Quiz – 8 End Term
54	**TUTORIAL: 15**		Activity (Think Pair Share)	**1101.4**	
55	BCS Theory (Introductory) and Applications of superconductivity	Qualitatively understand the BCS theory and their applications	Lecture	**1101.4**	Class Quiz – 8 End Term
56	**TUTORIAL: 16**		Activity (Think Pair Share)	**1101.4**	

LAB SESSIONS	Lab sessions based on different aspects of physics	Experiment and test different aspects of physics related to the theory taught in the class	Lab Sessions	**1101.5 & 1101.6**	Experimental results and viva-voce of 14 lab sessions Laboratory End Term Exam

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
PY 1101.1	understand the wide range of diversity in science and technology with the help of knowledge of basic Physics along with practical approach of Engineering Physics	3	1		2		2		3								
PY 1101.2	explain various processes involved in understanding the nature of light		3	3		2		2					1				
PY 1101.3	identify the problems and applications of Quantum mechanics	3					1	1				3	2				
PY 1101.4	impart the knowledge of empirical laws based on Solid state Physics and Atomic and Molecular Physics	1			3	2				1			1				
PY 1101.5	achieve perfectness in experimental skills and the study of practical applications in Physics			2		3	2		2	3			3				
PY 1101.6	develop skills to impart practical knowledge in real time solution	2			2		1	3			3	1					
	Max correlation -->	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**				

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

Engineering Thermodynamics| ES 1103 | 3 Credits | 3 0 0 3

Session: Jan 19 – May 19 | Faculty | Class:B.Tech. Ist Year

A. Introduction: Thermodynamics is a basic science that deals with equilibrium, energy and its transformation, and the laws governing such transformation. These laws are of wide applicability and are used in several branches of engineering and science. Principles and concepts of thermodynamics are important and indispensable tools in the innovation, design, development and improvement of engineering process, equipment and devices which deal with effective utilization of energy. Notable applications of engineering thermodynamics in the field of energy technology are:

power producing devices, e.g., internal combustion engines and gas turbines, steam and nuclear power plant, power consuming devices, e.g., fans, blowers and compressors, refrigeration and air conditioning plants, chemical process plant and direct energy conversion devices. It is essential that every engineer should have a thorough knowledge of thermodynamics and hence thermodynamics has been an essential part of engineering curricula all over the world.

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

[ES1103.1] Understand the fundamental concepts of thermodynamics such as temperature, pressure, system, properties, process, state, cycles and equilibrium in the context of engineering applications.

[ES1103.2] Apply first law of thermodynamics on flow and non-flow processes.

[ES1103.3] Design and analyse the concept of components (compressor, turbine, pump, etc.) with the use of thermodynamic law.

[ES1103.4] Analyse the concept of second law and entropy in the context of thermal applications.

[ES1103.5] Apply the concept of first & second law of thermodynamics to design/utilize the power generating and power consuming devices.

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 (Open Book)	15
	Sessional Exam II (Open Book)	15
	Quizzes (Open Book/Close Book) and Assignments	30
End Term Exam (Summative)	End Term Exam (Open Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Homework/ Home Assignment/ (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

Definitions & Concepts: SI Units; System, Thermodynamic Properties of Fluids: Mathematical, Tabular and Graphical representation of data; Ideal gas Van der Waals Equation of state; Compressibility chart; Thermodynamic Diagrams including Mollier diagram; Steam Tables. Zeroth Law of thermodynamics: temperature scale. First Law of Thermodynamics: Applications to Non flow processes, Applications of First Law of Thermodynamics of Flow Processes – Steady State / Transient; Applications of First Law of Thermodynamics to Chemically Reacting Systems. Second Law of Thermodynamics: Applications. Thermodynamic Relations: Thermodynamic Potentials, Maxwell's Relations; Availability. Power Cycles and Refrigeration Cycles, Gas-Vapor Mixtures and Psychrometry.

F. Text Book:

T1. An Introduction to Thermodynamics, YVC Rao, Universities Press (India) Private Limited, Revised Edition, 2004.

G. Reference Book:

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

H. Lecture Plan:

Lec No	**Topics**	**Session Objective**	**Mode of Delivery**	**Corresponding CO**	**Mode of Assessing the Outcome**
1	Introduction to Thermodynamics	Know the basics of the course and understand its applications	Lecture	ES1103.1	Home Assignment and Class Quiz Mid-Term I End-Term
2	Concepts and Definitions- System, Surroundings, Intensive and Extensive Properties, Energy, Equilibrium	Discuss the terms system and surroundings, thermodynamic properties and describe their use	Lecture	ES1103.1	
3	Equilibrium, Stability, Process, Work	Understand the criteria of thermal equilibrium, mechanical equilibrium and chemical equilibrium	Lecture	ES1103.1	
4	Work, Definition of Thermodynamics, Modes of work, Heat	Brief about the thermodynamics definition of work, distinguish between heat and work and identify their effects	Lecture	ES1103.1	Home Assignment and Class Quiz Mid-Term I End-Term
5	Thermodynamic Properties of Fluids- Concepts of phases, Equations of state	Understand a pure substance and a phase and phase transformation	Lecture	ES1103.1	
6	Ideal gas, van der Waals equation, Critical constants	Understand the concept of ideal gas and van der Walls equation of state	Lecture	ES1103.1	
7	Other equations of state, Compressibility chart, Reduced equation of state, Generalized compressibility chart	Use of compressibility chart and generalized compressibility chart and its applications	Lecture	ES1103.1	Home Assignment and Class Quiz Mid-Term I End-Term
8	Graphical representation of data – T-V diagram, P-V diagram, P-T diagram, Mollier diagram	Understand various thermodynamic diagrams like T-v, P-v, P-T, and Mollier diagram	Lecture/Activity	ES1103.1	
9	Tabular representation of data, Steam table	Estimating the properties of steam using steam tables.	Lecture/Activity	ES1103.1	
10	Zeroth law of thermodynamics, First law of thermodynamics-History	Understand the Zeroth law of thermodynamics	Lecture	ES1103.1 ES1103.2	Home Assignment and Class Quiz Mid-Term I End-Term
11	First law of thermodynamics, Consequences, Analysis of elementary processes	Know the genesis of the first law of thermodynamics	Lecture	ES1103.2	
12	Analysis of elementary	Apply the first law of	Lecture	ES1103.1	

	processes, Isothermal processes, Adiabatic processes, Polytropic processes	thermodynamics to analyse different thermodynamics process		ES1103.2	
13	Constant internal energy processes	Apply the first law of thermodynamics to analyse constant internal energy process	Lecture	ES1103.1 ES1103.2	Home Assignment and Class Quiz Mid-Term I End-Term
14	First law analysis of processes – Control mass analysis, Control volume analysis	Explain the control mass and control volume analysis	Lecture	ES1103.2 ES1103.3	
15	Applications of steady state flow processes, Throttling process, Applications of throttling	Analyse the steady flow processes and its applications	Lecture	ES1103.2 ES1103.3	
16	Transient flow processes, Case of an ideal gas	Analyse the transient flow processes.	Lecture	ES1103.1 ES1103.2 ES1103.3	Home Assignment and Class Quiz Mid-Term II End-Term
17 & 18	Second law of thermodynamics- Heat engine, Heat pump or refrigerator, Second law of thermodynamics	Understand the concept of second law and its requirement	Lecture/Lab Visit	ES1103.4	
19	Kelvin, Plank, and Clausius statement, Reversible and Irreversible reactions, Criteria for irreversible processes	Understand the statements of second law of thermodynamics and also discuss the criteria for irreversible process	Lecture	ES1103.4	
20	Carnot cycle, Carnot theorem, Thermodynamic temperature scale	Understand the Carnot cycle and its use in thermodynamics	Lecture	ES1103.4	Home Assignment and Class Quiz Mid-Term II End-Term
21	Clausius inequality, Entropy, Calculation of entropy change	State the Clausius inequality and calculate the entropy change of the system	Lecture	ES1103.4	
22	Principles of entropy increase, Temperature-entropy diagram	Understand the principles of entropy increase and its reason	Lecture	ES1103.4	
23	Available energy, Loss in available energy,	Define the available and unavailable energy through the concept of second law	Lecture	ES1103.4	Home Assignment and Class Quiz Mid-Term II End-Term
24	Availability and Irreversibility	Estimate the loss in available energy in a given process	Lecture	ES1103.4	
25	Thermodynamic relations- Maxwell's relations, Mnemonic diagram, Thermodynamic potentials	Understand the importance the Maxwell's relations	Lecture	ES1103.3 ES1103.4	

26	Thermodynamic potentials, Mathematical preliminaries, Entropy relations	Know the thermodynamic potentials	Self-Study	ES1103.3 ES1103.4	Home Assignment and Class Quiz Mid-Term II End-Term
27	Joule-Thompson coefficient, Clapyeron equation, Gibb's phase rule	Understand the Joule-Thompson coefficient, Clapyeron equation, Gibb's phase rule	Lecture	ES1103.3 ES1103.4	
28	Power and Refrigeration cycles-Classification, Vapor power cycles, Carnot vapor power cycle,	Classify the power cycles into vapour cycles and gas power cycles	Lecture	ES1103.1 ES1103.3 ES1103.5	Home Assignment and Class Quiz End-Term
29	Ideal Rankine cycle and practical Rankine cycle	Explain the basics of Rankine cycle and estimate the thermal efficiency of an Ideal and actual Rankine cycle	Lecture	ES1103.1 ES1103.3 ES1103.5	
30 & 31	Gas power cycles, Otto cycle, Diesel cycle	Analyse the Otto and diesel cycle	Lecture/Lab Visit	ES1103.1 ES1103.3 ES1103.5	
32	Comparison of Otto and Diesel cycle, Air standard dual cycle	Analyse the differences in Otto, Diesel and dual cycle	Lecture	ES1103.1 ES1103.3 ES1103.5	Home Assignment and Class Quiz End-Term
33	Ideal and Actual Brayton cycle	Analyse air standard Brayton cycle	Lecture	ES1103.1 ES1103.3 ES1103.5	
34 & 35	Refrigeration cycle, Vapor compression refrigeration cycle	Understand the practical refrigeration cycle and its components	Lecture/Lab Visit	ES1103.1 ES1103.3 ES1103.5	
36	Refrigerants, Gas refrigeration cycle	Know the criteria in selection of refrigerants and their use	Self-study	ES1103.1 ES1103.3 ES1103.5	Home Assignment and Class Quiz End-Term
37	Gas vapor mixtures and Psychrometry, ideal gas mixtures	Predict the properties of an ideal gas mixture from knowledge of the properties of the constituent species	Lecture	ES1103.1 ES1103.2 ES1103.5	
38	Psychrometer, Psychrometric chart	Use the psychrometric charts in the analysis of process of dealing with air-water vapour mixtures	Activity	ES1103.1 ES1103.5	

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
ES1103.1	Understand the fundamental concepts of thermodynamics such as temperature, pressure, system, properties, process, state, cycles and equilibrium in the context of engineering applications.	3													1	
ES1103.2	Apply first law of thermodynamics on flow and non-flow processes.	3	2													
ES1103.3	Design and analyse the concept of components (compressor, turbine, pump, etc.) with the use of thermodynamic law.	3		3	2										1	
ES1103.4	Analyse the concept of second law and entropy in the context of thermal applications	3	2	3	2		2	2							1	
ES1103.5	Apply the concept of first & second law of thermodynamics to design/utilize the power generating and power consuming devices.	3	3	3			2	2							1	

MANIPAL UNIVERSITY JAIPUR

School of Electrical, Electronics & Communication Engineering (SEEC)

Course Hand-out

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

Session: Jan 19 – May 19 | Faculty: Dr. Prashant Povel Dwivedi | Class: B.Tech. 1st year

A. Introduction:

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

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

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

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

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

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

[EC1101.4] Demonstrate interconversion on different number systems

[EC1101.5] Demonstrate minimization of Boolean expressions

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

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

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

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

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

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

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

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

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

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

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

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

D. Assessment Plan:

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

E. SYLLABUS

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

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

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

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

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

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

F. TEXT BOOKS

T1. R. L. Boylestad, L. Nashelsky, Electronic Devices and Circuit Theory, Ninth edition, PHI.

T2. A. P. Malvino, David J Bates, Electronic Principles, Seventh edition, TMH.

T3. G. Kennedy, B. Davis, Electronic Communication systems, TMH.

G. REFERENCE BOOKS

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

R1. J. Millman and C. C. Halkias, Integrated Electronics, Tata McGraw Hill, New Delhi. (1994).

R2. B. P. Singh and Rekha Singh, Electronic Devices and Circuits, Second Edition, Pearson Education, 2013.

H. Lecture Plan:

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

23	Transistor configuration: symbolic representation and CB Characteristics.	Characteristics of BJT under various config.	Lecture	EC1101.2 (CO 2)	Class Quiz
24	Transistor configuration: symbolic representation and CE Characteristics,	Characteristics of BJT under various config.	Lecture	EC1101.2 (CO 2)	Class Quiz
25	CC configuration w.r.t. CE, Relation between α and β	Characteristics of BJT under various config.	Lecture	EC1101.2 (CO 2)	Class Quiz, Mid Term II, End Term
26	Transistor Biasing, Q-point, Load line	Effect of load on the characteristics	Lecture	EC1101.2 (CO 2)	Class Quiz, Mid Term II, End Term
27	Fixed biasing	Effect of load on the characteristics	Lecture	EC1101.2 (CO 2)	Class Quiz, Mid Term II, End Term
28	Self-biasing, Bias stabilization	Effect of load on the characteristics	Lecture	EC1101.2 (CO 2)	Class Quiz, Mid Term II, End Term
29	Transistor as an amplifier, Frequency response	Understanding of amplifier characteristic and its response with frequency variation	Lecture	EC1101.2 (CO 2)	Class Quiz
30	Tutorial		Quiz 2		
31	Introduction to Operational Amplifier, Op. Amp Characteristics.	Understanding the OPAMP characteristics and it’s difference from BJT as an amplifier.	Lecture	EC1101.3 (CO 3)	Class Quiz
32	Inverting amplifier	Application of OPAMP	Lecture	EC1101.3 (CO 3)	Class Quiz, Mid Term II, End Term
33	NON-Inverting amplifier, Linear applications of Op. Amp as voltage follower	Application of OPAMP	Lecture	EC1101.3 (CO 3)	Class Quiz, Mid Term II, End Term
34	Summing amplifier, Subtractor	Application of OPAMP	Lecture	EC1101.3 (CO 3)	Class Quiz, End Term
35	Integrator, Differentiator	Application of OPAMP	Lecture	EC1101.3 (CO 3)	Class Quiz, End Term
36	Tutorial		Quiz 3		
37	Digital Electronics: Number system	Mathematical understanding of Number System	Lecture	EC1101.4 (CO 4)	Class Quiz, End Term
38	Number conversion, Binary addition	Application of a Number System in Digital Electronics.	Lecture	EC1101.4 (CO 4)	Class Quiz, End Term
39	Binary subtraction with complements (1’s and 2’s complement)	Understanding of Subtraction in Digital Electronics	Lecture	EC1101.4 (CO 4)	Class Quiz, End Term

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

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

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

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

MANIPAL UNIVERSITY JAIPUR

School of Electrical, Electronics and Communication

Department of Electrical Engineering
Course Hand-out

Electrical Engineering | EE 1101 | 4 Credits | 4 0 0

Session: Jan. 19 – May 19 | Faculty: Dr. Sunil Kumar Goyal | Class: B.Tech. First Year (All Branches)

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

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

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

[EE1101.1]. Recall basic circuit laws and apply theorems to analyse different types of DC circuits.
[EE1101.2]. Analyze and illustrate the comparison between linear electric & magnetic circuits.
[EE1101.3]. Identify and evaluate different configurations of single phase & three phase ac circuits.
[EE1101.4]. Understand the construction and operating principle of transformer.
[EE1101.5]. Illustrate the basic operating principles of DC machines & Induction motors and fundamental measuring Instruments

A. 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

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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

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

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

B. 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 (Open Book)</td><td>15</td></tr>
<tr><td>Sessional Exam II (Open 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 (Open 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. 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="2">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>

C. Syllabus

Introduction to Indian power scenario, Domestic appliances, Basic circuit elements, Source Transformation, Series & parallel resistive circuits, Review of Kirchhoff's laws, Star Delta Transformations, **DC Circuit Analysis:** Mesh and Node voltage analysis, DC Network Theorems-Superposition, Thevenin, Norton, Maximum Power Transfer. Capacitor and Inductor Series & Parallel connections, Charging & Discharging, Energy stored. **Magnetic circuits:** Terminologies, Analysis of series and parallel magnetic circuits, Review of Electromagnetism, Electromagnetic Induction, Fleming's left & right hand rules, Faradays laws, Lenz's law, Induced emf in a conductor & coil, Mutual Inductance, Coupling Coefficient and dot rule. **Single phase AC circuits:** Generation, EMF induced, Average value, RMS value, Peak factor, Form factor, Phasors, Analysis of Pure R, L, C Series and parallel combinations (RL, RC and RLC circuits), Power, Power factor, series and parallel Resonance. **Three phase AC Circuits:** Star and Delta connections, Analysis with balanced loads, Power measurements. **Transformers:** Single phase transformer- types, Construction, working principle, ideal and practical transformers, losses, Efficiency, Regulation. **Electrical Motors:** Introduction of Single & Three phase Induction motors, DC Motors. **Electrical Instruments:** Fundamentals of Electrical Measuring Instruments.

D. TEXT BOOKS

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

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

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

E. REFERENCE BOOKS

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

R2. D. P. Kothari. & I. J. Nagarath, Basic Electrical Technology, TMH 2004.

F. Lecture Plan:

Lec No	Topics	Session Objective	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

C. 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
EE 1101.1	Develop circuit designing skills through general insight of circuit laws and theorems.	3	2										2			
EE 1101.2	Analyze and illustrate the comparison between linear electric & magnetic circuits.	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

Course Hand-out

History of Indian Science & Technology
HS1102| 2 Credits | 2 0 0 2

Session: JULY-DEC. 2018 | Faculty Coordinator- Dr Arun Kumar Poonia| Class: B.Tech 1st Year

Introduction: The course is designed to enable students to know and to develop an understanding about the history of Indian science & technology and the contribution of India in the field of science & technology.

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

[HS1102.1] Identify the contribution of India in the field of science and technology.

[HS1102.2] Understand the contribution of ancient Indians in the field of science and technology for answering general knowledge questions during interviews for future employment

[HS1102.3] Analyse ancient Indian education system and reasons for its going into oblivion.

[HS1102.4] Examine the growth of Indian science and technology in the 20th century A.D.

B. Program Outcomes

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

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

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

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

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

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

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

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

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

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

[PO.11]. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary 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	15
	Sessional Exam II	15
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
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

An introduction and need to learn History of Indian science and technology; Early civilizations and their impact on development of science and technology; Contribution of Indian science and technology in the fields of mathematics, astronomy, medical science, architecture, metallurgy, agriculture, yoga; Discoveries and inventions; Indian education system; Possible reasons of oblivion; Effect of historical developments (pre and post-independence era), Policy measures; Case studies.

F. Text books

Lecture Notes

G. Reference books

R1. Indian Science and Technology in Eighteenth century, Dharampal, reprint of first edition (1983), Academy of Gandhian Studies, Hyderabad.

R2. The Beautiful Tree: Indigenous Indian Education in the Eighteenth century, Dharampal, second edition (1995) Keerthi Publishing house, Coimbatore

R3. India's Glorious Scientific Tradition, Suresh Soni, first edition (2008) Prabhat Prakashan

H. Lecture Plan:

Lecture No	Topics	Session Objective	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1	Introduction to the subject	To acquaint and clear teacher's expectations and understand students' expectations.	Lecture, Discussion	1102.1	Quizzes, 1st Sessional, End Term Examination
2	Why History to Engineers?	To ascertain the interest and the understanding of the students with focus on the need of this subject for them and its connection with the existing knowledge.	Lecture, Discussion	1102.1	Quizzes, 1st Sessional, End Term Examination
3	A Brief overview of India's contribution in Various Fields of Studies- I	To know about the scientific developments of the period. To know about the concepts of science, maths, technology, etc. used in the ancient times. To know about the major works of ancient Indians in the field of Science and Maths.	Discussion, Video	1102.1	Quizzes, 1st Sessional, End Term Examination
4	A Brief overview of India's contribution in Various Fields of Studies – II	To know about the scientific developments of the period. To know about the concepts of science, maths, technology, medicine, surgery, language, etc. in the ancient times. To know about the major works of ancient Indians in various fields of studies.	Lecture, PPT, Discussion	1102.1	Quizzes, 1st Sessional, End Term Examination
5	Ancient Civilizations and Science & Technology- With focus on Indus Valley Civilization	To know about the development and extent of Indus Valley Civilization. To know about the use of concepts of science & technology in Indus Valley Civilization.	PPT, Videos	1102.1	Quizzes, 1st Sessional, End Term Examination

6	Detailed Study about some aspects of Indus Valley Civilization	To know about the town planning/buildings/structures of Indus Valley Civilization. To know and study in detail about the city of Lothal and Harappa.	Lecture, PPT, Discussion	1102.2	Quizzes, 1st Sessional, End Term Examination
7	Ancient Indian Education System-1	To know about the educational system of ancient India. To know about the major fields of studies.	Lecture, PPT	1102.3	Quizzes, 1st Sessional, End Term Examination
8	Ancient Indian Education System-2	To know more about the educational system of ancient India. To know about the major fields of studies.	Discussion	1102.3	Quizzes, 1st Sessional, End Term Examination
9	Our ancient Universities- Nalanda and Takshila	To know about the educational system followed at these Universities and the scholars of those times. To know about the major fields of studies offered in these Universities.	PPT, Video	1102.3	Quizzes, 1st Sessional, End Term Examination
10	Probable Reasons for oblivion	To know about the probable reasons that led to the decline/fall of Indian education system.	Discussion	1102.3	Quizzes, 1st Sessional, End Term Examination
11	Contribution of India in the field of mathematics- 1	Significant contributions and achievements of ancient Indian mathematicians in comparison to the rest of the world.	Videos, PPTs	1102.2	Quizzes, 2 Sessional, End Term Examination
12	Contribution of India in the field of mathematics- 2	Significant contributions and achievements of ancient Indian mathematicians in comparison to the rest of the world.	Discussion	1102.2	Quizzes, 2 Sessional, End Term Examination
13	Contribution of India in the field of Astronomy- 1	Significant contributions and achievements of ancient Indian in the field of astronomy.	Videos, PPTs	1102.1	Quizzes, 2 Sessional, End Term Examination
14	Contribution of India in the field of Astronomy- 2	Significant contributions and achievements of ancient Indian in the field of astronomy.	Discussion	1102.1	Quizzes, 2 Sessional, End Term Examination

15	Contribution of India in the field of Architecture- 1	To look into the architectural heritage of India.	Videos and PPTs	1102.2	Quizzes, 2 Sessional, End Term Examination
16	Contribution of India in the field of Architecture- 2	To look into the architectural heritage of India.	Discussion	1102.2	Quizzes, 2 Sessional, End Term Examination
17	Contribution of India in the field of Metallurgy- 1	Significant contributions and achievements of ancient Indian metallurgists in comparison to the rest of the world.	Lecture	1102.1	Quizzes, 2 Sessional, End Term Examination
18	Contribution of India in the field of Metallurgy- 2, with special reference about Wootz steel.	A discussion on pioneering steel alloy matrix developed in India called Wootz steel and achievements of India in Zinc smelting by distillation process, first in the world	Lecture	1102.1	Quizzes, 2 Sessional, End Term Examination
19	Contribution of India in the field of Yoga and medicine- 1	Contribution of Indian scientists in plastic surgery and cataract surgery with reference to Sushruta Samhita, Jabamukhi Salaka etc.,	Lecture	1102.2	Quizzes, End Term Examination
20	Contribution of India in the field of Yoga and medicine- 2	Discussion on father of Indian medicine, Charkha and his contributions to ancient science of Ayurveda (Charakhasamhita)	Lecture	1102.2	Quizzes, End Term Examination
21	Indian Science & Technology in 20th Century- Major achievements	Major developments and achievements by indian scientists and researchers.	Lecture	1102.1, 1102.4	Quizzes, End Term Examination
22	Indian Science & Technology in 20th Century- Institutionalization of science	To understand the establishment of the scientific and technological institutes and the gradual proliferation of the scientific bodies and societies.	Lecture	1102.4	Quizzes, End Term Examination
23	Indian Science & Technology after Independence- Scientific internationalism and the Institute that Bhabha built	Understand the robust internationalism and mapping out colonial structures and institutional history of the Tata Institute of Fundamental Research.	Lecture	1102.4	Quizzes, End Term Examination
24	Indian Science & Technology after Independence- Biotechnology in India	Realising the adoption of modern biology and biotechnology including early phase	Lecture	1102.4	Quizzes, End Term Examination

		of Department of Biotechnology (DBT), established in 1986.			
25	Case Study- Jantar-Mantar (Jaipur)			1102.2	End Term Examination

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

CO	STATEMENT	Correlation with Program Outcomes (POs)											
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
[HS1102.1]	Identify the contribution of India in the field of science and technology.	2	-	-	-	2	2	-	-	-	-	-	1
[HS1102.2]	Understand the contribution of ancient Indians in the field of science and technology.	2	-	-	-	2	1	-	-	-	-	-	-
[HS1102.3]	Analyse ancient Indian education system and reasons for its going into oblivion.	2	-	2	-	-	1	-	-	-	-	-	-
[HS1102.4]	Examine the growth of Indian science and technology in the 20th century A.D.	1	2	-	-	-	1	-	-	-	-	-	3

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

MANIPAL UNIVERSITY JAIPUR

Faculty of Engineering

DEPARTMENT OF MATHEMATICS AND STATISTICS

Course Hand-out

Engineering Mathematics-I| MA1101 | 4 Credits | 3 1 0 4

Session: July – Dec., 2018 | Faculty: Dr. Mohd. Rizwanullah & Dr. Reema Jain | Class: B.Tech. First 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 subjects.

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

[MA1101.1] Solve the problem on Radius of curvature, Circle and chord of curvature, Asymptotes, curve tracing for Cartesian and polar curves.

[MA1101.2] Demonstrate the understanding of the derivatives of functions of several variables and it will enhance the problem solving skills.

[MA1101.3] Optimize the functions of several variables using Hessian method and Lagrangian method and further will improve the logical skills hence Employability.

[MA1101.4] Use matrices, determinants and techniques for solving systems of linear equations in the different areas of Linear Algebra

[MA1101.5] Solve Eigen value problems, Applications of integral calculus: area and length of curves and volume of solid of revolution of simple curves.

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

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

E. Syllabus

Differential Calculus: Radius of curvature, Circle and chord of curvature, Asymptotes, curve tracing for Cartesian and polar curves. Taylor's theorem for a function of one variable. Taylor's and Maclaurin's expansion of functions. **Partial Differentiation**: Euler's theorem on homogeneous functions, total derivative, derivatives of composite and implicit functions, Taylor's theorem for a function of two variables, extreme values of a function of two variables, Lagrange's method of undetermined multipliers, Errors and approximations. **Integral Calculus**: Reduction formulae. Applications of integral calculus: area and length of curves and volume of solid of revolution of simple curves. **Matrices**: Elementary transformations, Inverse and rank of a matrix by elementary transformation, consistency and solution of system of simultaneous equations, eigenvalues, eigenvectors, Caley-Hamilton theorem, diagonalization of a matrix

F. Text Books

T1. S. Pal & S. C. Bhunia, "Engineering Mathematics", Oxford University Press, 2015.
T2. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, Delhi, 2006.
T3. B. V. Ramana, "Higher Engineering Mathematics", McGraw Hill, 2014.

G. Reference Books

R1. E. Kreyszig, "Advanced Engineering Mathematics", Wiley India Edition, 2006.

R2. B. Ram, "Engineering Mathematics", Vol. I & II, Pearson, 2012.

R3. S. Narayan, "Differential Calculus", Shyam Lal Charitable Trust, Delhi, 2002.
R4. S. Narayan, "Integral Calculus", S. Chand & Co., Delhi, 2005

H. Lecture Plan:

Lecture No.	Description of the Topics	Session Outcome	Mode of Delivery	Correspon ding CO	Mode of Assessing the Outcome
	Curvature & Asymptotes:				
1	Introduction, Definition, Radius of curvature (Cartesian Coordinate)	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.1	Quizzes, Two Sessional, End Term Examination
2	Radius of curvature (Parametric Coordinate)	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.1	Quizzes, Two Sessional, End Term Examination
3	Radius of curvature (Polar Coordinate)	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.1	Quizzes, Two Sessional, End Term Examination
4	**Tutorial Class**	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Problem solving	1101.1	Quizzes, Two Sessional, End Term Examination
5	Circle of curvature	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.1	Quizzes, Two Sessional, End Term Examination
6	Chord of curvature	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.1	Quizzes, Two Sessional, End Term Examination
7	Asymptotes (Parallel)	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.1	Quizzes, Two Sessional, End Term Examination

8	Asymptotes (Inclined)	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.1	Quizzes, Two Sessional, End Term Examination
9	**Tutorial Class**	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Problem solving	1101.1	Quizzes, Two Sessional, End Term Examination
	Curve Tracing				
10	Procedure for tracing Cartesian curves	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.1	Quizzes, Two Sessional, End Term Examination
11	Problems based on above topic	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.1	Quizzes, Two Sessional, End Term Examination
12	Procedure for tracing polar curves	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.1	Quizzes, Two Sessional, End Term Examination
13	Problems based on above topic	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.1	Quizzes, Two Sessional, End Term Examination
14	**Tutorial Class**	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Problem solving	1101.1	Quizzes, Two Sessional, End Term Examination
15	Taylor's theorem for a function of one variable	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.2	Quizzes, Two Sessional, End Term Examination

16	Taylor's and Maclaurin's expansion of functions	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.2	Quizzes, Two Sessional, End Term Examination
17	**Tutorial Class**	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Problem solving	1101.2	Quizzes, Two Sessional, End Term Examination
	Partial Differentiation				
19	Introduction & problems	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.2	Quizzes, Two Sessional, End Term Examination
20	Euler's theorem on homogeneous functions	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.2	Quizzes, Two Sessional, End Term Examination
21	**Tutorial Class**	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Problem solving	1101.2	Quizzes, Two Sessional, End Term Examination
22	Total derivative	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.2	Quizzes, Two Sessional, End Term Examination
23	Derivatives of composite and implicit functions	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.2	Quizzes, Two Sessional, End Term Examination
24	Change of variables	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	1101.2	Quizzes, Two Sessional, End Term Examination
25	**Tutorial Class**	Identify, formulate, apply appropriate techniques,	Problem solving	1101.2	Quizzes, Two Sessional, End Term Examination

		professional ethics, Communicate effectively & life-long learning			
27	Taylor's theorem for a function of two variables	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	**1101.2**	Quizzes, Two Sessional, End Term Examination
28	**Tutorial Class**	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Problem solving	**1101.2**	Quizzes, Two Sessional, End Term Examination
29	Extreme values of a function of two variables	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	**1101.3**	Quizzes, Two Sessional, End Term Examination
30	Lagrange's method of undetermined multipliers	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	**1101.3**	Quizzes, Two Sessional, End Term Examination
31	Errors and approximations	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	**1101.3**	Quizzes, Two Sessional, End Term Examination
32	**Tutorial Class**	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Problem solving	**1101.3**	Quizzes, Two Sessional, End Term Examination
	Matrices:				
33	Matrices, elementary column and row transformations	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	**1101.4**	Quizzes, Two Sessional, End Term Examination
34	Inverse of a matrix by elementary transformations	Identify, formulate, apply appropriate techniques, professional ethics,	Lecture, Discussion & Examples	**1101.4**	Quizzes, Two Sessional, End Term Examination

		Communicate effectively & life-long learning			
35	Rank of a matrix by elementary transformations	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	**1101.4**	Quizzes, Two Sessional, End Term Examination
36	**Tutorial Class**	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Problem solving	**1101.4**	Quizzes, Two Sessional, End Term Examination
37	Solution of systems of linear equations, consistency	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	**1101.4**	Quizzes, Two Sessional, End Term Examination
39	Solution by Gauss elimination	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	**1101.4**	Quizzes, Two Sessional, End Term Examination
40	**Tutorial Class**	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Problem solving	**1101.4**	Quizzes, Two Sessional, End Term Examination
41	Cayley-Hamilton theorem, Eigenvalues	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	**1101.5**	Quizzes, Two Sessional, End Term Examination
42	Eigenvectors	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	**1101.5**	Quizzes, Two Sessional, End Term Examination
43	Diagonalization of a square matrix	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	**1101.5**	Quizzes, Two Sessional, End Term Examination

44	**Tutorial Class**	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Problem solving	**1101.5**	Quizzes, Two Sessional, End Term Examination
	Integral Calculus:				
46	Reduction formulae	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	**1101.6**	Quizzes, Two Sessional, End Term Examination
47	Area of simple curves	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	**1101.6**	Quizzes, Two Sessional, End Term Examination
48	**Tutorial Class**	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Problem solving	**1101.6**	Quizzes, Two Sessional, End Term Examination
49	Lengths of simple curves	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	**1101.6**	Quizzes, Two Sessional, End Term Examination
51	Volume of revolution of simple curves	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Lecture, Discussion & Examples	**1101.6**	Quizzes, Two Sessional, End Term Examination
52	**Tutorial Class**	Identify, formulate, apply appropriate techniques, professional ethics, Communicate effectively & life-long learning	Problem solving	**1101.6**	Quizzes, Two Sessional, End Term Examination

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

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												~~CORRELATION WITH PROGRAM SPECIFIC OUTCOMES~~		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	~~PSO 1~~	~~PSO 2~~	~~PSO 3~~
MA1101.1	Solve the problem on Radius of curvature, Circle and chord of curvature, Asymptotes, curve tracing for Cartesian and polar curves.	3	2	3	1			1			1		1			
MA1101.2	Demonstrate the understanding of the derivatives of functions of several variables and it will enhance the problem solving skills.	3	2	1	2	1										
MA1101.3	Optimize the functions of several variables using Hessian method and Lagrangian method and further will improve the logical skills hence Employability.	3	3	2	2						3		1			
MA1101.4	Use matrices, determinants and techniques for solving systems of linear equations in the different areas of Linear Algebra	3	2	2	2	1		1					1			
MA1101.5	Solve Eigen value problems, Applications of integral calculus: area and length of curves and volume of solid of revolution of simple curves	2	3	1	1	1							1			

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

MANIPAL UNIVERSITY JAIPUR

School of Basic Sciences

First Year B. Tech.

Engineering Mathematics-II| MA1201 | 4 Credits | 3 1 0 4

Session: January 2019 – May 2019 | Faculty: Dr. Giriraj Methi & Dr. M.Rizwan | Class: First Year B. Tech. II Semester

A. Introduction: An engineering student needs to have some basic mathematical tools and technique which emphasizes the development of rigorous logical thinking and logical 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 understanding the engineering subjects.

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

[MA1201.1]: Demonstrate the understanding of First order and First Degree differential Equations

[MA1201.2]: Apply and solve higher order linear differential equations and simultaneous differential equations

[MA1201.3]: Develop the skill to use Beta Gamma function in mathematical problems

[MA1201.4]: Able to change order of double integration and double integral in Cartesian form to polar form and vice versa

[MA1201.5]: Solve triple integral find area and volume of solids using double integral

[**MA1201.6]:** Understand and can handle solid coordinate figure Sphere, Right circular cone and Right Circular Cylinder

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 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

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	30
End Term Exam (Summative)	End Term Exam (Only Handwritten class 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 in home. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal.

E. Syllabus

MA1201 Engineering Mathematics-II

Ordinary Differential Equations: Solutions of first order and first degree differential equations, separable of variables, homogeneous and reducible to homogeneous equations, linear equations & Bernoulli equation, exact equations, reducible to exact. **Linear Higher Order Differential Equations:** Linear homogeneous equations with constant coefficients, inverse differential operators and method of variation of parameters, Solution of Cauchy's and Legendre's differential equations, solution of simple simultaneous linear differential equations. **Multiple Integrals:** Beta and Gamma Functions: elementary properties. Double and Triple integrals, area and volume by double integration, change of order of integration, change of variables from Cartesian to polar form and vice versa. **Analytical Solid Geometry:** Sphere, right circular cone, right circular cylinder.

A. TEXT BOOKS

T1. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, Delhi, 2006.

T2. E. Kreyszig, "Adianced Engineering Mathematics", Wiley India Edition, 2006.

B. REFERENCE BOOKS

R1. B. Ram, “Engineering Mathematics", Vol. I and II, Pearson, 2012.

R2. S. Pal & S. C. Bhunia, "Engineering Mathematics", Oxford University Press, 2015

F. Lecture Plan

Lecture No.	Topics	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1.	Introduction of Ordinary differential equations-Definition, order & degree of a differential equation	Lecture	[1201.1]	Mid Term - I End Term
2.	Solution of first order and first degree differential equations using Variable separable method	Lecture	[1201.1]	Mid Term - I End Term
3.	Solution of Homogeneous differential equations	Lecture	[1201.1]	Mid Term - I End Term
4.	Equations reducible to homogeneous form	Lecture	[1201.1]	Mid Term - I End Term
5.	Problems of equations reducible to homogeneous form	Lecture	[1201.1]	Mid Term - I End Term
6.	Problem Solving	Tutorial	[1201.1]	Mid Term - I End Term
7.	Solution of Linear differential equations	Lecture	[1201.1]	Mid Term - I End Term
8.	Solution of Bernoulli’s equation	Lecture	[1201.1]	Mid Term - I End Term

9.	Solution of Exact differential equations	Lecture	[1201.1]	Mid Term - I End Term
10.	Equations reducible to exact differetnial equations	Lecture	[1201.1]	Mid Term - I End Term
11.	Problems and different IF for reducible Exact differential equations	Lecture	[1201.1]	Mid Term - I End Term
12.	Problem Solving	Tutorial	[1201.]	Mid Term - I End Term
13.	Applications of first order and first degree differential equations in real world problems	Lecture	[1201.1]	Mid Term - I End Term
14.	Introduction and develop theory for CF	Lecture	[1201.2]	Mid Term - I End Term
15.	ways for finding CF	Lecture	[1201.2]	Mid Term - I End Term
16.	Linear homogenous higher order differential equations with constant coefficients	Lecture	[1201.2]	Mid Term - I End Term
17.	Problem Solving	Tutorial	[1201.2]	Mid Term - I End Term
18.	Inverse differential operator	Lecture	[1201.2]	Mid Term - I End Term

19.	Rules for finding Particular integral for exponential and trigonometrical cases	Lecture	[1201.2]	Mid Term - I End Term
20.	Rules for finding Particular integral for remaining cases	Lecture	[1201.2]	Mid Term - I End Term
21.	Develop Method of variation of parameters	Lecture	[1201.2]	Mid Term – II End Term
22.	Problems related to method of varation of parameter	Lecture	[1201.2]	Mid Term – II End Term
23.	Solution of Cauchy’s equation	Lecture	[1201.2]	Mid Term – II End Term
24.	Problem Solving	Tutorial	[1201.2]	Mid Term – II End Term
25.	Solution of Legendre’s equation	Lecture	[1201.2]	Mid Term – II End Term
26.	Solution of simple simultaneous linear differential equations	Lecture	[1201.2]	Mid Term – II End Term
27.	Problem Solving	Tutorial	[1201.2]	Mid Term – II End Term
28.	Applications of Linear higher order differential equations in real world problems	Lecture	[1201.2]	Mid Term – II End Term

29.	Beta & Gamma functions: Concept and Definitions	Lecture	[1201.3]	Mid Term – II End Term
30.	Properties and problems of beta function	Lecture	[1201.3]	Mid Term – II End Term
31.	Properties and problems of Gamma function	Lecture	[1201.3]	Mid Term – II End Term
32.	Problem Solving	Tutorial	[1201.3]	Mid Term – II End Term
33.	Double Integral & Tripal Integral	Lecture	[1201.4]	Mid Term – II End Term
34.	Area by double integration	Lecture	[1201.4]	Mid Term – II End Term
35.	Volume by double integration	Lecture	[1201.4]	Mid Term – II End Term
36.	Problem Solving	Tutorial	[1201.4]	Mid Term – II End Term
37.	Change of order of integration	Lecture	[1201.4]	Mid Term – II End Term
38.	Change of variables from Cartesian to polar form	Lecture	[1201.5]	Mid Term – II End Term
39.	Change of variables from Polar to Cartesianform	Lecture	[1201.5]	Mid Term – II End Term

40.	Problem Solving	Tutorial	[1201.5]	Mid Term – II End Term
41.	Three D: Basic Concepts	Lecture	[1201.6]	End Term
42.	Introduction to Sphere Equation of sphere with problems	Lecture	[1201.6]	End Term
43.	plane section of sphere	Lecture	[1201.6]	End Term
44.	Problem Solving	Tutorial	[1201.6]	End Term
45.	Right circular cone	Lecture	[1201.6]	End Term
46.	Right circular cylinder	Lecture	[1201.6]	End Term
47.	Problems based on right circular cone & cylinder	Lecture	[1201.6]	End Term
48.	Problem solving	Lecture	[1201.6]	End Term

G. 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**
[MA1201.1]	Demonstrate the understanding of First order and First Degree differential Equations	3	2	3	1	1		1			1		1				
[MA2101.2]	Apply and solve higher order linear differential equations and simultaneous differential equations	3	2	1	2	1		1			1		1				
[MA1201.3]	Use Beta Gamma function in mathematical problems	3	3	2	2	1		1			1		1				
[MA1201.4]	Able to change order of double integration and double integral in Cartesian form to polar form and vice versa	2	1	2	1	1		1			1		1				
[MA1201.5]	Solve triple integral find area and volume of solids using double integral	2	3	1	1	1		1			1		1				
[MA1201.6]	Understand and can handle solid coordinate figure Sphere, Right circular cone and Right Circular Cylinder	1	1	1	1	1		1			1		1				

MANIPAL UNIVERSITY JAIPUR

School of Automobile Mechanical and Mechatronics Engineering

Department of Mechanical Engineering
Course Hand-out

Basic Workshop Practice| ME 1130 | 2 Credits

Session: JUL 18 – JUNE 19 | Faculty: Ashish Sharma | B.Tech 1st Tear

A. Introduction: This course is offered by Dept. of Mechanical Engineering which focuses on mainly hands on learning based on various working shops like carpentry, fitting, soldering & plumbing, lathe machine, welding and foundry. This course gives an overview of fundamental working of various machine tools, marking and cutting tools and measuring instruments.

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

[ME1130.1] Understanding about the various measuring, marking and cutting tools and Comprehend the safety measures required to be taken while using tools.

[ME1130.2]Knowledge about lathe machine and its operations.

[ME1130.3] Understand the process of moulding and eldingprocesses.

[ME1130.4] Have hands on practice in carpentry and fitting work.

[ME1130.5] To fulfils the requirements of present day employers, who demand sound engineering skills employability.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

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

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

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

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

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

[PO.8].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-	26
	File/Records-	14
	Viva-	20
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

i. Introduction: Basic workshop experiments, tools, machines and applications of processes.

ii. Machine shop (A): Study of parts of lathe machine and lathe operations.

iii. Machine shop (B): Facing, Turning, Taper Turning and knurling on MS cylindrical work piece.

iv. Foundry shop (A): Study different types of moulding processes and various tools use for foundry processes.

v. Foundry shop (B): Prepare a green sand mould and demonstration of casting with molten aluminum.

vi. Welding shop (A): Study of types of welding process and applications of welding process.

vii. Welding shop (B): Welding of different types of joint on MS plate with arc welding process.

viii. Carpentry shop (A): Cut and prepare "T halving joint part A" *.

ix. Carpentry shop (B): Cut and prepare "T halving joint part B" *.

x. Fitting shop (A): Cut and prepare mild steel square part and make all the edges at 90 degree*.

xi. Fitting shop (B): Cut a 10x10 mm Notch on the mild steel Piece and make all the edges of notch at 90 degree *.

xii. Soldering shop (A): Cut and Prepare part A of the funnel *.

xiii. Soldering shop (B): Cut and Prepare part B of the funnel *.

xiv. Plumbing shop: Cut PVC pipe ‘work piece’ and prepare thread on it.

F. TEXT BOOKS

T1. H.S. Bawa “Workshop Practice” McGraw Hill Education, 2009

G. REFERENCE BOOKS

R1. S K Hajra Choudhary “Elements of Workshop Technology” Media Promoters & Publishers Pvt. Ltd 2007

Lecture Plan:

Lec No	**Topics**	**Session Outcome**	**Mode of Delivery**	**Corresponding CO**	**Mode of Assessing the Outcome**
1	Introduction: Basic workshop experiments, tools, machines and applications of processes.	To have clear understanding of various tools	Lecture+Lab	1130.1	Lab Experiment
2	Machine shop (A): Study of parts of lathe machine and lathe operations.	Study of Lathe machine parts	Lecture+Lab	1130.2	Lab Experiment
3	Machine shop (B): Facing, Turning, Taper Turning and knurling on MS cylindrical work piece.	Preparation of job and different operations on Lathe machines	Lecture+Lab	1130.2	Lab Experiment
4	Foundry shop (A): Study different types of moulding processes and various tools use for foundry processes.	Understanding of moulding processes	Lecture+Lab	1130.3	Lab Experiment
5	Foundry shop (B): Prepare a green sand mould and demonstration of casting with molten aluminium.	Preparation of moulding and study casting	Lecture+Lab	1130.3	Lab Experiment
6	Welding shop (A): Study of types of welding process and applications of welding process	Welding process explanation	Lecture+Lab	1130.3	Lab Experiment
7	Welding shop (B): Welding of different types of joint on MS plate with arc welding process.	Preparation and understanding of lap and butt joint in welding	Lecture+Lab	1130.3	Lab Experiment
8	Carpentry shop (A): Cut and prepare “T halving joint part A” *.	Knowledge on carpentry tools	Lecture+Lab	1130.4	Lab Experiment
9	Carpentry shop (B): Cut and prepare “T halving joint part B” *.	Preparation of different of joints in carpentry	Lecture+Lab	1130.4	Lab Experiment

10	Fitting shop (A): Cut and prepare mild steel square part and make all the edges at 90 degree*.	Lecture on fitting tools	Lecture+Lab	1130.4	Lab Experiment
11	Fitting shop (B): Cut a 10x10 mm Notch on the mild steel Piece and make all the edges of notch at 90 degree *.	Preparation of mild steel job	Lecture+Lab	1130.4	Lab Experiment
12	Soldering shop (A): Cut and Prepare part A of the funnel *.	Lecture on soldering tools	Lecture+Lab	1130.5	Lab Experiment
13	Soldering shop (B): Cut and Prepare part B of the funnel *.	Preparation of soldering jobs	Lecture+Lab	1130.5	Lab Experiment
14	Plumbing shop: Cut PVC pipe 'work piece' and prepare thread on it.	Preparation of job in plumbing shop	Lecture+Lab	1130.5	Lab Experiment

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

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES											
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
[ME1130.1]	Understanding about the various measuring, marking and cutting tools and Comprehend the safety measures required to be taken while using tools.			1			1		2				1
[ME1130.2]	Knowledge about lathe machine and its operations.				1	2				1			1
[ME1130.3]	Understand the process of moulding and welding processes.									1			1
[ME1130.4]	Have hands on practice in carpentry and fitting work.									1			1
[ME1130.5]	To know about plumbing and soldering procedure by preparing a job.									1			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

Mechanics of Solids | ES1102|4 Credits |4 0 0 4

Session: January 05–April 26,2019 | Faculty: Prof K. J. Sharma | Class: B.Tech Core Subject

A. Introduction: This course is offered by Dept. of Civil Engineering as a Core Course for first year students. Mechanics of solids includes important topics from Engineering Mechanics and Strength of Materials. The subject offers a basic understanding of different types of forces acting on rigid bodies at rest and in stage of motion. Most of the fundamentals needed to learn the basics of Engineering Mechanics and strength of materials are discussed in this subject. Strength of materials is a basic course essential for students of all branches of engineering. Modern research and advancement in field of stability, strength and design of structure and machines, dynamic effects. robotics, missiles. Aeroplane and aircraft design, automobiles and automatic control. fluid flow, engine performance, electrical machines, transmission tower, superstructure, heavy earthmoving machines, locomotives, metro railway, supersonic aircrafts, atomic and subatomic behaviour etc are highly dependent on basic principle of Mechanics of Solids In this coursework, students will be trained about methods of analysing forces, determination of centroid and moment of inertia of geometrical figures, determination of various stresses and strains, longitudinal and circumferential stresses and strains due to direct forces , thermal stresses; strains in metallic materials and stresses due to fluid pressures.. Also they will develop skill for testing various building and machinery materials such as- mild steel, cast iron etc. as per Indian standards guidelines. The course will include activities such as- assignments, quizzes, class tests, site visits, projects, focusing on the knowledge of students for lifelong learning and making them employable.

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

[ES1102.1] Develop the skill to evaluate forces in various engineering elements
[ES1102.2] To locate the centroid and determine the Moment of inertia of various bodies
[ES1102.3] Analysis of dynamics forces to be used in machinery and building component
[ES1102.4] To assess the engineering properties of material subjected to normal, shear and temperature stresses
[ES1102.5] To examine the stress and strain in thin cylinders and pipes along the longitudinal and circumferential direction

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

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

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

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

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

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

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

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

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

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

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

D. Assessment Plan:

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

E. SYLLABUS

Mechanics of Rigid Bodies: Introduction, basic principles and concepts, Force systems, resultant of concurrent and non- concurrent coplanar force systems; Equilibrium of concurrent and non-concurrent coplanar force systems. Centroid and Moment of Inertia of simple and composite areas, **Kinetics**:- Applications of D'Alembert's principle, work-energy and Impulse-Momentum principles. **Mechanics of Deformable Bodies**:- Mechanical properties of materials, normal stress and strain, Hooke's law, modulus of elasticity, tension test on ductile and brittle materials, factor of safety, allowable stress, Poisson's ratio, shear stress and shear strain, modulus of rigidity, relation between modulus of elasticity, modulus of rigidity and bulk modulus. Stresses and deformations in tapering bars, stepped bars, thermal stresses, statically indeterminate problems, Stresses on inclined planes, stresses in thin cylindrical pressure-vesse

F. TEXT BOOKS

T1. S.S.Bhavikatti, Engineering Mechanics 6th Edition2018,New Age International Publishers.

T2. S.S. Bhavikatti, 3rd edition2010, Vikash Publishing HouseEngineering Mechanics

G. REFERENCE BOOKS

R1. Beer and Johnson; Engineering Mechanics

R2. R.K.Bansal; Engineering Mechanics, 3rd edition 2013., Laxmi Publication

R3. Timoshenko; Strength of Materials

R4. R.K.Rajput; Strength of Materials , 6th edition2o15 , S. Chand Publishing

H. Lecture Plan:

Lecture No.	Topics to be covered
	PART-I MECHANICS OF RIGID BODIES
1	**Resultant of concurrent and non-concurrent forces:-** Definition of mechanics, force, principle of transmissibility
2	Classification of force system, resultant of concurrent coplanar forced, parallelogram and triangle law of forces, component of a force, resolution of a force, rectangular component of force and oblique components of a force
3	Illustrative Problems
4	Illustrative Problems
5	Illustrative Problems
6	Resultant of coplanar non –concurrent force system, moment of a force, couple, force and couple system, Varignon's theorem, types of loads on beams
7	Illustrative Problems
8	Illustrative Problems
9	**Equilibrium of concurrent and non con-current coplanar force system:** Definition, condition of equilibrium, Lami's theorem , space diagram and Free Body Diagram, types of supports, types of beams and types of loading
10	Problems on equilibrium of coplanar concurrent force system
11	Problems on equilibrium of coplanar concurrent force system
12	Problems on equilibrium of coplanar concurrent force system
13	Problems on resultant of coplanar non-concurrent force system
14	Problems on resultant of coplanar non-concurrent force system
15	Problems on resultant of coplanar non-concurrent force system
16	Tutorials based on L1-L15
17	**Centroid of plane area :-** Definition, derivation of Centroid of rectangle, circle,
18	Semi-circle, quarter circle, triangle, determination of centroid of composite area
19	Problems on determination of centroid of composite area
20	Problems on determination of centroid of composite area
21	Problems on determination of centroid of composite area
22	**Moment of Inertia:-- Definition,** Theorem of parallel and perpendicular axes, Radius of gyration, M. I. of standard plane lamina like rectangle, triangle and quarter circle
23-24	Problems on determination of M.I. for composite areas
25	**Kinetics of rectilinear motion:-** Newton's second law of motion, work energy principle and impulse momentum principle, D' Alembert's principle
26	Problems on kinetics using above methods
27	Problems on kinetics using above methods
	Part –II MECHANICS OF DEFORMABLE BODIES
28	**Simple Stresses and Strains:-** Introduction to mechanics of deformable, normal stress and strains, Hooke's law, modulus of elasticity

29	Tension test on ductile and brittle materials, factor of safety, allowable stress Tapering Problem ------ Illustrative problems
30	Tapering bars, Illustrative problems
31	Stepped bars Illustrative problems
32	Shear stress, shear strain single and double shear, modulus of rigidity
33	Poisson's ratio, bulk modulus, relationship between volumetric strain and linear strain
34	Relationship between modulus of elasticity, modulus of rigidity and bulk modulus
35	Illustrative Problems
36	**Statically indeterminate members and thermal stresses:-** Compound bars subjected to external loads
37	Illustrative problems
38	Illustrative problems
39	Illustrative problems
40	Temperature stresses, compound bar subjected to temperature stresses, illustrative problems
41	Illustrative Problems
42	Illustrative Problems
43	**Stresses on inclined plane:-** equation of stresses on inclined planes, condition for maximum and normal stresses on a plane, concept of principal plane and principal stresses, condition for maximum shear stress on plane and plane of maximum shear stress, resultant stress on a plane
44	Illustrative examples
45	Illustrative problems
46	**Stresses in thin cylinder** due to fluid pressure :-Analysis of thin cylinders subjected to fluid pressure- hoop stress, longitudinal stress and strain, joint efficiencies
47	Illustrative problems
48	Illustrative problems and doubt clarification.

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	
[ES1102.1]	Develop the skill to evaluate forces in various engineering elements	3	2	2	1	1	1	2	1			1	1					
[ES1102.2]	To locate the centroid and determine the Moment of inertia of various bodies	3	3	2	3	3	2	1	1			1	1					
[ES1102.3]	Analysis of dynamics forces to be used in machinery and building component	3	2	3	3	3	1		1	2	3	1	1					
[ES1102.4]	To assess the engineering properties of material subjected to normal, shear and temperature stresses	3	2	2	2	2	2			2	2		1					
[ES1102.5]	To examine the stress and strain in thin cylinders and pipes along the longitudinal and circumferential direction.	3	2	2	2	2	2		1	2	2	1	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

Environmental Studies | ES 1101 | 3 Credits | 3 0 0 3

Session: January – May 2019 | Faculty: Dr. M. Prabhu Inbaraj | Class: B. Tech Semester II

Introduction: This course is offered to B. Tech. first year students to make them aware of the importance of our natural environment. The course offers insights into the basics of environment, its components, functions; impacts of natural and anthropogenic activities on environment; methods to tackle such environmental issues. Further, this course emphasises on the significance of life on earth and thus, the need for its protection. Overall, this course is aimed to sensitise students to realise links between the natural and man-made environment.

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

[ES1101.1]. Apply the fundamental knowledge of environment, ecology and ecosystem to save the environment for sustainable development.

[ES1101.2]. 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.

[ES1101.3]. Develop the skill of the technique / procedures to predict / qualitatively assess the reduction in the environmental impact for sustainable development.

[ES1101.4]. 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.

[ES1101.5]. 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 witheffective communication.

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

D. SYLLABUS

Introduction to Environmental Studies; Multidisciplinary Nature of Environmental Studies, Scope and importance, concept of sustainability and sustainable development; spheres of the earth; structure of atmosphere.

Ecosystems; concept, structure and function, energy flow in an ecosystem, food chain, food webs and ecological succession, Forest, Grassland, Desert and Aquatic (Ponds, Streams, Lakes, River, Oceans, Estuaries) ecosystem.

Natural Resources (Renewable & Non Renewable Resources); Land Resources and land use change, Land degradation, soil erosion and desertification; Deforestation; Causes and impacts. Water; Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state). Energy resources; Renewable and non- renewable energy sources, use of alternate energy sources, growing energy needs.

Biodiversity and Conservation; Genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots, threats to biodiversity; Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity; *In-situ* and *ex-situ* conservation of biodiversity. Ecosystem and biodiversity services; Ecological, economic, social, ethical, aesthetic and Informational value.

Environmental Pollution; Environmental Pollution; type, causes, effects, and controls; Air, Water, Soil and Noise pollution, Nuclear hazards and human health risks, ill effects of fireworks, Solid waste management; control measures of urban and industrial waste, pollution case studies.

Environmental Policies and Practices; Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture, Environment laws; Environmental Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act; International agreements; Montreal and Kyoto protocols and Convention on Biological Diversity (CBD). Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context.

Human Communities and the Environment; Human population growth; impact on environment, human health and welfare, Resettlement and rehabilitation of project affected persons; case studies, Disaster management; flood, earthquake, cyclone and landslides. Environmental movements; Chipko, Silent valley, Bishnois of Rajasthan, Environmental ethics; Role of Indian and other religions and cultures in environmental conservation, Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi), Environmental Impact Assessment (EIA).

Field Work and field visits.

E. TEXT BOOKS (number as T1, T2 etc)

T1. Bharucha, E. (2013). Text book of Environmental Studies for undergraduate courses, Universities Press, Hyderabad, 2nd Edition

T2. Carson, R. (2002). Silent Spring. Houghton Mifflin Harcourt.

T3. De, A. K. and De, A. K. (2007). Environmental Studies, New Age International Publishers, New Delhi.

T4. Gadgil, M. and Guha, R. (1993). This Fissured Land; An Ecological History of India. University of California, Press.

T5. Groom, Martha J., Gary, K. Meffe and Carl Ronald Carroll (2006). Principles of Conservation Biology. Sunderland; Sinauer Associates.

T6. Grumbine, R. Edward and Pandit, M. K. (2013).Threats from India's Himalaya dams. Science, 339; 36-37.

T7. Rajagopalan, R. (2016). Environmental Studies; From Crisis to Cure, Oxford University Press.

T8. Singh, J. S., Singh, S. P. and Gupta, S. R. (2014). Ecology, Environmental Science and Conservation. S. Chand Publishing, New Delhi.

F. REFERENCE BOOKS (number as R1, R2 etc)

R1. Molles, M. C. (2015). Ecology: Concepts and Applications. McGraw Hill Higher Education, 7th Edition, 592 P.

R2. Chiras, D. D. (2014). Natural Resource Conservation: Management for a Sustainable Future. Pearson India.

Lecture Plan:

LEC NO	TOPICS
1	**Multidisciplinary Nature of Environmental Studies:** Scope of environmental studies, a multidisciplinary view, Importance of environmental studies
2	**Ecosystems and Environment:** Spheres of the earth: atmosphere, lithosphere, hydrosphere, biosphere
3	**Structure of the atmosphere:** troposphere, stratosphere, mesosphere, thermosphere, exosphere
4	**Ecology**: structure and function of the ecosystem
5	**Bio-geochemical cycles:** Nitrogen, Carbon
6	**Bio-geochemical cycles:** Sulphur, Phosphorous
7	**Ecological succession**
8	**Natural resources (Renewable & Non Renewable Resources):** Water Resources
9	**Energy Resources**: Conventional and non-conventional
10	**Energy Resources:** Conservation and Management
11	Forest Resources
12	Land Resources
13	**Biodiversity and its Conservation:** Biodiversity: Importance of biodiversity
14	Threats to biodiversity
15	Factors affecting biodiversity
16	Conservation of biodiversity
17	**Environmental pollution and control** : **Air pollution**: sources of air pollution and classification of air pollutants
18	Primary and secondary air pollutants
19	**Fireworks:** Chemical used, toxic fall out and their persistent in soil and water, Its ill effects on air quality pertaining to gaseous and particulate matter, Health hazards prevention and Control
20	**Water pollution:** Sources of water pollution, water quality standards (physical, chemical and biological characteristics of water quality parameters)
21	Effects of water pollution and Water Borne Diseases and its control
22	Basic water treatment process (filtration, sedimentation and overview of treatment plant)
23	**Soil pollution:** sources, effects and control of soil pollution
24	**Noise pollution:** sources, effects and control of noise pollution
25	**Solid waste management:** sources, characteristics
26	**Solid waste management:** control measures of urban and industrial wastes
27	Hazardous Waste – Environmental problems and health risks
28	**Environmental impact assessment(EIA):** Methodology and importance
29	**Social Issues and Environment:** Environmental concerns: urbanization, industrialization, agricultural revolution and their impact on environment
30	**Global warming** and greenhouse effect.
31	**Acid rain:** Causes and effects
32	**Ozone depletion** & depletion of ozone hole over Antarctica.
33	Urban problems related to energy
34	Water conservation, rain water harvesting, watershed management
35	Resettlement and rehabilitation of people; its problems and concerns. Case Studies
36	Wasteland reclamation
37	Environment Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act.
38	**Human Population and the Environment:** Population growth, variation among nations, Population explosion – Family Welfare Programme.
39	Environment and human health, Women and Child Welfare, Role of Information Technology in Environment.
40	Concept of sustainability and sustainable development.
41	**Field Work:** Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc. Study of common plants, insects, birds and basic principles.
42	Visit to a local polluted site-Urban/Rural/Industrial/Agricultural.
43	Study of simple ecosystems-pond, river, Delhi Ridge, etc.

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

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES				
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
[ES1101.1].	Apply the fundamental knowledge of environment, ecology and ecosystem to save the environment for sustainable development.	3		1			1	2					3					
[ES1101.2].	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								
[ES1101.3].	Develop the skill of the technique / procedures to predict / qualitatively assess the reduction in the environmental impact for sustainable development.	3	1			3	2	3		1			3					
[ES1101.4].	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								
[ES1101.5].	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

School of Computing and IT

Department of Information Technology
Course Hand-out

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

Session: Jul 18 – Dec 18 | Faculty: Vineeta Soni| Class: B.Tech III Semester

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

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

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

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

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

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

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

[CS1301.6]. Build the required skills to read and research the current literature in computer architecture.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

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

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

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

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

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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

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

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

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

D. Assessment Plan:

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

E. SYLLABUS

Basic Structure of computers: Computer types, functional units, basic operational concepts, bus structures, software, performance; **Machine Instructions and programs**: Numbers, arithmetic operations and characters, Memory locations and addresses; Memory operations, Addressing modes; **Arithmetic**: Addition and subtraction of signed numbers, Adders, ALU design, Bit slice processor, Multiplication of positive numbers Signed operand multiplication, Fast multiplication, Integer division, Floating point numbers and operations; **Memory Systems**:

Introduction, Basic concepts, Design methods; RAM memories, Read only memories, Speed size and cost, Cache memories, Performance considerations, Virtual memories, Memory, Management Requirements, Secondary storage; **Input / Output organization**: Accessing I/O devices, Interrupts, Direct memory access, Buses, Interface circuits; **Introduction to Parallel Processing:** Flynn Classification**,** Multi-Core Architecture, Pipelining.

F. TEXT BOOKS

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

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

G. REFERENCE BOOKS

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

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

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

H. Lecture Plan:

Lecture No	Major Topics	Topics	Session Outcomes	Mode of Delivery	Corresponding CO	Mode of Assessing CO
1.	Basic Structure of Computers (1-6 Lecture)	Introduction to basic structure of computers	Describe the interconnection between various functional units of a computer system and various factors that effects the performance of a computer.	Lecture	CS1301.1	Mid Term I, Quiz & End Term
2.		Functional units		Lecture	CS1301.1	Mid Term I, Quiz & End Term
3.		Basic operational concepts		Lecture	CS301.1	Mid Term I, Quiz & End Term
4.		Bus structures, software		Lecture	CS1301.1	Mid Term I, Quiz & End Term
5.		Performance		Flipped Class	CS1301.1	Mid Term I, Quiz & End Term
6.		Tutorial		Activity	1CS301.1, CS1301.5	Mid Term I, Quiz & End Term
7.	Machine Instructions and Programs (7-18 Lecture)	Numbers, Arithmetic Operations and Characters	Perform mathematical operations using different number representations, write assembly language programs using various instruction types.	Flipped Class	CS1301.2	Mid Term I, Quiz & End Term
8.		Memory Locations and Addresses, Memory Operations		Lecture	CS1301.2	Mid Term I, Quiz & End Term
9.		Instructions and Instruction Sequencing		Lecture	CS1301.2 & CS1301.3	Mid Term I, Quiz & End Term
10.		Register Transfer Notation, Assembly Language Notation		Lecture	CS1301.2	Mid Term I, Quiz & End Term
11.		Basic Instruction Types, Instruction Execution and Straight-Line Sequencing		Lecture	CS1301.2 & CS1301.3	Mid Term I, Quiz & End Term
12.		Branching, Condition Codes, Generating Memory Addresses	Use various conditions for flow control and addressing modes for accessing data. Formulate assembly language programs for a given high level language construct.	Lecture	CS1301.2	Mid Term I, Quiz & End Term
13.		Addressing Modes, Implementation of Variables and Constants, Indirection and Pointers		Flipped Class	CS1301.2	Mid Term I, Quiz & End Term
14.		Indexing and Arrays, Relative Addressing		Lecture	CS1301.2	Mid Term I, Quiz & End Term
15.		Additional Modes		Lecture	CS1301.2	Mid Term I, Quiz & End Term
16.		Basic I/O operations, Additional Instructions		Lecture	CS1301.2 & CS1301.3	Mid Term I, Quiz & End Term
17.		Example programs		Lecture	CS1301.2 & CS1301.3	Mid Term I, Quiz & End Term
18.		Tutorial		Activity	CS1301.2	Mid Term I, Quiz & End Term
19.		Addition and Subtraction of Signed Numbers		Flipped Class	CS1301.2	Mid Term I, Quiz & End Term

20.	Arithmetic (19-33 Lecture)	Design of Fast Adders	Analyse the design of various fast adder circuits.	Lecture	CS1301.2 & CS1301.6	Mid Term II, Quiz & End Term
21.		Carry Look Ahead Adders- Bit Stage Cell,4 Bit CLA		Lecture	CS1301.2 & CS1301.5	Mid Term II, Quiz & End Term
22.		Carry Look Ahead Adders 16 Bit		Lecture	CS1301.2 & CS1301.5	Mid Term II, Quiz & End Term
23.		Tutorial		Activity	CS1301.2	Mid Term II, Quiz & End Term
24.		Multiplication of Positive Numbers-Array Sequential Circuit	Perform multiplication and division operation using different methods, access their performance.	Flipped Class	CS1301.2 & CS1301.5	Mid Term II, Quiz & End Term
25.		Signed Operand Multiplication-Booth Algorithm		Lecture	CS1301.2	Mid Term II, Quiz & End Term
26.		Fast Multiplication-Bit Pair Recoding of Multipliers		Lecture	CS1301.2	Mid Term II, Quiz & End Term
27.		Carry-save addition of summands		Flipped Class	CS1301.2	Mid Term II, Quiz & End Term
28.		Integer Division-Restoring		Lecture	CS1301.2	Mid Term II, Quiz & End Term
29.		Integer Division-Nonrestoring		Lecture	CS1301.2	Mid Term II, Quiz & End Term
30.		Floating Point Numbers & Operation-Standards Exceptions, check to uncheck Exception	Introduce floating point representation in computer system, various associated operations and standards to represent them in memory using IEEE 754 format.	Lecture	CS1301.2	Mid Term II, Quiz & End Term
31.		Arithmetic Operations on Floating Point Numbers		Lecture	CS1301.2	Mid Term II, Quiz & End Term
32.		Examples on Arithmetic Operation on Floating Point Numbers		Lecture	CS1301.2	Mid Term II, Quiz & End Term
33.		Tutorial		Activity	CS1301.2	Mid Term II, Quiz & End Term
34.	Memory Systems (34-42 Lecture)	Memory Systems: Basic Concepts	Specify the significance of various cache mapping techniques and apply them in examples. Calculate the performance improvement with cache memories with different mapping techniques and replacement algorithms.	Flipped Class	CS1301.4	Mid Term II, Quiz & End Term
35.		Speed, Size & Cost		Lecture	CS1301.4 & CS1301.5	Mid Term II, Quiz & End Term
36.		Cache Memories-Mapping Functions		Lecture	CS1301.4 & CS1301.5	Mid Term II, Quiz & End Term
37.		Replacement Algorithms		Lecture	CS1301.4 & CS1301.5	Mid Term II, Quiz & End Term
38.		Example of Mapping Techniques		Flipped Class	CS1301.4	Mid Term II, Quiz & End Term
39.		Performance Considerations: Hit Rate & Miss Penalty, Caches on Processor Chip		Lecture	CS1301.4 & CS1301.5	Mid Term II, Quiz & End Term
40.		Virtual Memories	Explain virtual memory concept and address translation mechanism	Lecture	CS1301.4 & CS1301.6	Mid Term II, Quiz & End Term
41.		Address Translation		Lecture	CS1301.4	Mid Term II, Quiz & End Term
42.		Tutorial		Activity	CS1301.4	Mid Term II, Quiz & End Term

43.	Input / Output Organization (43-46 Lecture)	Accessing I/O Devices, Interrupts	Explain interaction between input output devices and various techniques used by processor to handle the related hardware using interrupts and DMA.	Lecture	CS1301.5	Quiz & End Term
44.		Interrupt H/W, Enabling Disabling Interrupts		Lecture	CS1301.5	Quiz & End Term
45.		Handling Multiple Devices, Controlling Device Requests, Exceptions		Lecture	CS1301.5	Quiz & End Term
46.		Use of interrupts in Operating Systems, Direct Memory Access		Lecture	CS1301.5	Quiz & End Term
47.	Introduction to Parallel Processing (47-53 Lecture)	Flynn Classification, Multi-Core Architecture	Specify the significance of pipelining with examples. Analyse various hazards that cause performance degradation in pipelined processors and means for mitigating their effect.	Lecture	CS1301.5 &CS1301.6	Quiz & End Term
48.		Pipelining		Flipped Class	CS1301.5	Quiz & End Term
49.		Data Hazards		Lecture	CS1301.5	Quiz & End Term
50.		Instruction Scheduling: Static and Dynamic		Lecture	CS1301.5 & CS1301.6	Quiz & End Term
51.		Control Hazard		Lecture	CS1301.5	Quiz & End Term
52.		Branch Prediction		Lecture	CS1301.5	Quiz & End Term
53.		Tutorial		Activity	CS1301.5	Quiz & End Term

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

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

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Department of Information Technology
Course Hand-out

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

Session: July 2018 – Nov 2018 | Faculty: Ravinder Kumar, Kavita | Class: B.Tech. IT (III Sem)

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

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

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

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

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

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

[CS1302.5]: Be able to understand working and use of logic families like BJT, MOSFET etc.

C. Program Outcomes and Program Specific Outcomes:

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

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

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

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

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

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

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

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

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

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

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

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

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

PSO2. To participate & succeed in IT oriented jobs/competitive examinations that offer inspiring & gratifying careers.

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

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	15
	Sessional Exam II (Closed Book)	15
	In class Quizzes and Assignments (video assignments/software simulation assignments)	30
End Term Exam (Summative)	End Term Exam (Closed Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to get eligible for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class should report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	

E. Syllabus

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

F. Text Books

T1. S. Brown , Z. Vranesic, "*Fundamentals of Digital Logic with VHDL Design*", TMH, 2000.
T2.M. Morris Mano, Michael D. Ciletti, "Digital Design", *Prentice Hall of India Pvt. Ltd.*, 2008.

G. Reference Books

R1.P. Leach, A. Malvino, G. Saha, "*Digital Principles and Applications*", TMH, 6th Edition, 2006.
R2. J. Bhasker, *"A VHDL Primer"*, PHI Pvt. Ltd., 3rd Ed., 2005.

A. Lecture Plan

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

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

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

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

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

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

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

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

MANIPAL UNIVERSITY JAIPUR
School of Computing and Information Technology
Department of Information Technology
Course Hand-out
Data Structures | CS1303 | 4 Credits | 3 1 0 4
Session: July 18 – Nov 18 | Faculty: Dr. Anju Yadav, Dr. Sulabh Bansal, Rohit K Gupta | Class: B. Tech IT (III Sem)

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

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

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

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

[CS1303.3]. Select and/or apply appropriate data structures to solve problems and assess the trade-offs involved in the design choices and hence develop employability skills

[CS1303.4]. describe and analyze various sorting algorithms like bubble, selection ,insertion, merge sort, heap sort and quick sort

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

D. Assessment Plan:

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

E. SYLLABUS

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

F. TEXT BOOKS

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

G. REFERENCE BOOKS

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

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

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

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

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

H. LECTURE PLAN

Lec No	Major Topics	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode Of Assessing CO
1.	**Introduction**	Introduction to data structures, Algorithm Specifications, How to Write Algorithms	define data structure and list various data structure.	Lecture	1303.1	Class Quiz End Term
2.		Performance Analysis- Time and Space Complexity, Asymptotic Analysis, Example , Functions in 'C', Example Programs on Functions	analyze time complexity of simple algorithms.	Lecture	1303.1 1303.1	Class Quiz Home Assignments I Sessional End Term
3.	**Arrays**	Example Programs on Functions, Arrays : Introduction, Single Dimensional Arrays : Declaration, Initialization, Operations (Insertion and Deletion of Element)	define arrays and apply knowledge on single dimensional arrays in writing programs.	Lecture	1303.1 1303.2	Class Quiz Home Assignments I Sessional End Term
4.		Sorting Algorithms – Selection Sort, Bubble Sort and Insertion Sort	construct searching and sorting algorithms and write programs using single dimensional arrays.	Lecture	1303.2	Class Quiz Home Assignments I Sessional End Term
5.		Multidimensional Arrays, Two Dimensional Arrays : Declaration, Initialization, Addition of Two	explain row major and column major memory allocation in 2-D arrays, Apply knowledge on two dimensional arrays in	Lecture	1303.1 1303.2	Class Quiz Home Assignments

		Matrices, Row Major and Column Major Representation	writing programs			I Sessional End Term
6.		Example Programs on Two Dimensional Arrays, Row Major and Column Major Representation	apply knowledge on two dimensional arrays in writing programs.	Lecture	1303.2 1303.3	Class Quiz Home Assignments I Sessional End Term
7.		Pointers : Introduction, Example Programs on Pointers, Pointers and Arrays, Dynamic Memory Allocation	illustrate dynamic memory allocation using pointers in solving problems requiring list of values.	Lecture	1303.1 1303.2	Class Quiz Home Assignments I Sessional End Term
8.		Dynamic Memory Allocation: Dynamic Array creation, Dynamic structure creation.	apply knowledge on pointers in writing programs.	Lecture	1303.1 1303.2	Class Quiz Home Assignments I Sessional End Term
9.		Problems solving by students on array	analyze the applicability of array as appropriate Data Structure to solve the problem and develop an algorithm/program to provide the solution to a given problem through it.	Tutorial	1303.3	Class Quiz Home Assignments I Sessional End Term
10.		Problems solving by students on array	structure mapping and model a given real world problem into array.	Tutorial	1303.3	Class Quiz Home Assignments I Sessional End Term
11.	**Linked List**	Linked List : Introduction, Basic Terminologies, Advantages over Arrays, Applications, Structures in 'C', Example Programs on Structures and pointer to Structure	describe linked list data structure, disadvantages of array based storage and need of linked list data structure, develop structures in 'C' and dealing it with pointers.	Lecture	1303.1 1303.2	Class Quiz Home Assignments I Sessional End Term

12.		Passing Structures to Functions, Singly Linked List : Introduction , Operations	pass structures to functions, to explain self-referential structures and functions, describe linked list storage structure and basic operations.	Lecture	1303.1 1303.2	Class Quiz Home Assignments I Sessional End Term
13.		Singly Linked List : Operations (Continued)	implement singly linked list storage structure and basic operations (insertion, deletion and searching) defined over it.	Lecture	1303.1 1303.2	Class Quiz Home Assignments I Sessional End Term
14.		Circular Linked List : Introduction, Operations	understand and implement circular linked list storage structure and basic operations (insertion, deletion and searching) defined over it.	Lecture	1303.1 1303.2	Class Quiz Home Assignments I Sessional End Term
15.		Doubly Linked List : Introduction, Operations	understand and implement circular linked list storage structure and basic operations (insertion, deletion and searching) defined over it.	Lecture	1303.1 1303.2	Class Quiz Home Assignments I Sessional End Term
16.		Some Example Programs on Linked List	implement linked list operations like reversing a linked list, finding middle of the list, sorting a list etc.	Lecture	1303.3	Class Quiz Home Assignments I Sessional End Term
17.		Problems solving by students on linked list	analyze the applicability of linked list as appropriate Data Structure to solve the problem and develop an algorithm/program to provide the solution to a given problem through it.	Tutorial	1303.3	Class Quiz Home Assignments I Sessional End Term
18.		Problems solving by students on linked list	structuring, mapping and model a given real world problem into linked list.	Tutorial	1303.3	Class Quiz Home Assignments I Sessional

						End Term
19.	**Stacks**	Recursive Functions, Example Programs on Recursive Functions, Stack : About, Applications	explain the working philosophy of stack and how the system stack stores local function calls.	Lecture/ Expert-Lecture	1303.1 1303.3	Class Quiz Home Assignments II Sessional End Term
20.		Stack : Operations, Implementation of Stack using Array and Linked List	develop a stack based application and realize the stack functioning using arrays as well as linked list and compare their implementations.	Lecture/ Expert-Lecture	1303.1 1303.2	Class Quiz Home Assignments II Sessional End Term
21.		Expression Notations : Polish Notation, Reverse Polish Notation, Infix Notation, Evaluation of Expression written in Polish Notation	explain various forms of mathematical notations to express an expression and their evaluation	Lecture	1303.3	Class Quiz Home Assignments II Sessional End Term
22.		Evaluation of Expression written in Reverse Polish Notation Evaluation of Expression written in Infix Notation	evaluate the postfix(infix) expression using stacks	Lecture	1303.3	Class Quiz Home Assignments II Sessional End Term
23.		Conversion of Expression from one Notation to Another	explain how to realize a mathematical expression using stacks and to convert an infix expression to postfix notation using stack.	Lecture	1303.3	Class Quiz Home Assignments II Sessional End Term
24.		Conversion of Expression from one Notation to Another	convert an infix expression to prefix notation using stack	Lecture	1303.3	Class Quiz Home Assignments II Sessional End Term
25.		Problems solving by students on stack applications	develop recursive code, to handle the problem using stacks, to analyze the applicability of stack with respect to a given	Tutorial	1303.3	Class Quiz Home Assignments

			problem			II Sessional End Term
26.	**Queues**	Linear Queue : Introduction, Applications, Operations, Implementation using Array and Linked List	explain Queue Data structure, its application in real world and its operations enqueue and dequeue, to implement queue data structure using array and linked list.	Lecture	1303.1 1303.2	Class Quiz Home Assignments II Sessional End Term
27.		Circular Queue : About, Applications, Operations, Implementation using Array and Linked List	explain Circular Queue Data structure, its application in real world and its operations enqueue and dequeue	Lecture	1303.1 1303.2	Class Quiz Home Assignments II Sessional End Term
28.		Priority Queue and Deques : About, Applications, Operations, Implementation using Array and Linked List	explain Priority Queue Data structure and Deques, its application in real world and its operations enqueue and dequeue.	Lecture	1303.1 1303.2	Class Quiz Home Assignments II Sessional End Term
29.		Problems solving by students on queue applications	analyze the applicability of queue as appropriate Data Structure to solve the problem, to develop an algorithm/program to provide the solution to a given problem through it.	Tutorial	1303.3	Class Quiz Home Assignments II Sessional End Term
30.	**Trees**	Trees : Introduction , Basic Terminology, Types of Trees, Binary Search Tree : Creation, : Searching an Element , Insertion of Node	describe about binary tree (BT), tree-terminology, types of BT, creation of Binary Search Tree, search operations	Lecture	1303.1 1303.2	Class Quiz Home Assignments II Sessional End Term
31.		Binary Search Tree : Deletion of Node, Determining Height	describe about deletion of a node in BST and computing height	Lecture	1303.2	Class Quiz Home Assignments II Sessional End Term

32.		Binary Search Tree : Traversal (In-order, Pre-order and Post- order)	explain different traversal in BST	Lecture	1303.2	Class Quiz Home Assignments II Sessional End Term
33.		Threaded Binary tree : Introduction, Creation , Insertion of Node, Deletion of Node and Traversal of Tree	describe about Threaded Binary tree, its applications and operations	Lecture	1303.1 1303.2	Class Quiz Home Assignments End Term
34.		AVL Tree : Introduction , Applications Creation , Searching an Element, Insertion of Node	describe drawbacks of BST, Use of AVL tree, how to insert a value in AVL and then required rotations (LL, RR , LR and RL)	Lecture	1303.1 1303.2	Class Quiz Home Assignments End Term
35.		AVL Tree : Deletion of Node	describe how to delete a node from AVL tree and then required rotations	Lecture	1303.2	Class Quiz Home Assignments End Term
36.		Heaps : Insertion of Node , Binary Heap: Creation, Insertion of Element, Deletion of Element	describe what is heap, types, creations of max and min heaps, heap sort, use of heap in priority queue implementation	Lecture	1303.1 1303.2	Class Quiz Home Assignments End Term
37.		B and B+ Trees	Applications of B and B+ Trees, Construction of B and B+ Trees, Insertion and Deletion of nodes in B and B+ Trees	Lecture	1303.1 1303.2	Class Quiz Home Assignments End Term
38.		Problems solving by students on tree and its use	construct BST and AVL tree from given sequence of values	Tutorial	1303.3	Class Quiz Home Assignments End Term
39.		Problems solving by students on tree and its use	construct heap from given sequence of values and implement priority queue	Tutorial	1303.3	Class Quiz Home Assignments End Term
40.	**Graphs**	Graphs : Introduction, Basic	describe representation of graph in term of	Lecture	1303.1	Class Quiz

		Terminology, Applications, Representation of Graphs : Adjacency Matrix Representation	adjacency matrix with their complexity		1303.2	Home Assignments End Term
41.		Representation of Graphs : Adjacency List Representation	describe representation of graph in term of adjacency list with their complexity	Lecture	1303.1 1303.2	Class Quiz Home Assignments End Term
42.		Graph Traversal : Breadth First Traversal, Depth First Traversal	conceptualize on the various methods of graph traversal and understand the concept of Queue and Stack data structure	Lecture	1303.2	Class Quiz Home Assignments End Term
43.		Minimum Spanning Tree, Prims Algorithm, Kruskal's Algorithm	understand the application of graph such as TSP problem	Lecture	1303.2	Class Quiz Home Assignments End Term
44.		Shortest Path Algorithms: Dijkstra's Algorithm, Floyd's Algorithm	understand the application of graph such as computer networking(Routing System)	Lecture	1303.2	Class Quiz Home Assignments End Term
45.		Problems solving by students on graph algorithms	find shortest path using Dijkstra's Algorithm and Floyd's Algorithm for a given graph	Tutorial	1303.3	Class Quiz Home Assignments End Term
46.		Problems solving by students on graph algorithms	find MST using Prims Algorithm and Kruskal's Algorithm for a given graph	Tutorial	1303.3	Class Quiz Home Assignments End Term
47.	**Searching & Sorting**	Sorting : Introduction, Bubble Sort, Insertion Sort	describe the concept of sorting with various sorting algorithm	Lecture	1303.1	Class Quiz Home Assignments End Term
48.		Sorting (Continued) : Quick Sort, Merge Sort	describe the application of sorting such as medical monitoring	Lecture	1303.1 1303.4	Class Quiz Home Assignments

						End Term
49.		Sorting (Continued) : Radix Sort , Heap Sort	describe the concept of priority queue with the help of heap sort	Lecture	1303.1 1303.4	Class Quiz Home Assignments End Term
50.		Hashing : Introduction, Applications, Hash Functions	describe different hashing techniques/functions	Lecture	1303.1 1303.2 1303.4	Class Quiz Home Assignments End Term
51.		Hash Collisions, Collision Resolution : Open Addressing, Chaining	describe different collision resolving techniques with examples	Lecture	1303.1 1303.2	Class Quiz Home Assignments End Term
52.		Problems solving by students on soring and its application	develop program for searching and sorting	Tutorial	1303.3	Home Assignments End Term

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

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
[CS1303.1]	explain basic concepts of various data structures	3	2										2	3		
[CS1303.2]	describe how arrays, linked lists, stacks, queues, trees and graphs are represented in memory and their operations		1	2									2		2	2
[CS1303.3]	Select and/or apply appropriate data structures to solve problems and assess the trade-offs involved in the design choices and hence develop employability skills		1	2									2		2	2
[CS1303.4]	describe and analyze various sorting algorithms like bubble, selection ,insertion, merge sort, heap sort and quick sort		1	2									2	2		1

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Department of Information Technology

Course Hand-out

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

Session: July-November, 2018

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

Class: B.Tech. IT

A. Introduction:

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

The main objective of the course are as follows:

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

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

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

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

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

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

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

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

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

PROGRAM OUTCOMES

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

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

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

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

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

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

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

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

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

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

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

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

PROGRAM SPECIFIC OUTCOMES

The graduation from B.Tech. in Information Technology will empowers the student:
[PSO 1]: To apply creativity in support of the design, simulation, implementation and inference of existing and advanced technologies.

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

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

D. Assessment Plan:

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

E. SYLLABUS

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

F. TEXT BOOKS

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

G. REFERENCE BOOKS

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

H. Lecture Plan:

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

31.	**Interfaces (30-34 lecture)**	Interfaces	Understand abstraction	Lecture	1304.3	Mid Term II, Quiz & End
32.		Default interface methods	New method in JAVA8	Flipped Class	1304.3	Mid Term II, Quiz & End
33.		static methods in interfaces	Understand static in JAVA9	Lecture	1304.3	Mid Term II, Quiz & End
34.		Tutorial	Tutorial	Activity	1304.3	Mid Term II, Quiz & End
35.	**Exception Handling (35-38 lecture)**	Fundamentals, Exception types, Uncaught	How to handle error/ exception	Lecture	1304.2 & 1304.6	Mid Term II, Quiz & End
36.		Using try and catch, multiple catch clauses,	Using try, catch block	Lecture	1304.2 & 1304.6	Mid Term II, Quiz & End
37.		Throw, throws, finally, built-in exceptions, creating own exception	How to throw an explicit exception	Lecture	1304.2 & 1304.6	Mid Term II, Quiz & End Term
38.		Tutorial	Tutorial	Activity	1304.5	Mid Term II, Quiz & End
39.	**Multithreaded Programming (39-42 lecture)**	Thread Model: thread priorities, synchronization	Learn Multitasking and threading	Flipped Class	11304.2 & 1304.6	Quiz & End Term
40.		main thread, creating single thread and multiple threads,	Handle multiple threads	Lecture	1304.2 & 1304.6	Quiz & End Term
41.		Interthread communication, suspending, resuming and	Learn how to stop and start a thread	Lecture	1304.2 & 1304.6	Quiz & End Term
42.		Tutorial	Tutorial	Activity	1304.5	Quiz & End Term
43.	**String Handling (43-45 lecture)**	Constructors, Constructor chaining, string	Learn polymorphism	Lecture	1304.4	Quiz & End Term
44.		Character extraction, comparison, searching and	Understand String operations	Lecture	1304.4	Quiz & End Term
45.		String Class Methods and String Buffer Class	Learn String immutable	Flipped Class	1304.4	Quiz & End Term
46.	**Generics Class(46-49 lecture)**	Collection framework, Arraylist ,	Understand Collections	Lecture	1304.4	Quiz & End Term
47.		LinkList, HashMap,Vector	Learn different data structures	Lecture	1304.4	Quiz & End Term
48.		Making own generics class	Template and generics	Lecture	1304.4	Quiz & End Term
49.		Tutorial	Tutorials	Activity	1304.4	Quiz & End Term
50.	**GUI and Event Handling (50-52 Lecture**	GUI lifecycle, Events, Events listener, adapter	Learn Swings for GUI application	Flipped Class	1304.4 & 1304.5	Quiz & End Term
51.		Different Event classes	Learn Actionlistener class	Lecture	1304.4 & 1304.5	Quiz & End Term
52.		Event Listener Interfaces	Understanding of events	Lecture	1304.4 & 1304.5	Quiz & End Term

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

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

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Department of Information Technology

Course Hand-out

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

Session: July 18 – Nov 18 | Faculty: Dr. Anju Yadav, Dr. Sulabh BAnsal, Rohit Kumar Gupta | Class: B. Tech IT (III Sem)

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

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

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

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

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

[CS1331.4]. Implement various sorting and searching algorithms

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Continuous Assessments	70
Exam (Summative)	Exam (Small Project/Exam)	30
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester	

	examination. The allowance of 25% includes all types of leaves including medical leaves.
Make up Assignments (Formative)	Students who misses a lab will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 2 throughout the entire semester.

E. SYLLABUS

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

F. TEXT BOOKS

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

G. REFERENCE BOOKS

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

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

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

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

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

H. LAB PLAN

Lec No	Major Topics	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode Of Assessing CO
1.	**Arrays**	Programs based on 1-D array operations	describe and implement various operations on 1-D array	Lab	1331.1 1331.3	Internal Evaluation Home Assignments External Evaluation
2.		Programs based on 2-D array operations	describe and implement various operations on 2-D array	Lab	1331.1 1331.3	Internal Evaluation Home Assignments External Evaluation
3.		Programs based on 2-D array operations with pointer notations	describe and implement various operations on 2-D array using pointers and functions.	Lab	1331.1 1331.2	Internal Evaluation Home Assignments External Evaluation
4.	**Linked List**	Programs to implement singly linked-list list operations	describe and implement various operations on one way linked list	Lab	1331.2 1331.3	Internal Evaluation Home Assignments External Evaluation
5.		Programs to implement Circular Linked list and Doubly-linked list operations	describe and implement various operations on circular and two way linked list	Lab	1331.1 1331.2	Internal Evaluation Home Assignments External Evaluation
6.	**Stacks**	Programs to implement stack and its operations	describe and simulate stack and its operations	Lab	1331.2 1331.3	Internal Evaluation Home Assignments External Evaluation
7.		Programs based on implementation of stack	describe and implement various application programs on stack	Lab	1331.1 1331.2	Internal Evaluation Home Assignments External Evaluation
8.	**Queue**	Programs based on implementation of queue and	describe and implement various application programs on queue, and	Lab	1331.2 1331.3	Internal Evaluation Home Assignments

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

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

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
[CS1331.1]	explain basic concepts of various data structures	3	2										2	3		
[CS1331.2]	describe how arrays, linked lists, stacks, queues, trees and graphs are represented in memory and their operations		1	2									2		2	2
[CS1331.3]	select and/or apply appropriate data structures to solve problems.		1	2									2		2	2
[CS1331.4]	Implement various sorting and searching algorithms		1	2									2	2		1

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

MANIPAL UNIVERSITY JAIPUR

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Department of Information Technology

Course Hand-out

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

Session: July-November, 2018

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

Class: B.Tech. IT

A. Introduction:

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

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

[CS1304.1]:	Identify basic programming construct of java language
[CS1304.2]:	Identify and develop different classes based on real world scenario.
[CS1304.3]:	To identify and experiment with different class to demonstrate polymorphism and inheritance and exception handling model
[CS1304.4]:	Understand Multi-threading Model and built classes to demonstrate multi-threading programming
[CS1304.5]:	Analyse real world problem and model Graphical user interface to solve problem

C PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

PROGRAM OUTCOMES

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

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

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

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

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

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

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

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

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

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

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

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

Program Specific Outcomes (PSOs)

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

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

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

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

D. Assessment Plan:

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

E. SYLLABUS

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

F. TEXT BOOKS

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

G. REFERENCE BOOKS

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

H . Lecture Plan

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

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
[CS1304.1]:	Understand basic programming construct of java language	1				1								1		
[CS1304.2]:	Identify and develop different classes based on real world scenario.	1	1	1		1								1		
[CS1304.3]:	To identify and experiment with different class to demonstrate polymorphism and inheritance and exception handling model	1	2	2	1	1								2		
[CS1304.4]:	Understand Multi-threading Model and built classes to demonstrate multi-threading programming	1	2	2	1	1								2		
[CS1304.5]:	Analyse real world scenario and model Graphical user interface to solve problem	1	2	2	1	1								2		

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Department of Information Technology

Course Hand-out

Value, Ethics & Governance BB1101 [2 Credits] [2 0 0 2]

Session: Jan-May, 2018 | Faculty: Dr. Manik Konch | Class: B.Tech 3rd sem

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.

A. Course Objectives: 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.

B. Program Outcomes and Program Specific Outcomes

PROGRAM OUTCOMES

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

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

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

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

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

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

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

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

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

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

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

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

PROGRAM SPECIFIC OUTCOMES

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

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

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

C. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	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.

D: **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

Text / Reference Books:

1. Professional Module of ICSI.
2. Ghosh B.N., Business Ethics & Corporate Governance, McGraw Hill.
3. Mandal S.K., Ethics in Business & Corporate Governance, McGraw Hill .
4. Ray C.K., Corporate Governance, Value & Ethics, Vaya Education of India
5. Chatterjee Abha, Professional Ethics, Oxford Publications.

***Suggestive Case Studies:**

1) Uphar Theatre Tragedy- Engineering Ethics
2) Bhopal Gas Tragedy- Operational Engineering Ethics
3) Satyam Case- Financial Reporting Ethics
4) Enron Case- Business Ethics
5) Neerav Modi Case- Financial Fraudulence *cases*

D. **Lecture Plan:**

Lec No	**Topics**	**Session Outcome**	**Mode of Delivery**	**Correspon ding 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

Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
[BB11 01.1]	Define the meaning and relevance of Value and Ethics and apply in personal & professional life.						1		2							
[BB11 01.2]	Describe the importance of three Gunas for self-development, lifelong learning & growth.						1		2	1	1		2			1
[BB11 01.3]	Find issues and identify solutions related to Public & Private Governance systems.						1	1		1	2					
[BB11 01.4]	Explain the relevance of Company's Act 2013 with reference to corporate world.						1		1	1						
[BB11 01.5]	Explain the role and key objectives of organizational governance in relation to ethics and law.						1		2	1			1			1
[BB11 01.6]	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 IT

DEPARTMENT OF INFORMATION TECHNOLOGY

Course Hand-out

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

Session: Jan 19-May 19 | Faculty: Rohit Kumar Gupta, Vinita Soni, Kavita, Dr. Pankaj Vyas | Class: B. Tech. IV SEM

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

D. ASSESSMENT PLAN:

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

E. SYLLABUS

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

F. TEXT BOOKS

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

G. REFERENCE BOOKS

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

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

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

I. Lecture Plan:

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

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

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

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
[CS1401.1]	Describe the objectives, structure, functionality and types of operating systems.	2	1	1		1							2	1	1	1
[CS1401.2]	Write system programs using file and process system calls and PThread API.	2	2	3		1					1	1	2	1		2
[CS1401.3]	Compare various algorithms used for process scheduling.	2	2	2		1							2	1		1
[CS1401.4]	Describe concepts related to concurrency and achieve the same for cooperating processes, Apply various deadlock handling strategies to solve resource allocation problems.	2	2	2	1	1							2	1		1
[CS 1401.5]	Evaluate the performance of different memory management techniques and page replacement algorithms.	2	2	2	1	1					1	1	2	1		1
[CS 1401.6]	Describe file concepts and analyse various disk scheduling and storage strategies.	2	2	2	1	1					1	1	2	1		1

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

DEPARTMENT OF INFORMATION TECHNOLOGY

Course Hand-out

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

Session: Jan 2019 – May 2019 | Faculty: Mr. Shashank Sharma, Mr. Virender, Mr. Krishna Kumar| Class: B.Tech. IV Semester

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

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

[CS1402.1]: Classify, Compare & recall different file-based system, data model

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

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

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

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

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

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

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

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

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

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

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

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

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

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

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

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

Program Specific Outcomes (PSOs)

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

[PSO2.] To participate & succeed in IT oriented jobs/competitive examinations that offer inspiring & gratifying careers.

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

D. Assessment Plan:

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

E. SYLLABUS

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

F. TEXTBOOKS

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

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

G. REFERENCE BOOKS

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

H. LECTURE PLAN: 54 Lectures

Lectures	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing CO
1.	Introduction to Data, data processing requirement, desirable characteristics of an ideal data processing system.	Classify, Compare & recall different file-based system, Data Model.	PPT, Lecture, Class Notes	1402.1	N. A.
2.	Traditional file-based system, its drawback, File processing systems versus database management systems.	Compare file systems and DBMS	PPT, Lecture, Class Notes	1402.1	Mid Term I, Quiz & End Term
3.	Data Models, Schemas and Instances. Categories of Data Models.	Classify and Compare different Data Model.	PPT, Lecture, Class Notes	1402.1	Mid Term I, Quiz & End Term
4.	Three Schema Architecture, Data Independence (Logical & Physical).	Classify and Compare various architectures and data independence.	PPT, Lecture, Class Notes	1402.1	Mid Term I, Quiz & End Term

5.	Benefits of DBMS. Database system applications, Purpose of database systems, Different database users.	Classify, Compare & recall different file-based system, Data Model.	PPT, Lecture, Class Notes	1402.1	Mid Term I, Quiz & End Term
6.	Conceptual data model, Conceptual data modelling using E-R data model.	Understand and design Entity Relationship Model and illustrate the concept of cardinality, mapping and various constraints.	PPT, Lecture, Class Notes	1402.1 & 1402.2	Mid Term I, Quiz & End Term
7.	Entity Types, Entity Sets, Attributes, Keys and Weak Entity type.	Understand and design Entity Relationship Model and illustrate the concept of cardinality, mapping and various constraints.	PPT, Lecture, Class Notes	1402.1 & 1402.2	Mid Term I, Quiz & End Term
8.	Relationship Types, Relationship Sets, Roles, and Structural Constraints.	Understand and design Entity Relationship Model and illustrate the concept of cardinality, mapping and various constraints.	PPT, Lecture, Class Notes	1402.1 & 1402.2	Mid Term I, Quiz & End Term
9.	Enhanced Entity-Relationship (EER) Model: Subclass, Super classes and Inheritance.	Understand and design Entity Relationship Model and illustrate the concept of cardinality, mapping and various constraints.	PPT, Lecture, Class Notes	1402.1 & 1402.2	Mid Term I, Quiz & End Term
10.	Specialization and Generalization, Constraints and characteristics of Specialization and Generalization Hierarchies.	Understand the concepts of generalization and specialization and various constraints associated.	PPT, Lecture, Class Notes	1402.1 & 1402.2	Mid Term I, Quiz & End Term
11.	Relational Model Concepts: Domain, Attributes, Tuples and Relations.	Understand the concepts of relational model	PPT, Lecture, Class Notes	1402.1 & 1402.2	Mid Term I, Quiz & End Term
12.	Relational Model Constraints and Relational Database Schema: Domain Constraints, Key Constraints and Constraints on NULL Values.	Understand and design Entity Relationship Model and illustrate the concept of NULL values.	PPT, Lecture, Class Notes	1402.1 & 1402.2	Mid Term I, Quiz & End Term
13.	Entity Integrity, Referential Integrity and Foreign Keys.	Understand various concepts of key constraints.	PPT, Lecture, Class Notes	1402.1 & 1402.2	Mid Term I, Quiz & End Term
14.	Relational database design using ER-to-Relational Mapping.	Understand mapping of ER models into relations	PPT, Lecture, Class Notes	1402.1 & 1402.2	Mid Term I, Quiz & End Term
15.	Mapping EER Model constructs to Relations.	Understand mapping of EER models into relations	PPT, Lecture, Class Notes	1402.1 & 1402.2	Mid Term I, Quiz & End Term
16.	Relational Algebra: Unary Relational Operations SELECT and PROJECT.	Understand unary relational operations like SELECT and PROJECT	PPT, Lecture, Class Notes	1402.3	Mid Term I, Quiz & End Term
17.	Sequences of Operations and the RENAME Operation.	Understand the sequences of operations and the RENAME Operation.	PPT, Lecture, Class Notes	1402.3	Mid Term I, Quiz & End Term
18.	Relational Algebra Operation from Set Theory: UNION, INTERSECTION,	Interpret different Relational Algebra operations and apply the techniques and rules in different problems	PPT, Lecture, Class Notes	1402.3	Mid Term I, Quiz & End Term

	CARTESIAN PRODUCT (CROSS PRODUCT) Operations.				
19.	Binary Relational Operations: JOIN and DIVISION Operation	Interpret JOIN and DIVISON operations and apply the techniques and rules in different problems.	PPT, Lecture, Class Notes	1402.3	Mid Term I, Quiz & End Term
20.	Variations of JOIN: THETA JOIN, EQUI JOIN, NATURAL JOIN, INNER JOIN and OUTER JOIN	Interpret different types of JOIN operations and apply the techniques and rules in different problems	PPT, Lecture, Class Notes	1402.3	Mid Term I, Quiz & End Term
21.	Additional Relational Operations: Generalized Projection, Aggregate Functions and Grouping.	Interpret additional Relational Algebra operations and apply the techniques and rules in different problems	PPT, Lecture, Class Notes	1402.3	Mid Term II, Quiz & End Term
22.	Tuple Relational Calculus: Tuple Variable and Range Relations, Expressions and Formulas in tuple relational calculus.	Interpret different Relational Calculus operations and apply the techniques and rules in different problems	PPT, Lecture, Class Notes	1402.3	Mid Term II, Quiz & End Term
23.	The Existential and Universal Quantifiers, Safe Expressions.	Understand existential and universal and existential quantifiers.	PPT, Lecture, Class Notes	1402.3	Mid Term II, Quiz & End Term
24.	Domain Relational Calculus.	Understand concepts of domain relational calculus.	PPT, Lecture, Class Notes	1402.3	Mid Term II, Quiz & End Term
25.	SQL Data Definition and Data Types, Specifying Constraints in SQL, Schema change statements in SQL.	Understand fundamentals of SQL	PPT, Lecture, Class Notes	1402.3	Mid Term II, Quiz & End Term
26.	Basic queries in SQL, More complex SQL queries: Comparisons involving NULL and Three-Valued Logic, Nested Queries, Tuples, and Set/Multiset Comparisons.	Interpret SQL and apply the techniques and rules in different problems	PPT, Lecture, Class Notes	1402.3	Mid Term II, Quiz & End Term
27.	Correlated Nested Queries, EXISTS and UNIQUE functions in SQL.	Interpret SQL and apply the techniques and rules in different problems	PPT, Lecture, Class Notes	1402.3	Mid Term II, Quiz & End Term
28.	Joined tables in SQL and Outer Joins, Aggregate functions in SQL.	Interpret SQL and apply the techniques and rules in different problems	PPT, Lecture, Class Notes	1402.3	Mid Term II, Quiz & End Term
29.	GROUP BY, HAVING Clauses, INSERT, DELETE, AND UPDATE Statements in SQL.	Interpret SQL and apply the techniques and rules in different problems	PPT, Lecture, Class Notes	1402.3	Mid Term II, Quiz & End Term
30.	Views (Virtual tables) in SQL, Specifying General Constraints as assertion and Triggers, Additional features of	Interpret SQL and apply the techniques and rules in different problems	PPT, Lecture, Class Notes	1402.3	Mid Term II, Quiz & End Term

	SQL.				
31.	Database Design: Redundant information in tuples and update anomalies, insertion anomalies, deletion anomalies and modification anomalies.	Understand the concepts of different anomalies and how they can be removed	PPT, Lecture, Class Notes	1402.4	Mid Term II, Quiz & End Term
32.	Properties of Relational Decompositions: Dependency preservation and Lossless join property of a decomposition.	Understand concepts of relational decompositions	PPT, Lecture, Class Notes	1402.4	Mid Term II, Quiz & End Term
33.	Functional Dependencies: Definition of functional dependencies, Inference rules for functional dependencies.	Understand concepts of functional dependencies	PPT, Lecture, Class Notes	1402.4	Mid Term II, Quiz & End Term
34.	Equivalence of sets of functional dependencies, Minimal sets of functional dependencies.	Understand the process of finding out equivalence among given sets of FDs and finding out minimal sets of functional dependencies	PPT, Lecture, Class Notes	1402.4	Mid Term II, Quiz & End Term
35.	Normal forms based on Primary keys, Normalization of relations, Definition of Super Key and Candidate Key. Definition of Prime and Non-Prime Attribute.	Understand different normalization techniques for optimizing database and analyse database design	PPT, Lecture, Class Notes	1402.4	Mid Term II, Quiz & End Term
36.	Normal Forms: First normal form, Second normal form.	Understand 1NF and 2NF	PPT, Lecture, Class Notes	1402.4	Mid Term II, Quiz & End Term
37.	Third normal form and Boyce-Codd normal form.	Understand 3NF and BCNF	PPT, Lecture, Class Notes	1402.4	Mid Term II, Quiz & End Term
38.	Multivalued dependencies and fourth normal form.	Understand concepts of multivalued dependencies	PPT, Lecture, Class Notes	1402.4	Mid Term II, Quiz & End Term
39.	Introduction to transaction processing, Desirable properties of transactions.	Understand and summarize transaction processing	PPT, Lecture, Class Notes	1402.5	Quiz & End Term
40.	Characterizing schedules based on recoverability.	Understand and summarize concepts of recoverability of schedules	PPT, Lecture, Class Notes	1402.5	Quiz & End Term
41.	Characterizing schedules based on Serializability: Serial, Nonserial and conflict serializable schedules.	Understand and summarize concepts of schedules	PPT, Lecture, Class Notes	1402.5	Quiz & End Term
42.	View equivalence and View Serializability.	Understand and summarize concepts of serializability	PPT, Lecture, Class Notes	1402.5	Quiz & End Term
43.	Concurrency control techniques: Two Phase locking Techniques	Understand and summarize concurrency control techniques.	PPT, Lecture, Class Notes	1402.5	Quiz & End Term

	(Binary Lock, Shared/Exclusive Lock).				
44.	Basic 2PL, Strict 2PL, Rigorous 2PL.	Understand the concepts of locking for concurrency control	PPT, Lecture, Class Notes	1402.5	Quiz & End Term
45.	Deadlock prevention protocol (Wait-Die, Wound-Wait), Deadlock detection and starvation.	Understand different strategies of deadlock prevention and detection strategies	PPT, Lecture, Class Notes	1402.5	Quiz & End Term
46.	Concurrency control based on Timestamp Ordering (Basic TO, Strict TO and Thomas's Write Rule.	Understand concurrency control based on timestamp ordering.	PPT, Lecture, Class Notes	1402.5	Quiz & End Term
47.	Granularity of Data items and Multiple Granularity Locking.	Understand concepts of multiple granularity locking	PPT, Lecture, Class Notes	1402.5	Quiz & End Term
48.	Database Recovery Techniques: Recovery Concepts, Recovery Technique based on Deferred Update.	Understand and summarize recovery techniques.	PPT, Lecture, Class Notes	1402.5	Quiz & End Term
49.	Recovery Technique based on Immediate Update, Recovery Systems Check pointing and Shadow paging.	Understand and summarize recovery techniques.	PPT, Lecture, Class Notes	1402.5	Quiz & End Term
50.	File Storage: File structures (Fixed Length Record, Variable Length Record), Record Blocking and Spanned versus Un-spanned Records.	Explain different database storage structure and access technique	Lectures, Flipped Classroom	1402.6	Quiz & End Term
51.	RAID organization and Levels, Hashing Techniques (Internal and External Hashing).	Explain RAID organization and Hashing techniques	Lectures, Flipped Classroom	1402.6	Quiz & End Term
52.	Indexing Structure: Single Level ordered indexes (Primary, Clustering, and Secondary).	Explain different indexing techniques	PPT, Lecture, Class Notes	1402.6	Quiz & End Term
53.	Multilevel Indexes, Dynamic multilevel indexes using B-Trees.	Explain different indexing techniques	PPT, Lecture, Class Notes	1402.6	Quiz & End Term
54.	Dynamic multilevel indexes using B+-Trees.	Explain different indexing techniques	PPT, Lecture, Class Notes	1402.6	Quiz & End Term

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

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CS 1402.1:	Classify, Compare & recall different file-based system, Data Model	1												1		
CS 1402.2:	Understand and design Entity Relationship Model and illustrate the concept of cardinality, mapping and various constraints	2	2	2	2	2					2			2	2	
CS 1402.3:	Interpret different query language SQL, Relation Algebra, calculus and apply the techniques and rules in different problems	2		1	2	2								2	2	
CS 1402.4:	Understand different normalization technique for optimizing database and analyse database design	2		2			2							2	2	
CS 1402.5:	Understand and summarize transaction processing, concurrency and recovery technique.	2	2	1		2	1							2	2	
CS 1402.6:	Explain different database storage structure and access technique	1		1		1								2		1

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

MANIPAL UNIVERSITY JAIPUR

School of Computing & Information Technology

DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE HAND-OUT

Microprocessor and Microcontroller | CS 1403 | 3 Credit | 3 0 0 3

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

Class: B.Tech. IInd Year IV Semester

A. Introduction:

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

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

[CS1403.1]: Understand the internal architecture and interfacing of different peripheral devices with 8086 microprocessor.

[CS1403.2]: Understand & Apply basic instruction set of 8086 to write the assembly language programming.

[CS1403.3]: Analyze and Implement various instruction timing, delay loops, Procedures and Macros.

[CS1403.4]: Understand the internal architecture and interfacing of different peripheral devices with 8086 microprocessor.

[CS1403.5]: Become proficient at working on 16-Bit microcontroller based systems.

C PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

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

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

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

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

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

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

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

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

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

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

Program Specific Outcomes (PSOs)

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

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

PSO2. To participate & succeed in IT oriented jobs/competitive examinations that offer inspiring & gratifying careers.

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

D. Assessment Plan:

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

E. SYLLABUS

8086: internal architecture, programming the 8086, Addressing modes, Flags; Instruction Set: assembler and Assembler directives, Simple sequence programs, Jumps and conditional jumps, Loop instructions, Instruction timing and delay loops; String instructions, Writing and Using Procedures and Macros, 8255: Programmable Parallel ports and Handshake Input/ Output; Interrupts and Interrupt Responses: 8259 Priority Interrupt Controller, 8254 Software-Programmable Timer/counter; Software interrupts, Intel 8096-16-bitMicrocontroller: Overview; Instruction Set and Programming; Hardware features, , iRMX, ARM processor, Real-Time Executive: iRTX.

F. TEXT BOOK

T1. Douglas. V. Hall, "*Microprocessors and Interfacing*", TMH, Revised Second Edition 2006, ISBN-10: 0-07-060167-4. Reprint -2011.

G. REFERENCES

R1. B. B. Brey, "*The Intel Microprocessors*", Prentice Hall India, Seventh Edition, 2005.

R2. A. Clements, "*Microprocessor system design 68000 Hardware*", Software and Interfacing, PWS Publishing Company, Third Edition, 1997.

H. Lecture Plan

Lecture No.	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1	Introduction-Microprocessor and Microcontroller	Basic understanding of the course, practicality of the microprocessor and microcontroller	Lecture	1403.1 1403.5	NA
2	Segmentation, Physical Address Calculation	Understanding the memory organization of 8086	Lecture	1403.1	In Class Quiz Mid Term I End Term
3-4	Detailed System Architecture	Identifying the building blocks of system architecture and their functions	Lecture	1403.1	In Class Quiz Mid Term I End Term
5-6	Addressing modes	Understanding the structure of instructions	Lecture, Practice questions	1403.1 1403.2	Home Assignment Mid Term I End Term
7	Introduction to Programming-Data Transfer Instructions	Understanding the assembly language programming and 8086 instruction set	Lecture, Practice questions	1403.2	In Class Quiz Home Assignment Mid Term I End Term
8	Stack Instructions and I/O	Understanding the working of stack instructions	Lecture, Practice questions	1403.2	In Class Quiz Home Assignment Mid Term I End Term
9	Arithmetic Instructions	Understanding the working of arithmetic instructions	Lecture, Practice questions	1403.2	In Class Quiz Home Assignment Mid Term I End Term
10	BCD Arithmetic Instructions	Understanding the working of BCD arithmetic instructions	Lecture, Practice questions	1403.2	In Class Quiz Home Assignment Mid Term I End Term
11	Logical Instructions	Understanding the working of logical instructions	Lecture, Practice questions	1403.2	In Class Quiz Home Assignment Mid Term I End Term

12	Flag Controlling Instructions and Branching Instructions	Understanding the working of flag and branching instructions	Lecture, Practice questions	1403.2	In Class Quiz Home Assignment Mid Term I End Term
13	Loop Instructions	Understanding the working of loop instructions	Lecture, Practice questions	1403.2	In Class Quiz Home Assignment Mid Term I End Term
14	Instruction timing and delay loops	Understanding the working of delay loops and timing of instructions	Lecture, Practice questions	1403.2	In Class Quiz Home Assignment Mid Term I End Term
15	Assembler Directives	Use of assembler directives	Lecture, Practice questions	1403.2	In Class Quiz Home Assignment Mid Term I End Term
16	String Instructions	Working of string instructions	Lecture, Practice questions	1403.2	In Class Quiz Home Assignment Mid Term I End Term
17	Writing and Using Procedures	Implementing procedures in 8086 assembly programs	Lecture, Practice questions	1403.3	In Class Quiz Home Assignment Mid Term II End Term
18	Macros	Implementing macros in 8086 assembly programs and difference between procedure and macros	Lecture, Practice questions	1403.3	In Class Quiz Home Assignment Mid Term II End Term
19-22	8255: Programmable Parallel ports and Handshake Input/ Output	Understand the internal architecture and interfacing of 8255 with 8086	Lecture	1403.4	In Class Quiz Home Assignment Mid Term II End Term
23	Interrupts and Interrupt Responses	Understanding the concept of interrupts and interrupt responses	Lecture	1403.4	In Class Quiz Home Assignment Mid Term II End Term
24-27	8259 Priority Interrupt Controller	Understand the internal architecture and interfacing of 8259 with 8086	Lecture	1403.4	In Class Quiz Home Assignment Mid Term II

					End Term
28-31	8254 Software-Programmable Timer/counter; Software interrupts	Understand the internal architecture and interfacing of 8254 with 8086	Lecture	1403.4	In Class Quiz Home Assignment Mid Term II End Term
32-36	Intel 8096-16-bit Microcontroller: Overview; Instruction Set and Programming; Hardware features	Understand the basic architecture of 16-bit microcontroller & its need.	Lecture	1403.5	In Class Quiz Home Assignment End Term
37	ARM processor, Real-Time Executive: iRTX	Understand the basic architecture of ARM processor & its need.	Lecture, Hands on session	1403.5	In Class Quiz Home Assignment End Term

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

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
[CS1403.1]:	Interpret and illustrate the basic architecture of 16-bit 8086 Microprocessors & its need.	2	2	1		1	1		1	1		1	1	1		
[CS1403.2]:	Understand & Apply basic instruction set of 8086 to write the assembly language programming.	3	2	1	2						1		1	3		
[CS1403.3]:	Analyse and Implement various instruction timing, delay loops, Procedures and Macros.		3		2	1							1	2		
[CS1403.4]:	Understand the internal architecture and interfacing of different peripheral devices with 8086 microprocessor.	2	2						1		1	1	1	1		
[CS1403.5]:	Become proficient at working on 16-Bit microcontroller based systems.			1	2	1		1				1	1	1	1	1

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and IT

DEPARTMENT OF INFORMATION TECHNOLOGY

Course Hand-out

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

Session: Jan 29-May 29 | Faculty: Rohit Kumar Gupta, Vinita Soni, Kavita, Dr. Pankaj Vyas | Class: B. Tech. IV SEM

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

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

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

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

D. ASSESSMENT PLAN:

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

E. SYLLABUS

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

F. TEXT BOOKS

T1. Das, S., Unix Concepts and Applications, (4e), Tata McGraw-Hill Publications, 2017.

T2. Silberschatz, A. and Galvin, P. B., Operating System Concepts, (8e), International student version, John Wiley & Sons, 2009.

G. REFERENCE BOOKS

R1. Blum, R., and Bresnahan, C., Linux Command Line and Shell Scripting Bible, (3(e), Wiley india Pvt. Ltd, 2015.

R2. Maurice J. Bach, "The Design of the UNIX Operating System", Pearson Education

H. Lecture Plan

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

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

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES			
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	
[CS1432.1]:	Explain basic Unix commands and write shell Scripts.	1	1	2	2	1	1		1	1		1		1	1	1	
[CS1432.2]:	Write system programs using file and process system calls and PThread API.	1	1	1										1			
[CS1432.3]:	Compare various algorithms used for process scheduling.	1	1	1										1			
[CS1432.4]:	Describe concepts related to concurrency and achieve the same for cooperating processes, Apply various deadlock handling strategies to solve resource allocation problems.	1		1					1	1	1	1		1	1		
[CS1432.5]:	Evaluate the performance of different memory management techniques and page replacement algorithms.	1	1	2	1	1				1		1		1			

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and IT

DEPARTMENT OF INFORMATION TECHNOLOGY

Course Hand-out

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

Session: Jan 19-May 19 | Faculty: Mr. Shashank Sharma, Mr. Virender, Mr. Krishna Kumar | Class: B. Tech. IV SEM

A. Introduction:

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

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

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

C PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

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

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

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

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

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

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

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

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

Program Specific Outcomes (PSOs)

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

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

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

D. Assessment Plan:

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

E. SYLLABUS

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

F. Text Books

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

G. Reference Books

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

H . Lecture Plan

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

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

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

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

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

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

SCHOOL OF COMPUTING & INFORMATION TECHNOLOGY
DEPARTMENT OF INFORMATION TECHNOLOGY
COURSE HAND-OUT
Microprocessor and Microcontroller Lab | CS 1433 | 2 Credit | 0 1 2 2
Session: Jan '2019 – May '2019 | Faculty: Mr. Ankit Mundra, Dr. Vivek Kumar Verma
Class: B.Tech. IInd Year IV Semester

A. Introduction:

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

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

[CS1433.1]: Interpret and illustrate the basic architecture of 16-bit 8086 Microprocessors & its need.
[CS1433.2]: Understand & Apply basic instruction set of 8086 to write the assembly language programming.
[CS1433.3]: Analyze and Implement various instruction timing, delay loops, Procedures and Macros.
[CS1433.4]: Analyze and Implement various string instruction and Flag instructions.
[CS1433.5]: Understand the internal architecture and interfacing of different peripheral devices with 8086 microprocessor.

C PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

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

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

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

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

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

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

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

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

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

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

Program Specific Outcomes (PSOs)

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

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

PSO2. To participate & suITed in IT oriented jobs/competitive examinations that offer inspiring & gratifying careers.

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

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Continuous evaluation (Record + Execution + Viva)	70
End Term Exam (Summative)	End Term Practical Exam (CLOSED BOOK)	30
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

E. SYLLABUS

Data and Address transfer Instructions, Simple Arithmetic Instructions, Arithmetic Instructions, BIT Manipulation Instructions: Program execution transfer Instructions, Program execution Transfer Instructions, Array operations, String Operations.

F. TEXT BOOK

T1. Douglas. V. Hall, “*Microprocessors and Interfacing*”, TMH, Revised Second Edition 2006, ISBN-10: 0-07-060167-4. Reprint -2011.

G. REFERENCES

R1. B. B. Brey, “*The Intel Microprocessors*”, Prentice Hall India, Seventh Edition, 2005.

R2. A. Clements, “*Microprocessor system design 68000 Hardware*”, Software and Interfacing, PWS Publishing Company, Third Edition, 1997.

G. Lab Plan

Lab No.	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1	Basic introduction of 8086 emulator.	Use of 8086 emulator for writing assembly programs.	Lecture Demonstration at system	CS1433.1	Continuous Evaluation End Term Examination
2	Implementation of data transfer instruction	Understand data transfer instructions with register and memory.	Lecture Demonstration at system	CS1433.1	Continuous Evaluation End Term Examination
3	Implementation of arithmetic addition and subtraction operation by different addressing modes.	Understand the use of addition and subtraction instructions.	Lecture Demonstration at system	CS1433.2	Continuous Evaluation End Term Examination
4	Implementation of arithmetic multiplication and division operation by different addressing modes.	Understand the use of multiplication and division instructions.	Lecture Demonstration at system	CS1433.2	Continuous Evaluation End Term Examination
5	Implementation of arithmetic multiplication and division operation by using repetitive addition and subtraction.	Understand the use of multiplication and division with repetitive addition and substation by applying LOOP instructions.	Lecture Demonstration at system	CS1433.2 CS1433.3	Continuous Evaluation End Term Examination
6	Implementation of complement (1's and 2's) and shift (Left and Right) operation by different addressing modes.	Understand the use of complement, shift and rotate instructions.	Lecture Demonstration at system	CS1433.2 CS1433.3	Continuous Evaluation End Term Examination
7	Branching instruction: Implementation of if- else instruction program.	Demonstrate the use of Branch control and Jump instructions in development of programs.	Lecture Demonstration at system	CS1433.3 CS1433.4	Continuous Evaluation End Term Examination
8	String instruction: Implementation Of data transfer by using string data.	Understand string data transfer instructions with register and memory.	Lecture Demonstration at system	CS1433.3	Continuous Evaluation End Term Examination

9	Bit Manipulation instruction: Implementation of NOT, AND & OR instruction program.	Demonstrate the use of logical instructions in development of programs.	Lecture Demonstration at system	CS1433.4	Continuous Evaluation End Term Examination
10	Iteration Control Instructions: Implementation of Loop instruction program.	Demonstrate the use of Iteration Control Instructions in development of programs.	Lecture Demonstration at system	CS1433.3 CS1433.4	Continuous Evaluation End Term Examination
11	Processor Control Instructions: Implementation of flag controlling instruction program.	Demonstrate the use of Processor Control Instructions in development of programs.	Lecture Demonstration at system	CS1433.3 CS1433.4	Continuous Evaluation End Term Examination
12	Sorting: Implementation of different comparison based sorting technique program.	Demonstrate the sorting in assembly program using instructions.	Lecture Demonstration at system	CS1433.4	Continuous Evaluation End Term Examination
13	Traffic control system: Illustration of traffic control system.	Understand how to develop a real life problem as traffic control using instructions of assembly programming.	Lecture Demonstration at system	CS1433.4 CS1433.5	Continuous Evaluation End Term Examination

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

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
[CS1433.1]:	Interpret and illustrate the basic architecture of 16-bit 8086 Microprocessors & its need.	1	1	2	2	1	1		1	1		1		1	1	
[CS1433.2]:	Understand & Apply basic instruction set of 8086 to write the assembly language programming.	1	1	1							1			1		
[CS1433.3]:	Analyse and Implement various instruction timing, delay loops, Procedures and Macros.	1	1	1		1								1		
[CS1433.4]:	Analyse and Implement various string instruction and Flag instructions.	1							1		1	1		1		
[CS1433.5]:	Understand the internal architecture and interfacing of different peripheral devices with 8086 microprocessor.	1	1	2	1	1		1				1		1		1

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology
Department of Computer Science & Engineering
Course Hand-out
Design & Analysis of Algorithm | CS1501| 4 Credits | 4 0 0 3
Session: July 19 – Nov 19 | Dr. Pratistha Mathur, Dr. Ashish Jain & Dr. N. N. Das | Class: V IT

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

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

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

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

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

D. Syllabus:

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

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

E. Text Books:

T1. E. Horowitz, S. Sahni and S. Rajasekaran, *"Computer Algorithms"*, 2nd Edition, University Press, 2007.
T2. T. H. Cormen, C. E. Leiserson, R.L.Rivest, and C. Stein, "*Introduction to Algorithms*", 3rd Edition, MIT press, 2009.

F. Reference Book:

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

G. Lecture Plan:

Lec #	TOPICS	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1.	Introduction to Algorithms, Specification of Algorithm, Complexity	Acquaint to the subject, requirement of the subjects and recall the concepts related to algorithms	Slides / Black Board	1501.1	Quiz 1 and Sessional-I and End-Sem
2.	Asymptotic Notation- Analysis of Algorithm,	Define Asymptotic notation and understand its significance	Slides / Black Board	1501.1	Quiz 1 and Sessional-I and End-Sem

3.	Time & Space Complexity – Hands-on	Practice Complexity analysis on standard algorithms	Slides / Black Board	1501.1	Quiz 1 and Sessional I and End-Sem
4.	Insertion Sort and Analysis, QA-Discussions	Recall Insertion sort algorithm, Analysis of algo using step count method and representation in asymptotic notation	Slides / Black Board	1501.1	Quiz 1 and Sessional-I and End-Sem
5.	Selection Sort and Bubble Sort Analysis, QA-Discussions	Practice step count method on selection and bubble sort	Slides / Black Board	1501.1	Quiz 1 and Sessional-I and End-Sem
6.	Divide and Conquer: Merge Sort and Analysis, QA-Discussions	Describe the divide-and-conquer paradigm using merge sort and Analyse its time and space complexity	Slides / Black Board	1501.2	Quiz 1 and Sessional-I and End-Sem
7.	Quick Sort and Analysis,	Design quick sort algorithm and analyse it	Slides / Black Board	1501.2	Quiz 1 and Sessional-I and End-Sem
8.	Master Theorem and its cases	Define master theorem for a quick analysis of recursive algorithm	Slides / Black Board	1501.2	Quiz 2 and Sessional-I and End-Sem
9.	Randomized Quick sort Analysis	Describe Randomization- a different design paradigm and its effect on complexity	Slides / Black Board	1501.2	Quiz 2 and Sessional-I and End-Sem
10.	Heap Sort - Insertion, Deletion – Analysis	Describe heap data structure and use of it in sorting.	Slides / Black Board	1501.2	Quiz 2 and Sessional-I and End-Sem
11.	Heap Sort- Priority Queue	Apply Heap sort for maintain priority queue	Slides / Black Board	1501.2	Quiz 2 and Sessional-I and End-Sem
12.	Heap - Insertion, Deletion – Analysis	Describe other operation on Heap and analyse	Slides / Black Board	1501.2	Quiz 2 and Sessional-I and End-Sem
13.	Strassen's Matrix Multiplication	Apply dive and conquer paradigm on matrix multiplication and introduction to different algo strassesn's method and compare time complexity	Slides / Black Board	1501.2	Quiz 2 and Sessional-I and End-Sem
14.	Greedy Paradigm - Introduction, Coin Change Problem	Describe greedy paradigm of algorithm design and understand concept with example	Slides / Black Board	1501.4	Quiz 3 and Sessional-I and End-Sem

15.	Job Sequencing with deadline, Interval Scheduling Problem (Given as Assignment)	Devise algorithm using Greedy paradigm	Slides / Black Board	1501.4	Quiz 3 and Sessional-I and End-Sem
16.	Knapsack-problem,	Define knapsack problem, device algorithm using Greedy paradigm	Slides / Black Board	1501.4	Quiz 3 and Sessional-I and End-Sem
17.	Optimal Merge tape, Huffman Encoding	Synthesize algorithm using greedy paradigm anf analyse it	Slides / Black Board	1501.4	Quiz 3 and Sessional-I and End-Sem
18.	Spanning Trees - MST	Define Problem Minimum spanning tree and its usage	Slides / Black Board	1501.4	Quiz 3 and Sessional-1 and End-Sem
19.	Prim's, Algorithm	Synthesize algorithm using prim's method based on greedy paradigm and analyse it	Slides / Black Board	1501.4	Quiz 3 and Sessional-2 and End-Sem
20.	Kruskal's Algorithm	Synthesize algorithm using Kruskal's method based on greedy paradigm and analyse it	Slides / Black Board	1501.4	Quiz 3 and Sessional-2 and End-Sem
21.	Dijkstra's Algorithm-SSSP	Define Single sourse shortest path problem. Synthesize algorithm using Dijkstra's method based on greedy paradigm and analyse it	Slides / Black Board	1501.4	Quiz 3 and Sessional-2 and End-Sem
22.	Graph Search Algorithm - BFS/ DFS	Explain graph search algorithm and their analysis	Slides / Black Board	1501.4	Quiz 4 and Sessional-2 and End-Sem
23.	Topological Sort,	Understand the need of topological sort method and its algorithm	Slides / Black Board	1501.4	Quiz 4 and Sessional-2 and End-Sem
24.	Bellman Ford Algorithm	Understand Bellman ford algorithm and its merit and demerit	Slides / Black Board	1501.4	Quiz 4 and Sessional-2 and End-Sem
25.	Connected Components, Bi-connected Components	Understand Biconnected components, concept and algo to find articulation points	Slides / Black Board	1501.4	Quiz 4 and Sessional-2 and End-Sem
26.	Introduction to Dynamic Programming-	Describe the dynamic-programming paradigm	Slides / Black Board	1501.3	Quiz 5 and Sessional-2 and End-Sem

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

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

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

H. Course Evaluation:

Criteria	Description	Date	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	Sept 5 – Sept 7, 2019	15
	Sessional Exam II (Closed Book)	Nov 4 –Nov 6, 2019	15
	Quizzes and Assignments (Accumulated and Averaged)	Regularly	30
End Term Exam (Summative)	End Term Exam (Closed Book)	Nov 29 – Dec 12, 2019	40
	Total		100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.		
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.		
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.		

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

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

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

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

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

Course Out-Comes	**STATEMENT**	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO 2	PSO 3
[CS1501.1]	Analyze worst-case running times of algorithms using asymptotic analysis.		3		2				2					3		
[CS1501.2]	Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm.		2	2				1				2			2	1
[CS1501.3]	Design dynamic-programming algorithms, and analyse them to enhance entrepreneurship skills.				2	2								2	1	3
[CS1501.4]	Synthesize efficient greedy algorithms in common engineering design situations to enhance employment skills.						2		2	3				3	2	
[CS1501.5]	Synthesize new graph algorithms and algorithms that employ graph computations as key components, and analyse them to improve employment skills.			2						1	2			1		2

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Department of Computer Science & Engineering
Course Hand-out

Automata & Compiler Design | CS 1505 | 4 Credits | 3 1 0 4

Session: July '18 – December '18 | Faculty: Mr. Virender Dehru, Mr. Manu Srivastava, Mr. Rohit Kumar Gupta, Ms. Anubha Parashar, Mr. Satyabrata Roy | Class: B.Tech Semester: V | Department Core Course

A. Introduction: The objective of this course is to make the students familiar with the fundamental area of computer science which will enable the students to focus on abstract models of computation. The course exposes students to the computability theory, as well as to the complexity theory. The goal is to allow them to answer fundamental questions about problems, such as whether they can or cannot be computed. The objective is also to make the students familiar with the language processors as well as various phases of compilation process of any source code. Throughout the semester they will learn about lexical analysis, different types of parsing techniques, code generation and optimization. The goal is to allow them to answer in detail about how a compiler works and how it reports to its users various types of errors.

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

[CS1505.1]. Understand alphabet, strings, language and build regular expression and applying these concepts to construct finite automata.
[CS1505.2]. Compare the characteristics of different types of formal languages and grammars as mentioned in Chomsky Hierarchy and to build push down automata.
[CS1505.3]. Determine the type of computational problems and examine the decidability of them by constructing Turing machines and propose an optimal abstract model that can be applied to a suitable real life problem.
[CS1505.4]. Inspect the performance of each phase of a compiler and compare the working principles of different types of parsers.
[CS1505.5]. Construct optimized compiler using various type checking rules and concepts of storage organizations, thus developing optimized compiler construction skill.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	15
	Sessional Exam II (Closed Book)	15
	Quiz (Open Book)	15
	Assignments	10
	Relevant MOOC	05
End Term Exam (Summative)	End Term Exam (Closed Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

Introduction: Automata Theory: Mathematical Preliminaries and Notation :Review of set theory, function, relation; Finite Automata: Deterministic and Non Deterministic Finite Automata (FA), Regular languages, Mealy and Moore machine; Regular Sets and Regular Grammars: Chomsky Hierarchy, Regular Expressions, Regular Grammar and FA, Pumping Lemma for Regular Languages; Context Free Languages (CFL) and Grammars: Ambiguity, Methods for Transforming Grammars; Push Down Automata: Nondeterministic Pushdown Automata (NPDA), Design of NPDA, PDA and CFLs; Introduction to Turing machine; Introduction to Compiler Design: Structure of a Compiler; Lexical Analysis, Recognition of Tokens; Introduction to LR Parsing: Simple LR, More Powerful LR Parsers Generators; Syntax Directed Translations; Type Checking: Rules for Type Checking, Storage Organization.

F. Text Books

T1. An Intorduction to Formal Languages and Automata – Peter Linz, Jones and Bartlett Student Edition, Fifth Edition, 2010.

T2. Compilers : Principles, Techniques and Tools – A. Aho, J. Ullman, M. S. Lam, R. Sethi, Pearson Education, 2nd Edition, 2007.

G. Reference Books

R1. Introduction to the Theory of Computation – Michael Sipser, Cengage Learning, Third Edition, 2012.

R2. Introduction to Languages and the Theory of Computation – John Martin, Tata McGraw Hill, Fourth Edition, 2010.

R3. Introduction to Automata Theory, Languages and Computations – J. E. Hopcroft, R. Motwani, J. Ullman, Pearson Education, 3rd Edition, 2006.

H. Lecture Plan:

Lec No	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1	Mathematical Preliminaries and Notation, Review of set theory	Understand basics of set theory, groups, relations, functions.	Lecture	NA	NA
2	Function, relation, Three Basic Concepts i.e. string, sentence and languages	Understand basics of set theory, groups, relations, functions.	Lecture	NA	In Class Quiz (Not Accounted)
3-8	Design of Deterministic Finite Automata (DFA), Minimization of DFA	Introduction to automata theory and finite state machines	Lecture, Practice questions	1505.1	Home Assignment Mid Term I End Term
9-10	Design of FA with output: Mealy and Moore machine and their equivalence	Understand the design principles of Mealy and Moore machines	Lecture, Practice questions	1505.1	In Class Quiz Home Assignment Mid Term I End Term
11-12	Equivalence of DFA and NDFA, Removal of null moves from FA	Understanding the basic difference between DFA and NDFA and realising the importance of NDFA	Lecture, Practice questions	1505.1	In Class Quiz Home Assignment Mid Term I End Term
13	Chomsky Hierarchy of Grammar and Formal Languages	Understand the notations and properties of formal languages and grammar, compare different types of languages and their grammars according to Chomsky Hierarchy	Lecture, Practice questions	1505.2	In Class Quiz Home Assignment Mid Term I End Term
14-21	Regular Languages: Construction of Regular Expressions, equivalence of Regular Expressions and Finite Automata, equivalence of regular grammar and finite automata, Identifying non-regular languages and Pumping Lemma for regular languages	Understand the properties of regular languages and equivalence between FA and RE, FA and regular grammar. Apply pumping lemma to identify non-regular languages.	Lecture, Practice questions	1505.2	In Class Quiz Home Assignment Mid Term I End Term
22-25	Ambiguity in CFGs, Derivation trees, Simplification of CFGs, CNF and GNF, Pumping Lemma for CFGs	Understand the properties of CFLs, normal forms of CFGs. Apply pumping lemma to identify non-CFLs.	Lecture, Practice questions	1505.2	In Class Quiz Home Assignment Mid Term I End Term
26-31	Design of PDA, Types of PDA, Equivalence of PDA: NPDA and DPDA, Conversion of PDA and CFGs.	Design pushdown automata and understanding the properties of it variants. Equivalence between PDA and CFGs.	Lecture, Practice questions	1505.1 1505.2	In Class Quiz Home Assignment Mid Term II End Term

32-35	Introduction to Turing machines, design of Turing machines, properties of recursive and recursively enumerable languages, decidability.	Design of Turing machines, application of Turing machines and understanding the properties of recursive and recursively enumerable languages. Understanding whether a given problem is decidable	Lecture, Practice questions	1505.2 1505.3	In Class Quiz Home Assignment Mid Term II End Term
36-38	Introduction to compilers, structure and phases of a compiler, lexical analysis phase of a compiler	Summarize the structure and roles of each phase of a compiler. Illustrate the role of a lexical analyser.	Flipped Classroom	1505.4	In Class Quiz Home Assignment Mid Term II End Term
39-46	Introduction to syntax analysis and parsing, computing FIRST and FOLLOW, LR(0), SLR(1), CLR(1) and LALR(1) parsing	Develop and compare the working principles of different types of parsers.	Lecture, Practice questions	1505.4	In Class Quiz Home Assignment Mid Term II End Term
47-50	Introduction to Syntax directed translations, S-attributes, I-attributes and L-attributes, Building annotated trees	Understand and develop syntax directed translation scheme and annotated trees	Lecture, Practice questions	1505.4 1505.5	In Class Quiz Home Assignment End Term
51-52	Type Checking: Rules for Type Checking, Storage Organization.	Understanding concepts of type checking and its various rules. Summarize the storage organization.	Flipped Classroom	1505.4 1505.5	In Class Quiz Home Assignment End Term

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

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
[CS 1505.1]	Understand alphabet, strings, language and build regular expression and applying these concepts to construct finite automata.	3	3	3	3		1		1				1	3	2	
[CS 1505.2]	Compare the characteristics of different types of formal languages and grammars as mentioned in Chomsky Hierarchy and to build push down automata.	3	3	2	3		1		1				1	2		
[CS 1505.3]	Determine the type of computational problems and examine the decidability of them by constructing Turing machines and propose an optimal abstract model that can be applied to a suitable real life problem.	3	3	3	3		2		1	1		1	1	3	2	1
[CS 1505.4]	Inspect the performance of each phase of a compiler and compare the working principles of different types of parsers.	2	2	2					1			1	1	2	3	
[CS 1505.5]	Construct optimized compiler using various type checking rules and concepts of storage organizations, thus developing optimized compiler construction skill.	3	3	3	3	2	1		1			1	1	1	2	3

MANIPAL UNIVERSITY JAIPUR

School of Computing and IT, Dept. of Information Technology

Course Hand-out

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

Session: July 18 – Nov 18 | Faculty: Dr. Devesh Srivastava, Ms Kavita, Ginika Mahajan | Class: B. Tech IT (V Sem)

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

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

[IT 1502.1] Describe basic concept related to software engineering Methods, tool, Process Model and use them in software project.

[IT 1502.2] Apply different Estimation Techniques based on project Metrics, Measures and indicators.

[IT 1502.3] Design software and architecture at different detail levels based on requirements for software projects.

[IT 1502.4] Demonstrate the Testing methods and their procedures to implement in any project.

[IT 1502.5] Assess maintenance of the software projects.

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

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

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

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

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

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

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

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

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

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

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

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

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

Program Specific Outcomes

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

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

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

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Close Book)	15
	Sessional Exam II (Close Book)	15
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Close Book)	40
	Total	100

E. SYLLABUS

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

F. TEXT BOOKS

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

G. REFERENCE BOOKS

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

H. Lecture Plan:

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

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

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

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

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

CO	**STATEMENT**	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
[IT1502.1]	Describe basic concept related to software engineering Methods, tool, Process Model and use them in software project.	2			3	1			1	1				1		1
[IT 1502.2]	Apply different Estimation Techniques based on project Metrics, Measures and indicators.		2									1				2
[IT 1502.3]	Design software and architecture at different detail levels based on requirements for software projects.				2						1		2	3	2	
[IT 1502.4]	Demonstrate the Testing methods and their procedures to implement in any project.	2		3								2			2	
[IT 1502.5]	Assess maintenance of the software projects.							1		2		3	2	1		

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Department of Information Technology

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

Session: July 2018 – Dec 2018 | Faculty:,Krishna Kumar | Class: B.Tech V Semester

A. Introduction:

This course provides students with the fundamental concepts and techniques used for communicating data in efficient and reliable manner. The student will be able to gain practical understanding of relevant terminology and describe various encoding techniques, flow & error control mechanisms, multiplexing & multiple-access techniques used for enabling data communication. The course lays down the foundation for Computer Networks, Wireless & Mobile Communication and Network security.

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

[IT1504.1]: Define the significance of relevant terminologies, explain the transmission of digital & analog signals over different types of transmission media and outline the effects of various transmission impairments on analog & digital transmission.

[IT1504.2]: Describe the principles of signal encoding techniques used for digital data to digital signal conversion and analog data to digital signal conversion and compare them.

[IT1504.3]: Develop skills pertaining to error detection and correction techniques in order to find and overcome error encountered during transmission and discuss flow control and error control techniques.

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

[IT1504.5]: Identify and compare various generations of wireless cellular networks.

C. Program Outcomes and Program Specific Outcomes

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

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

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

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

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

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

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

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

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

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

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

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

Program Specific Outcomes (PSOs)

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

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

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

PSO3. Should be able to recognize the importance of professional developments by pursuing postgraduate studies and positions.

D. Assessment Plan:

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

End Term Exam (Summative)	End Term Exam (Close Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	

E. Syllabus

Data Transmission: Concepts and Terminology, Analog and Digital Data Transmission, Transmission Impairments, Channel Capacity.

Transmission Media: Guided Transmission Media, Wireless Transmission, Wireless Propagation, Line-of-Sight Transmission.

Signal Encoding Techniques: Analog and Digital Signals, Digital-To-Digital Conversion: Line Coding Schemes, Block Coding, Scrambling, Analog-To-Digital Conversion: Pulse Code Modulation, Delta Modulation.

Digital Data Communication Techniques: Asynchronous and Synchronous Transmission, Types of Errors, Error Detection, Error Correction, Line Configurations.

Data Link Control Protocols: Flow Control, Error Control, High-Level Data Link Control (HDLC).

Multiplexing: Frequency-Division Multiplexing (FDM), Time-Division Multiplexing (TDM), Code-Division Multiple Access (CDMA); Space Division Multiplexing.

Spread Spectrum: The Concept of Spread Spectrum, Frequency Hopping Spread Spectrum (FHSS), Direct Sequence Spread Spectrum (DSSS).

Cellular Wireless Communication Techniques: Introduction, Generations: 1G, 2G, 3G, 4G, and 5G.

F. Text Books

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

G. Reference Books

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

H. Lecture Plan

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

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

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

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

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

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

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

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

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

49.		Performance Consideration – FHSS and DSSS	Understand and summarize the Performance Consideration – FHSS and DSSS	Lecture	[1504.4]	End Term
50.		Code Division Multiple Access (CDMA)	Understand the Code Division Multiple Access (CDMA)	Lecture & Problem Solving Practice	[1504.4]	End Term
51.	Cellular Wireless Communication Techniques	Introduction, Generations: 1G, 2G, 3G,	Understand the concept of 1G, 2G, 3G,	Lecture	[1504.5]	End Term
52.		4G, and 5G	Understand the concept of 4G, 5G	Lecture	[1504.5]	End Term

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

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES			
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	
[IT150 4.1]	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		
[IT150 4.2]	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		
[IT150 4.3]	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	
[IT150 4.4]	Distinguish between different types of multiplexing techniques and spread spectrum techniques.	2								1	2			2	1		
[IT150 4.5]	Identify and compare various generations of wireless cellular networks.	2						1					1	1	1		

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

MANIPAL UNIVERSITY JAIPUR
School of Computing and IT
Department of Information Technology
Course Hand-Out
Software Engineering & Project Management Lab| IT1532 | Credit 1| 0 0 2 1
Session: July 18 - Nov 18 | Faculty: Dr. Devesh Kumar Srivastava, Ms Kavita, Ginika Mahajan, |
Class: B.Tech IT (V Sem)

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

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

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

C. Program Outcomes and Program Specific Outcomes

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Continuous evaluation	70
End Term Exam (Summative)	End Term Practical Exam	30
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

E. Syllabus

Design Strategies, Unified Modeling Language (UML 2.0): Use case diagrams, Class diagram, Object diagram, Activity diagram, sequence diagram, component diagram, deployment diagram, state chart diagram, ER Diagrams and DFD Designing Test Cases, SQA plans.

F. Text Books

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

G. References

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

H. Lab Plan

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

9	State Diagram And Interaction Diagram	Design State Diagram And Interaction Diagram In Rational Rose.	Lab	IT1532.3 IT1532.4	Internal Evaluation Home Assignment External Evaluation
10	Component Diagram And Deployment Diagram	Develop Component Diagram And Deployment Diagram In Rational Rose.	Lab	IT1532.3 IT1532.4	Internal Evaluation Home Assignment External Evaluation
11	Case Study On UML Diagram	Construct UML Diagram for different Projects	Lab	IT1532.3	Internal Evaluation Home Assignment External Evaluation
12	Test Cases	create Test Case And Apply On Software Code To Verify And Validate It	Lab	IT1532.5	Internal Evaluation Home Assignment External Evaluation
13	Manual Testing, Automated Testing	Create Test Case And Apply Manually Or Through Tool To Test The Software	Lab	IT1532.5	Internal Evaluation Home Assignment External Evaluation

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

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
[IT1532.1]:	Discuss the software life cycle phases including project management, requirements engineering, software design, prototyping and testing.	3	2						1	2	2	1			1	
[IT1532.2]:	Apply Data Flow Diagram Model levels and Entity relationship diagram.	1		3										3		
[IT1532.3]:	Illustrate software design based on the software requirement specification.		2	3		2					2	1		2		
[IT1532.4]:	Design Software manual and automated test cases.	3			1					2					2	2

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Department of Information Technology
Course Hand-out

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

Session: July 18 – Dec 18 | Faculty: Dr. D. P. Sharma, Mr, Shashank, Mr Venkatesh Gauri Shankar | Class: Dep. Elective (V Sem)

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

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

[IT1552.1]. Acquire basic programming skills of Python programming.

[IT1552.2]. Illustrate the concept of file handling and exception handling.

[IT1552.3]. Implement the concept of re-usability in python.

[IT1552.4]. Understand and Implement the concept of analytics using python libraries like numpy, Pandas, scipy.

[IT1552.5]. Enhance skills required for employability or entrepreneurship.

C. Program Outcomes and Program Specific Outcomes

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Open Book)	15
	Sessional Exam II (Open Book)	15
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Open Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. Syllabus

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

F. Text Books

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

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

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

G. Reference Books

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

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

H. Lecture Plan:

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

18	Inheritance	Lecture	Learn concepts of OOP	1552.2, 1552.5	Class Quiz Mid Term I End Term
19,20	**File Handling:** Create a file, read and write operation with file	Lecture	Able to create a file and its operations	1552.4	Class Quiz Mid Term II End Term
21,22	**Exception Handling:** Introduction to Exceptions & Errors, Handling exceptions using try-except-else-finally	Lecture	Able to create exceptions and handle exceptions	1552.4	Class Quiz Mid Term II End Term
23,24,25	**Numpy:** Introduction to Numpy, indexing and Boolean indexing, Data types and Operations	Lecture	Apply and use Numpy framework for scientific calculations	1552.6	Class Quiz Mid Term II End Term
26,27,28	**Pandas:** Pandas and its features, Creating Series and Data Frame with data inputs	Lecture	Apply and use Pandas framework for scientific computations	1552.6	Class Quiz End Term
29, 30,31	**Matplotlib**: Matplotlib and its data visualization features, types of plots	Lecture	Apply and use Matplotlib framework for drawing charts	1552.6	Class Quiz End Term
32, 33,34	**SciPy:** Introduction, characteristics and sub-packages of SciPy	Lecture	Apply and use Scipy framework for scientific computations	1552.6	Class Quiz End Term
35, 36	Tutorial on various concepts	Lecture	Apply concepts in realtime problem solving	1552.6	Class Quiz End Term

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

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
[IT 1552.1]	Acquire basic programming skills of Python programming.	1	3	1										1		
[IT 1552.2]	Illustrate the concept of file handling and exception handling.		1	3									1			
[IT 1552.3]	Implement the concept of re-usability in python.		1	2	1										1	
[IT 1552.4]	Understand and Implement the concept of analytics using python libraries like numpy, Pandas, scipy.			1						2	1	1			1	
[IT 1552.5]	Enhance skills required for employability or entrepreneurship.			3	2										2	

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Department of Information Technology

Course Hand-out

Computer Networks | CS 1602 | 4 Credits | 3104

Session: Jan 2019 – June 2019 | Faculty: Ginika Mahajan, Ankit Mundra | Class: B.Tech VI Semester

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

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

[CS1602.1]: Understand and learn basic concept of TCP/IP model, IPV4, class full addressing, sub netting and classless addressing.

[CS1602.2]: Analysis and Implement the Routing and its types.

[CS1602.3] Demonstrate the Internet control protocols, IPV6 transitions.

[CS1602.4]: Analyse the Transport Layer and Its protocols, congestion control.

[CS1602.5]: Describe the Application Layer, its protocols and Network Security.

B. Program Outcomes :

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

C. Assessment Plan:

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

D. SYLLABUS

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

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

TEXT BOOKS:

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

REFERENCE BOOK:

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

E. Lecture Plan:

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

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

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

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

CO	Statement	Correlation with Program Outcomes												Correlation with Program Specific Outcomes			
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
[CS160 2.1]	Understand and learn basic concept of TCP/IP model, IPV4, class full addressing, sub netting and classless addressing.	2		3		3								3	1	2	
[CS160 2.2]	Implement the Routing and its types			2										1	1	3	
[CS160 2.3]	Demonstrate the Internet control protocols, IPV6 transitions.					1								1	1		
[CS160 2.4]	Analyse the Transport Layer and Its protocols, congestion control.					1								1	1		1
[CS160 2.5]	Describe the Application Layer, its protocols and Network Security.							2		2				1	1		1

1: Low Correlation 2: Moderate Correlation 3: Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

SCHOOL OF COMPUTING & INFORMATION TECHNOLOGY

DEPARTMENT OF INFORMATION TECHNOLOGY
COURSE HAND-OUT
Computer Networks Lab| CS 1631| 1 Credit | 0 0 2 1

Session: Jan '20 – May '20 | Faculty: Ms Ginika Mahajan, Mr. Ankit Mundra |Class: B.Tech. IIIrd Year VI Semester

A. Introduction:

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

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

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

C PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

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

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

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

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

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

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

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

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

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

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

Program Specific Outcomes (PSOs)

At the end of the BTech IT program, the student:

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

PSO2. To participate & succeed in IT oriented jobs/competitive examinations that offer inspiring & gratifying careers.

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

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Continuous evaluation (20 for Performance, 10 Lab file, 20 Viva, 20 Project)	70
End Term Exam (Summative)	End Term Practical Exam (Performance and Viva)	30
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

E. SYLLABUS

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

F. REFERENCES

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

G . Lab Plan

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

12	Network Utilities- Ping, Netstat, Ipconfig, Ifconfig, Arp, Trace-route	Demonstrate the use of network utilities	Lecture Demonstration at system	CS1631.6	Continuous Evaluation End Term Examination

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

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
[CS1631.1]:	Demonstrate the concepts of packet tracer and network connecting devices.	1	1	2	2	1	1		1	1		1		1	1	
[CS1631.2]:	Demonstrate the concept of topology and configuration.	1	1	1										1		
[CS1631.3]:	Demonstrate the implementation of different protocols.	1	1	1										1		
[CS1631.4]:	Demonstrate the concepts NAT protocol configuration.	1		1					1	1	1	1		1		
[CS1631.5]:	Demonstrate the concept of socket programming.	1	1	2	1	1				1		1		1		1
[CS1631.6]:	Demonstrate the usage different network utilities.	1	1	2	1	1						1		1		

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Department of Information Technology
Course Hand-out

ARTIFICIAL INTELLIGENCE | IT1653 | 3 Credits | 3 0 0 3

Session: Jan 19 – May 19| Faculty: **Dr. Pratistha Mathur**| Class: Elective

A. Introduction: This course introduces artificial intelligence techniques and soft computing techniques to the students. The course will teach you about Autonomous Agents, Problem solving, Search, Heuristic methods, State space Learning, Game Playing, Knowledge Representation, Uncertainty, Propositional Logic, Predicate Logic, Logic-based Agents, Basics of Natural Language Processing, Neural Networks, Evolutionary Computation.

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

IT1653.1 Discuss basics of Artificial intelligence and some representative applications of artificial intelligence.
IT1653.2 Formalise a given AI problem and analyse it along different dimensions.
IT1653.3 Identify and implement appropriate A.I. search technique to solve the problem.
IT1653.4 Illustrate knowledge representation using propositional, first order predicate logic and semantic network and apply reasoning process to draw conclusions.
IT1653.5 Apply different models performing common machine learning tasks such as classification and clustering.
IT1653.6 Understand the role of soft computing and NLP techniques to solve problems.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

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

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

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

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

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

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

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

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

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

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

[PSO.1]. To apply creativity in support of the design, simulation, implementation and inference of existing and advanced technologies.
[PSO.2]. To participate & succeed in IT oriented jobs/competitive examinations that offer inspiring & gratifying careers.
[PSO.3]. To recognize the importance of professional developments by pursuing postgraduate studies and positions.

D. Assessment Plan:

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

E. SYLLABUS

Pre-requisite(s): Programming in C, Data Structures, Engineering Mathematical - III, Design and Analysis of Algorithms

Introduction: What is Artificial Intelligence, Current Trends in AI; **Intelligent Agents**, Agent v/s Software Program, Classification of Agents, Working of an Agent, Single and Multi-Agent System, Performance Evaluation of Agents, Architecture of Intelligent Agents**; AI Problems- Problem Space**: Problem analysis; **Problem Solving Techniques**: Heuristic search Techniques; **Knowledge Representation**: Semantic Networks, Propositional and Predicate Logic: Propositional and Predicate calculus, semantics for predicate calculus, theorem prover, inference rules, unification, Resolution, Refutation in predicate logic; **Learning -** Supervised, unsupervised, Symbolic learning: Rote Learning, learning by taking, learning by example, explanation based learning, learning by parameter adjustment; **Soft Computing**: Neural Networks: Perceptron, Back Propagation, Hop-field Networks; **Introduction to Genetic Algorithms** -a simple GA algorithm, Application to GA - robot path Planning, optimization; **Introduction to Natural Language Processing** - Introduction, Parsing using CFG, Chomsky, case grammar.

F. TEXT BOOKS

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

G. REFERENCE BOOKS

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

1. Lecture Plan:

Lec No	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1- 2	Fundamental Concepts	Intelligent Systems, Foundation and Application of AI Current Trends in AI	Lecture	**IT1653.1**	In Class Quiz Sessional I End Term
3– 5	Problems, Problem Spaces	Defining a Problem Characteristics of a Problem A brief introduction to problem solving techniques.	Lecture	**IT1653.2**	In Class Quiz Sessional I End Term
6-7	Intelligent Agents	Agent v/s Software Program Rational Agent and PEAS Description Classification of Agents, Working of an Agent Single and Multi-Agent System Performance Evaluation of Agents, Architecture of Agent, Intelligent Agents;	Lecture Tutorial	**IT1653.2**	In Class Quiz End Term
8-12	Heuristic Search Techniques	Heuristic search technique: Generate and Test, Hill Climbing, Best-first search, Problem reduction, Constraint satisfaction, Means-ends analysis	Lecture Tutorial	**IT1653.3**	Sessional I End Term
13-14	Game Playing	Min-Max Search Procedure Alpha-Beta Pruning Two – player perfect information games	Lecture Tutorial	**IT1653.3**	In Class Quiz End Term
15	Knowledge Representation	Knowledge Representation Issues	Lecture	**IT1653.4**	Class Quiz Sessional II End term
16-19	Propositional and Predicate Logic	Propositional and Logic operators , Simplification laws Predicate Calculus: Limitations of Propositional Logic Quantifiers: Existential and Universal Domain Constraints Nested Quantifiers Semantics for predicate calculus Inference rules, Resolution principle	Lecture	**IT1653.4**	Class Quiz Sessional II End term
20-23	Knowledge Representation	Knowledge Representation using predicate logic Semantic nets	Tutorial	**IT1653.4**	Class Quiz Sessional II End term
24 – 28	Learning in AI	Learning, different types of learning, learning by	Lecture	**IT1653.5**	Class Quiz Sessional II

		example-induction (Find-s, Version Space, Decision Trees), Naïve Bayes Classifier			End term
29 – 32	Neural Networks	Introduction, Neuron, Model, Perceptron, Formulation , Perceptron, Back propagation	Lecture	**IT1653.6**	Class Quiz Sessional II End term
33 – 35	Genetic Algorithm	Introduction to genetic algorithm	Lecture	**IT1653.6**	Class Quiz End Term
36 – 39	Natural Language Processing:	Introduction Parsing using context free grammar Chomsky hierarchy Case grammar	Lecture	**IT1653.6**	Home Assignment Class Quiz End Term
40	Conclusion and Course Summarization	NA	Lecture	**NA**	NA

2. Course Outcome Attainment Level Matrix:

CO	STATEMENT	ATTAINMENT OF PROGRAM OUTCOMES **THRESHOLD VALUE: 40%**												ATTAINMENT OF PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
IT1653.1	Discuss basics of Artificial intelligence and some representative applications of artificial intelligence.			2												
IT1653.2	Formalise a given problem and analyse it along different dimensions		3	2												
IT1653.3	Identify and implement appropriate A.I. search technique to solve the problem.	2	3													
IT1653.4	Illustrate knowledge representation using propositional, first order predicate logic and semantic network and apply reasoning process to draw conclusions.	2		2												
IT1653.5	Apply different models performing common machine learning tasks such as classification and clustering.					2								2		
IT1653.6	Understand the role of soft computing and NLP techniques to solve problems.	2											2	2		1

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Department of Information Technology
Course Hand-out

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

Session: Jan 19 –May 19 | Faculty: Dr. D.P.Sharma | Class: Open Elective

Introduction: This open elective course is offered by Department of Information and Technology mainly targeting students who wish to pursue career in Data Science or higher studies in Engineering discipline with data science specialization. This course objectives to discuss techniques to explain how advanced Data Analytics can be leveraged to create Data with Statistical environment and how the data scientist role and skills differ from those of a traditional business intelligence analyst. This course also support with the design, implementation and inference of advanced technologies in Data Science.

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

- **[1692.1].** Deploy a structured lifecycle approach to data science and its statistical approaches.
- **[1692.2].** Reframe a business challenge as a data science challenge.
- **[1692.3].** Apply Data Science analytic techniques and tools to analyse data, create statistical models, and identify insights that can lead to statistical results.
- **[1692.4].** Select optimal visualization techniques to clearly communicate data analytic insights to business sponsors and others.
- **[1692.5].** Compare between different algorithms and accordingly use tools such as Python libraries in Data Science.
- **[1692.6].** Observe and illustrate the fundamental aspect of Data Science and their statistical analytics with their applications in industry and research.

A. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

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

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

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

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

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

h. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

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

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

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

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

PROGRAM SPECIFIC OUTCOMES

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

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

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

B. Assessment Plan:

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

C. SYLLABUS

Descriptive Statistics: Introduction, Descriptive Statistics, Probability Distribution; **Inferential Statistics:** Inferential Statistics through Hypothesis Testing, Permutation and Randomization Test; **Regression and ANOVA:** regression analysis, analysis of variance; **Machine Learning:** Differentiating algorithmic and model based framework, OLS, RIDGE & LASSO regression, KNN & classification; **Supervised Learning with regression and Classification technique:** Bias-Variance Dichotomy, Logistic Regression, LDA, QDA, Regression and Classification Trees.

D. TEXT BOOKS

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

E. REFERENCE BOOKS

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

Lecture Plan:

LEC NO	Main Topic	TOPICS	Mode of Delivery	Corresponding CO	Mode Of Assessing CO
1	**Introduction**	Data, Information Context, Knowledge	Lecture	IT1692.1, IT1692.1 & IT1692.5	Mid Term I, Quiz-1 & End Term
2		Continuous Interval, Discrete Interval	Lecture	IT1692.1 & IT1692.2	Mid Term I, Quiz-1 & End Term
3		Data Collection, Primary Data, Secondary Data, Numerical Data, Grouped Data.	Lecture and Flipped Class	IT1692.1 & IT1692.5	Mid Term I, Quiz-1 & End Term
4	**Descriptive Statistics and Inferential Statistics**	Descriptive Statistics, Descriptive Vs. Inferential Statistics	Lecture	IT1692.2 & IT1692.4	Mid Term I Quiz-2 & End Term
5		Basic Blocks of Descriptive Statistics	Lecture and Flipped Class	IT1692.2 & IT1702.4	Mid Term I, Quiz-2 & End Term
6		Central Tendency (Mean, Median, Mode for Grouped Data and Numerical Data)	Flipped Class	IT1692.2 & IT1692.4	Mid Term I, Quiz-2 & End Term
7-8		Dispersion (Range, Variance, Standard Deviation, Quartile)	Activity	IT1692.2 & IT1692.3	Mid Term I, Quiz-2 & End Term
9-10		Distribution and Visualization (Conditional Probability, Bayes' Theorem, Random Variables and Introduction to Probability Distribution)	Lecture	IT1692.3& IT1692.4	Mid Term I, Quiz-2 & End Term
11-12		Distribution and Visualization (The Frequency Distribution, Commutative Distribution, Relative and Cumulative Frequency Distributions Ogive Curve)	Lecture	IT1692.2 & IT1692.5	Mid Term I, Quiz-2 & End Term
13		Stem-and Leaf display	Lecture	IT1692.2 & IT1692.3	Mid Term I Quiz-3 & End Term
14-15		Distribution and Visualization (Normal Distribution, Empirical Rule, Chebyshev's Theorem)	Activity	IT1692.2 & IT1692.5	Mid Term II, Quiz-3 & End

16-17		Distribution and Visualization (Pie Charts, Bar Graphs, Pareto Charts, Histograms, Box and Whisker Plots, Scattered Plot, Dot Plot, Error plot)	Lecture	IT1692.3 & IT1692.5	Mid Term II, Quiz-3 & End
18		Populations and Samples, Population and Sample Variance, Population and Sample Standard Deviation	Lecture	IT1692.3 & IT1692.4	Mid Term II, Quiz-3 & End
19		Inferential Statistics, Hypothesis, Null and Alternate Hypothesis,	Lecture	IT1692.3 & IT1692.5	Mid Term II, Quiz-3 & End
20		ANOVA	Activity	IT1692.2 & IT1692.5	Mid Term II, Quiz-3 & End
21		Z statistics, T statistics	Lecture	IT1692.5 & IT1692.6	Mid Term II, Quiz-3 & End
22		F statistics, chi square statistics	Lecture	IT1692.5 & IT1692.6	Mid Term II, Quiz-3 & End
23		Binomial statistics, Parametric test and non-Parametric test	Lecture	IT1692.5 & IT1692.6	Mid Term II, Quiz-3 & End
24		Central Limit Theorem & Confidence Intervals.	Lecture	IT1692.3 & IT1692.4	Mid Term II, Quiz-3 & End
25	**Regression and Supervised Learning**	Regression analysis, Type of Regression	Lecture	IT1692.5 & IT1692.6	Mid Term II, Quiz-4 & End
26		OLS, Linear, Logistic, Multiple	Lecture	IT1692.4 & IT1692.5	Mid Term II, Quiz-4 & End Term
27		RIDGE & LASSO regression	Lecture	IT1692.2 & IT1692.3	Quiz-4 & End Term
28		Regression and Classification Trees using	Lecture	IT1692.3 & IT1692.6	Quiz-4 & End Term
29-30		Decision Tree, Random Forest Tree	Flipped Class	IT1692.3 & IT1692.6	Quiz-4 & End Term
31-32		KNN and Classification, SVM, Ensemble Methods,	Flipped Class	IT1692.3 & IT1692.6	Quiz-4 & End Term
33-34		LDA, QDA, Bias-Variance Dichotomy	Lecture	IT1692.3 & IT1692.4	Quiz-4 & End Term
35		Assessment Metrics and Evaluations	Lecture	IT1692.2 & IT1692.3	Quiz-4 & End Term
36	**Prescriptive Analysis**	Prescriptive Analysis	Activity	IT1692.5 & IT1692.6	Quiz-5 & End Term
37		Creating Data through Designed Experiments	Lecture	IT1692.4 & IT1692.5	Quiz-5 & End Term

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

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

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CS 1692.1	Deploy a structured lifecycle approach to data science and its statistical approaches.	1	2	3	2		2		2		1			1	1	2
CS 1692.2	Reframe a business challenge as a data science challenge.	3	2	3	3	1		2					2	2	3	1
CS 1692.3	Apply Data Science analytic techniques and tools to analyse data, create statistical models, and identify insights that can lead to statistical results.	3	3	3	2				2	1	1		2	2		1
CS 1692.4	Select optimal visualization techniques to clearly communicate data analytic insights to business sponsors and others.	3	2	3	2	2			2	1	1		1	2	2	3
CS 1692.5	Compare between different algorithms and accordingly use tools such as R, RStudio, Pycharm, Python libraries in Data Science.	2	3	3	2	2	1	2	3	2	1	2	2	3	1	2
CS 1692.6	Observe and illustrate the fundamental aspect of Data Science and their statistical analytics with their applications in industry and research.	1	2	3	2		1		2		1			1	1	2

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

DEPARTMENT OF INFORMATION TECHNOLOGY

Course Hand-out

Data Science| IT1654 | 3 Credits | 3 0 0 3

Session: Jan 19 –May 19 | Faculty: Mr. Venkatesh Gauri Shankar | Class: Department Elective

A. Introduction: This department elective course is offered by Department of Information and Technology mainly targeting students who wish to pursue career in Data Science or higher studies in Engineering discipline with data science specialization. This course objectives to discuss techniques to explain how advanced Data Analytics can be leveraged to create Data with Statistical environment and how the data scientist role and skills differ from those of a traditional business intelligence analyst. This course also support with the design, implementation and inference of advanced technologies in Data Science.

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

[1654.1]. Deploy skill to a structured lifecycle approach to data science and its statistical approaches.
[1654.2]. Reframe employability to a business challenge as a data science challenge.
[1654.3]. Apply Data Science analytic techniques and tools to analyse data, create statistical models, and identify insights that can lead to statistical results.
[1654.4]. Select optimal visualization techniques to clearly communicate data analytic insights to business sponsors and others.
[1654.5]. Compare between different algorithms and accordingly use tools such as R, RStudio, Pycharm, Python libraries in Data Science.
[1654.6]. Observe and illustrate the fundamental aspect of Data Science and their statistical analytics with their applications in industry, research and entrepreneurship.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

D. Assessment Plan:

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

E. SYLLABUS

Descriptive Statistics: Introduction, Descriptive Statistics, Probability Distribution; **Inferential Statistics:** Inferential Statistics through Hypothesis Testing, Permutation and Randomization Test; **Regression and ANOVA:** regression analysis, analysis of variance; **Machine Learning:** Differentiating algorithmic and model based framework, OLS, RIDGE & LASSO regression, KNN & classification; **Supervised Learning with regression and Classification technique:** Bias-Variance Dichotomy, Logistic Regression, LDA, QDA, Regression and Classification Trees, SVM, Ensemble Methods, random Forest; **Prescriptive Analysis:** Creating Data through Designed Experiments, Active learning, Reinforcement Learning.

F. REFERENCE BOOKS

1. Trevor, H. et al., The elements of statistical learning, Vol. 2. No.1.New York, Springer, 2009.
2. Douglas, C. and George, C., Applied Statistics and Probability for Engineers, John Wiley and Sons, 2010.

G. LECTURE PLAN:

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

			Quartile)			
9-10		Distribution and Visualization (Conditional Probability, Bayes' Theorem, Random Variables and Introduction to Probability Distribution)	Understand the fundamental concepts like Distribution and Visualization (Conditional Probability, Bayes' Theorem, Random Variables and Introduction to Probability Distribution)	Lecture	CO 3 and 4	Mid Term I, Quiz-2 & End Term
11-12		Distribution and Visualization (The Frequency Distribution, Commutative Distribution, Relative and Cumulative Frequency Distributions Ogive Curve)	Understand the fundamental concepts like Distribution and Visualization (The Frequency Distribution, Commutative Distribution, Relative and Cumulative Frequency Distributions Ogive Curve)	Lecture	CO 2 and 5	Mid Term I, Quiz-2 & End Term
13		Stem-and Leaf display	Analyze the data usingStem-and Leaf display	Lecture	CO 2 and 3	Mid Term I Quiz-3 & End Term
14-15		Distribution and Visualization (Normal Distribution, Empirical Rule, Chebyshev's Theorem)	Describe and analyze the data by different tools like Distribution and Visualization (Normal Distribution, Empirical Rule, Chebyshev's Theorem)	Activity	CO 2 and 5	Mid Term II, Quiz-3 & End

16-17		Distribution and Visualization (Pie Charts, Bar Graphs, Pareto Charts, Histograms, Box and Whisker Plots, Scattered Plot, Dot Plot, Error plot)	Describe and analyze the data by different tools like Distribution and Visualization (Pie Charts, Bar Graphs, Pareto Charts, Histograms, Box and Whisker Plots, Scattered Plot, Dot Plot, Error plot)	Lecture	CO 3 and 5	Mid Term II, Quiz-3 & End
18		Populations and Samples, Population and Sample Variance, Population and Sample Standard Deviation	Able to understand the basic concepts like Populations and Samples, Population and Sample Variance, Population and Sample Standard Deviation	Lecture	CO 3 and 4	Mid Term II, Quiz-3 & End
19		Inferential Statistics, Hypothesis, Null and Alternate Hypothesis,	Predict information by using tools like Inferential Statistics, Hypothesis, Null and Alternate Hypothesis,	Lecture	CO 3 and 5	Mid Term II, Quiz-3 & End
20		ANOVA	Able to perform ANOVA test	Activity	CO 2 and 5	Mid Term II, Quiz-3 & End
21		Z statistics, T statistics	Able to perform Z statistics, T statistics	Lecture	CO 5 and 6	Mid Term II, Quiz-3 & End
22		F statistics, chi square statistics	Able to perform F statistics, chi square statistics	Lecture	CO 5 and 6	Mid Term II, Quiz-3 & End
23		Binomial statistics, Parametric test and non- Parametric test	Differentiate among different test like Binomial statistics, Parametric test and non- Parametric test	Lecture	CO 5 and 6	Mid Term II, Quiz-3 & End
24		Central Limit Theorem & Confidence Intervals.	Understand about distribution Central Limit Theorem & Confidence Intervals.	Lecture	CO 3 and 4	Mid Term II, Quiz-3 & End

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

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

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
[IT 1654.1]	Deploy a structured lifecycle approach to data science and its statistical approaches.	1	2	3	2		2		2		1			1	1	2
[IT 1654.2]	Reframe a business challenge as a data science challenge.	3	2	3	3	1		2					2	2	3	1
[IT 1654.3]	Apply Data Science analytic techniques and tools to analyse data, create statistical models, and identify insights that can lead to statistical results.	3	3	3	2				2	1	1		2	2		1
[IT 1654.4]	Select optimal visualization techniques to clearly communicate data analytic insights to business sponsors and others.	3	2	3	2	2			2	1	1		1	2	2	3
[IT 1654.5]	Compare between different algorithms and accordingly use tools such as R, RStudio, Pycharm, Python libraries in Data Science.	2	3	3	2	2	1	2	3	2	1	2	2	3	1	2
[IT 1654.6]	Observe and illustrate the fundamental aspect of Data Science and their statistical analytics with their applications in industry and research.	1	2	3	2		1		2		1			1	1	2

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

MANIPAL UNIVERSITY JAIPUR

School of Computing & Information Technology

DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE HAND-OUT

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

Session: July- Dec 2018 | Faculty: Dr. Lokesh Sharma
Class: B.Tech. IV Year VII Semester

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

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

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

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

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

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

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

B. Program Outcomes and Program Specific Outcomes

PROGRAM OUTCOMES

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

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

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

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

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

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

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

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PROGRAM SPECIFIC OUTCOMES

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C. Assessment Plan:

<table>
<tr><th>Criteria</th><th>Description</th><th>Maximum Marks</th></tr>
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</table>

D. Syllabus:

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

E. Text / Reference Books:

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

F. Lecture Plan:

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

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

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

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

Course Articulation Matrix: (Mapping of COs with POs)

CO	**STATEME NT**	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
[IT1701.1]	Define the fundamentals of Number Theory used in Cryptography.	3	2	1	1		1				1		1	1	1	1
[IT17012]	Explain the standard cipher algorithms in transit across data networks.	2		2	1	1	1				1		1	1	1	1
[IT1701.3]	Identify Security attacks and select	2		1	1		1		2		1		1	1	1	1
[IT1701.4]	Apply various key distribution and management schemes.	2		2	1	1	1				1		1	1	1	1
[IT1701.5]	Evaluate authentication mechanisms.	2		2	1		1				1		1	1	1	1

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology
Department of Information Technology
Course Hand-out
Advance Data Structures| IT1702| 4 Credits | 3 1 0 4

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

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

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

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

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

PROGRAM OUTCOMES

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

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

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

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

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

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

E. Syllabus

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

F. Reference books:

R1. E. Horowitz, S. Sahni and S. Rajasekaran, "Computer Algorithms", 2nd Edition, University Press, 2007.
R2. V. Aho, J. E. Hopcroft and J. D. Ullman, "The Design and Analysis of Computer Algorithms", 1st Edition, Pearson Education, 1999.
R3. T. H. Cormen, C. E. Leiserson, R.L.Rivest, and C. Stein, "Introduction to Algorithms", 3rd Edition, MIT press, 2009.
R4. Narshing Deo, "Graph Theory with Applications to Engineering and Computer Science", 1979.

G. Lecture Plan:

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

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

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

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
[IT1702.1]	Implement the latest data structure knowledge with the advance tree structure.	3			2		2		2					1		
[IT1702.2]	Describe and analyse the latest graph based algorithm for enhancing the graph data structure knowledge.		1	3				2		3		2			1	2
[IT1702.3]	Comparing the different sorting network with the many tree data structure.	1			3	2					3			2	1	3
[IT1702.4]	Concentrate on many number theoretic algorithm in the use of many latest research field like data science.	2		1			2		2	3				3	2	
[IT1702.5]	Understand and use the data structure for implementing some analogy based real life applications	2		2		3				1	2			3		2
[IT1702.6]	Connect between different data structures and find best suitable for the analytics and design situation.	2		2				3			3		1	3		2

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

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

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

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

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

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

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

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

PROGRAM OUTCOMES

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

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

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

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

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

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

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

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

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

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

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

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

Program Specific Outcomes (PSOs)

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

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

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

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

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Continuous evaluation (Record + Execution + Viva+ attendance)	70 (20+20+20+10)
End Term Exam (Summative)	End Term Practical Exam	30
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

E. SYLLABUS

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

F. Reference books:

R1. E. Horowitz, S. Sahni and S. Rajasekaran, "Computer Algorithms", 2nd Edition, University Press, 2007.
R2. V. Aho, J. E. Hopcroft and J. D. Ullman, "The Design and Analysis of Computer Algorithms", 1st Edition, Pearson Education, 1999.

G . Lab Plan

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

8	To implement weighted graph with operations.	To implement weighted graph with operations.	Lecture Demonstration in the lab	IT 1733.6	Continuous Evaluation End Term Examination
9	To implement contingency representation matrix	To implement contingency matrix representation	Lecture Demonstration in the lab	IT 1733.6	Continuous Evaluation End Term Examination
10	To implement node vertex representation to show graph.	To implement node vertex representation to show graph.	Lecture Demonstration in the lab	IT 1733.6	Continuous Evaluation End Term Examination
11	To implement bipartite graph and their operations. To implement Ford Fulkerson algorithm.	To implement bipartite graph and their operations.	Lecture Demonstration in the lab	IT 1733.6	Continuous Evaluation End Term Examination

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

CO	**STATEMENT**	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
[IT1733.1]:	To implement data structures like Binary Search Tree, Insertion and deletion.	1	1	1		1	1								1	
[IT1733.2]:	To implement and demonstrate Red-Black Trees, Insertion and deletion.			1	1	1										
[IT1733.3]:	To implement Fibonacci heaps and Binomial heaps with their operations.				1	1									1	
[IT1733.4]:	To implement 2-3 Trees Insertion and deletion.	1	1			1										
[IT1733.5]:	To implement Fibonacci heap binomial Heap insertion and Deletion.			1	2	1									1	
[IT1733.6]:	To implement contingency matrix representation, to implement bipartite graph and their operations. To implement Ford Fulkerson algorithm.		1	1	3	2		1						2		1

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

MANIPAL UNIVERSITY JAIPUR

School of Computing & Information Technology

Department of Information Technology

Course Hand-out

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

Session: July- Dec 2018 | Faculty Dr Devershi P Bhatt | Class: B.Tech VII (PE)

Introduction: This course aims providing in-depth coverage on mobile/wireless networking, the characteristics of wireless radio channels, propagation models, architectures and protocols of mobile/wireless networks, wide-area and local-area wireless network, cellular networks and Bluetooth.

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

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

B. Program Outcomes and Program Specific Outcomes

PROGRAM OUTCOMES

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

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

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

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

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

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

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

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

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

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

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

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

PROGRAM SPECIFIC OUTCOMES

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

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

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

C. Assessment Plan:

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

D. Syllabus:

Syllabus: Evolution of mobile radio communication, Transmission fundamentals; **Modulation techniques:** Signal encoding criteria, Overview of ASK, PSK, FSK, MSK, Spread spectrum modulation; **Cellular concepts:** Frequency reuse, Channel assignment strategies, Handoff strategies; **Wireless LAN:** Overview of Wireless LAN Technology; Infrared LANS, Spread Spectrum LANs, Narrowband microwave LANS; IEEE 802 Protocol Architecture, IEEE 802.11 Architecture and Services, IEEE 802.11 Medium Access Control and IEEE 802.11 Physical Layer. **Bluetooth:** Radio Specification; Baseband Specification; Link Manager Specification; Logic Link Control and Adaptation Protocol; HiperLAN 1 and HiperLAN 2; Wireless Sensor Networks. **Mobile Computing:** Mobile IP, ubiquitous and nomadic computing; Wireless LANS & the wireless world wide web; Mobile agent technology and standards; **Case studies**: Agent TCL, aglets, PMADE, system design.

E. Reference Books:

R1. T.S. Rappaport, "*Wireless Communications - Principle and Practice*", Second Edition, PHI, 2005.
R2. 2. W. Stallings, "*Wireless Communication and Network",'* Second Edition, PHI, 2004.
R3. R. Pandya "*Mobile and Personal Communication systems and services*", PHI, 2001.

R4. M. Ciampa, "*Guide to Designing and Implementing wireless LANs*", Thomson learning, Vikas Publishing House, 2001.

F. ecture Plan:

Lecture no.	Major Topics	Session outcome	Correspondin g CO	Mode of Delive ry	Mode of Assessing CO
L-1	**Evolution of Mobile Communication & Propagation**	Introduction and Evolution to Mobile Communication	CO1	Lecture	In class Quiz Mid Term I End Term Exam
L-2	**Evolution of Mobile Communication & Propagation**	Basics of Propagation	CO2	Lecture	In class Quiz Mid Term I End Term Exam
L-3	**Evolution of Mobile Communication & Propagation**	Propagation Models	CO2	Lecture	In Class Quiz, Mid Term I End Term
L-4	**Evolution of Mobile Communication & Propagation**	Free-Space Propagation Model, Large-Scale Path Loss	CO2	Lecture	In Class Quiz Mid Term I End Term
L-5	**Evolution of Mobile Communication & Propagation**	Small Scale Multipath Propagation	CO2	Flipped Class	In Class Quiz Mid Term I End Term
L-6 to L-7	**Modulation techniques**	Modulation Techniques	CO2	Flipped Class	Class Quiz, Mid Term I End Term

L-8 to L10	**Modulation techniques**	Liner Modulation Techniques - ASK, PSK, FSK, MSK	CO2	Lecture	Class Quiz Mid Term I End Term
L-11 to L-12	**Modulation techniques**	Spread spectrum modulation	CO2	Flipped Class	Class Quiz Mid Term I End Term
L-13	**Cellular concepts**	Cellular Concepts	CO3	Lecture	Class Quiz Mid Term I End Term
L-14	**Cellular concepts**	Frequency reuse	CO3	Lecture	Class Quiz Mid Term I End Term
L-15	**Cellular concepts**	Channel assignment strategies	CO3	Tutorial	Class Quiz Mid Term I End Term
L-16	**Cellular concepts**	Handoff strategies: Prioritizing Handoffs and practical handoff consideration	CO3	Tutorial	Class Quiz Mid Term I End Term
L-17	**Cellular concepts**	Interference and System Capacity	CO3	Lecture	Class Quiz Mid Term I End Term
L-18	**Cellular concepts**	Trunking and Grade of Service	CO3	Lecture	Class Quiz Mid Term I End Term
L-19	**Wireless LAN**	Overview of Wireless LAN Technology	CO4	Lecture	Class Quiz Mid Term II End Term
L-20	**Wireless LAN**	Challenges in Wireless LAN	CO4	Lecture	Class Quiz Mid Term II End Term
L-21 to L-23	**Wireless LAN**	Infrared LANS, Spread Spectrum LANs , Narrowband microwave LANS	CO4	Lecture	Class Quiz Mid Term II End Term

L-24	**Wireless LAN**	WLAN applications	CO4	Lecture	Class Quiz Mid Term II End Term
L-25	**Wireless LAN**	Introduction to IEEE 802	CO4	Lecture	Class Quiz Mid Term II End Term
L-26 to L-28	**Wireless LAN**	IEEE 802.11 Protocol Introduction, IEEE 802.11 Architecture, IEEE 802.11 Services	CO4	Lecture	Class Quiz Mid Term II End Term
L-29	**Wireless LAN**	IEEE 802.11 MAC and Physical Layer	CO4	Lecture	Class Quiz Mid Term II
L-30	**Bluetooth**	**Bluetooth:** Radio Specification	CO4	Flipped Class	Class Quiz Mid Term II End Term
L-31	**Bluetooth**	Baseband Specification	CO4	Lecture	Class Quiz End Term
L-32	**Bluetooth**	Link Manager Specification	CO4	Lecture	Class Quiz End Term
L-34	**Bluetooth**	Logic Link Control and Adaptation Protocol	**CO4**	Tutorial	Class Quiz End Term
L-35	**Bluetooth**	**HiperLAN & WSN**	CO4	Lecture	Class Quiz End Term
L-36	**Mobile Computing, WWWW and its applications**	**Introduction to Mobile Computing**	CO5	Lecture	Class Quiz End Term
L-37 to L-39	**Mobile Computing, WWWW and its applications**	Mobile IP Introduction and architecture	CO5	Lecture	Class Quiz End Term
L-40	**Mobile Computing, WWWW and its applications**	**Introduction to WWWW & Mobile Agent** Applications and architecture of wireless world wide web Mobile agent technology and standards	CO5	Lecture	End Term

Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
[IT1753.1]	Explain the basic fundamentals of Mobile Communications.	3				1					1		2		2	2
[IT1753.2]	Analyse transmission fundamentals and various propagation and modulation techniques.	3				1		2			1		2		2	2
[IT1753.3]	Apply the cellular radio concepts and developments.	3	2	2	2	1	1				1	1	2	3	2	2
[IT1753.4]	Compare and Contrast the concept of WLAN and Bluetooth.	3				2	1	1			1	1	2	2	2	2
[IT1753.5]	Describe the functionality of Mobile IP and WWWW	3				2	1				1	1	2	3	2	2

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Computing & Information Technology

DEPARTMENT OF INFORMATION TECHNOLOGY

COURSE HAND-OUT

SOCIAL NETWORK ANALYSIS || IT1759|| 3 Credits|| [3 0 0 3]
Session: JUL-DEC-2018 | Faculty NAME: Mr JAYA KRISHNA R|
Class: B.Tech VIII Semester| ELECTIVE

A. Introduction:

This course is offered by the Department of Information Technology as the influence of online social Networks in our everyday life is inevitable as they have presented novel techniques of communication and serve as a medium for news propagation, ideas, thoughts and any other information. Such information propagate via friendships between people, which leads to advertising and viral marketing. In this course we study about network structure link formation, communities, influence etc.,

B. Course Outcomes: At the end of the course, students will be able to

[IT1759.1]: Analyse basic knowledge and concept of Complex networks and importance of different algorithms of computation in Social Network Analysis.

[IT1759.2]: Critically analyse and process available online datasets with the help of networkx or similar packages to

[IT1759.3]: Acquire basic skill set required for employability or entrepreneurship.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

PO1. **Engineering knowledge**: Apply the knowledge of mathematics, computer science, and communication engineering fundamentals to the solution of complex engineering problems.

PO2. **Problem analysis**: The sophisticated curriculum would enable a graduate to identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using basic principles of mathematics, computing techniques and communication engineering principles.

PO3. **Design/development of solutions**: Upon analysing, the B Tech IT graduate should be able to devise solutions for complex engineering problems and design system components or processes that meet the specified requirements with appropriate consideration for law, safety, cultural & societal obligations with environmental considerations.

PO4. **Conduct investigations of complex problems**: To imbibe the inquisitive practices to have thrust for innovation and excellence that leads to use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO6. **The engineer and society**: The engineers are called society builders and transformers. B. Tech IT graduate should be able to apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. **Environment and sustainability**: The zero effect and zero defect is not just a slogan, it is to be practised in each action. Thus a B Tech IT should understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. **Ethics**: Protection of IPR, staying away from plagiarism are important. Student should be able to apply ethical principles and commit to professional ethics, responsibilities and norms of the engineering practice.

PO9. Individual and team work: United we grow, divided we fall is a culture at MUJ. Thus an outgoing student should be able to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. Communication: Communicate effectively for all engineering processes & activities with the peer engineering team, community and with society at large. Clarity of thoughts, being able to comprehend and formulate effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in varied environments.

PO12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)

At the end of the B Tech IT program, the student:

[PSO.1]: To apply creativity in support of the design, simulation, implementation and inference of existing and advanced technologies.

[PSO.2]: To participate & succeed in IT oriented jobs/competitive examinations that offer inspiring & gratifying careers.

[PSO.3]: To recognize the importance of professional developments by pursuing postgraduate studies and positions.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Quiz	5
	Mini project	10
	Assignments	15
	MTE I ,MTE II	30
End Term Exam (Summative)	End Term Exam	40
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

E. SYLLABUS

Introduction to Social Web: Nodes, Edges and Network measures, Describing Nodes and Edges, Describing Networks, Layouts; **Visualizing Network features:** The role of Tie Strength, Measuring Tie Strength, Tie Strength and Network Structure, Tie Strength and Network Propagation, Link Prediction, Entity Resolution; **Link Prediction:** Case Study Friend Recommendation, Introduction to Community Discovery, Communities in Context, Quality Functions; **Algorithms:** The Kernighan-Lin algorithm, Agglomerative Algorithms, Spectral Algorithms, Multi-level Graph Partitioning, Markov Clustering, Other Approaches; **Introduction to Social Influence**: Influence Related Statistics, Social Similarity and Influence, Homophile, Existential Test for Social Influence, Influence and Actions, Influence and Interaction, Influence Maximization in Viral Marketing

F. TEXT BOOKS

T1. J. Goldbeck, *"Analyzing the Social Web"*, Morgan Kaufmann Publications, 2013.
T2. C. C. Aggarwal, "*Social Network Data Analytics*", Springer Publications, 2011.

G. REFERENCE BOOKS

R1. J. Scott, *"Social Network Analysis", (3e)*, SAGE Publications Limited, 2013.
R2. Jay Goldman, *"Facebook Cookbook"*, O'Reilly, 2009.
R3. S.Kumar, F. Morstatter, H. Liu, "Twitter Data Analytics", Springer Publications, 2013

H . Lecture Plan:

Class No.	Topics	Mode of Delivery	Session Outcome	Corresponding Couse outcome	Mode of Assessing the Outcome
1-2	Introduction to Social Web	Lecture, Activity	Know about different graphs and networks	IT1759.1	Class Quiz Mid Term I End Term
3-4	Nodes, Edges and Network measures	Lecture, Activity	Know how to create a node and its properties	IT1759.1	Class Quiz Mid Term I End Term
5-6	Describing Nodes and Edges	Lecture, Activity	Know how to create a node and its properties	IT1759.1	Class Quiz Mid Term I End Term
7-8	Describing Networks, Layouts, Networkx Introduction	Lecture, Activity	Know how to create a graph in Python	IT1759.1	Class Quiz Mid Term I End Term
9-10	Visualizing Network features in NetworkX	Lecture, Activity	Know how to Visualize a graph in Python	IT1759.1 IT1759.2	Class Quiz Mid Term I End Term
11-12	The role of Tie Strength, Measuring Tie Strength	Lecture, Activity	Role of tie strength and link prediction	IT1759.1 IT1759.2	Class Quiz Mid Term I End Term
13-14	Tie Strength and Network Structure, Tie Strength and Network Propagation	Lecture, Activity	Role of tie strength	IT1759.1 IT1759.2	Class Quiz Mid Term I End Term
15-16	Link Prediction, Entity Resolution	Lecture, Activity	Role of link prediction	IT1759.1 IT1759.2	Class Quiz Mid Term I End Term
17-18	**Link Prediction**: Case Study Friend Recommendation,	Lecture, Problem based learning, Flipped Class	How find a community in a network	IT1759.2	Class Quiz Mid Term II End Term
19-20	Introduction to Community Discovery	Lecture, Problem based learning, Flipped Class	How find a community in a network	IT1759.2	Class Quiz Mid Term II End Term
21-22	Communities in Context	Lecture, Problem based learning, Flipped Class	How find a community in a network	IT1759.2	Class Quiz Mid Term II End Term
23-24	Community Detection Algorithms	Lecture, Problem based learning, Flipped Class	How find a community in a network	IT1759.2	Class Quiz Mid Term II End Term
25-26	Quality Functions	Lecture, Problem based learning, Flipped Class	Learn different algorithms in finding a community	IT1759.2	Class Quiz Mid Term II End Term

27-28	**Algorithms**: The Kernighan-Lin algorithm	Lecture, Problem based learning, Flipped Class	Learn different algorithms in finding a community	IT1759.2	Class Quiz Mid Term II End Term
29	Agglomerative Algorithms, Spectral Algorithms	Lecture, Problem based learning, Flipped Class	Learn different algorithms in finding a community	IT1759.2	Class Quiz Mid Term II End Term
30	Markov Clustering, Other Approaches	Lecture, Problem based learning, Flipped Class	Learn different algorithms in finding a community	IT1759.2	Class Quiz Mid Term II End Term
31	Other Approaches: Label Propagation, Clique Percolation	Lecture, Problem based learning, Flipped Class	Learn different algorithms in finding a community	IT1759.2	Class Quiz Mid Term II End Term
32	**Introduction to Social Influence**: Influence Related Statistics, Social Similarity and Influence, Homophile, Existential Test for Social Influence, Influence and Actions, Influence and Interaction, Influence Maximization in Viral Marketing	Lecture, Problem based learning, Flipped Class	Spread of Influence and how to become viral in social networks	IT1759.2 IT1759.3	Class Quiz Mid Term II End Term
33	Introduction to Social Influence	Lecture, Problem based learning, Flipped Class	Spread of Influence and how to become viral in social networks	IT1759.2 IT1759.3	Class Quiz End Term
34	Influence Related Statistics, Social Similarity and Influence, Homophile,	Lecture, Problem based learning, Flipped Class	Spread of Influence and how to become viral in social networks	IT1759.2 IT1759.3	Class Quiz End Term
35	Existential Test for Social Influence, Influence and Actions	Lecture, Problem based learning, Flipped Class	Spread of Influence and how to become viral in social networks	IT1759.2 IT1759.3	Class Quiz End Term
36	Influence Maximization in Viral Marketing	Lecture, Problem based learning, Flipped Class	Spread of Influence and how to become viral in social networks	IT1759.2 IT1759.3	Class Quiz Mid Term I End Term

1 Course Articulation Matrix: (Mapping of COs with POs)

CO	**STATEMENT**	CORRELATION WITH PROGRAM OUTCOMES														
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
[IT1759.1]:	Understand basic knowledge and concept of Complex networks and importance of different algorithms of computation in Social Network Analysis.	2	1	1	1		1				1	1		1	1	
[IT1759.2]:	Critically analyse and process available online datasets with the help of networkx package.		1	1	1	1								2	1	
[IT1759.3]:	Introduce the concept of connectivity, network robustness, Influence and will explore ways of measuring the importance or centrality of a node in a network		2	2	2		1			1	1	1	1	2		1

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Department of Information Technology

Course Hand-out

Natural Language Processing | IT 1760 | 3 Credits | 3 0 0 3

Session: July 18 – Dec 18 | Faculty: Sumit Srivastava| Class: B.Tech VII Semester

Dept. Elective

A. Introduction: This course is offered by Dept. of Information Technology as an elective subject, targeting students who wish to pursue development in industries or higher studies in field of Natural Language Processing. This course aims to make the students understand the models, methods, and algorithms of Natural Language Processing for common NLP tasks, such as speech recognition, machine translation, spam filtering, text classification, spell checking etc. After learning through this course, students will be able to understand and implement probabilistic models, estimate parameters for such models, and run meaningful experiments to validate such language models. The student will gain understanding of linguistic phenomena and will explore the linguistic features relevant to each NLP task. Prerequisite for the course is knowledge of fundamental mathematics including Linear algebra Probability and Statistics, AI, and programming in any high level language, preferably python.

B. Course Outcomes: At the end of the course, students will be able to

[IT1760.1]. Understand the models and methods of Natural Language Processing for common NLP tasks.

[IT1760.2]. Describe and analyse parts of speech used for any natural language with key concepts NLP.

[IT1760.3]. Design and Implement the grammatical components of a language and how it apply with NLP models

[IT1760.4]. Comprehend the models for word sense and discourse analysis.

[IT1760.5]. Apply real world applications with of NLP models.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

[PO1] Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO2] Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO3] Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO4] Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO5] Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO6] The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO7] Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO8] Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO9] Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO10]: Communication: Communicate effectively_on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO11] Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO12] Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

[PSO1] To apply creativity in support of the design, simulation, implementation and inference of existing and advanced technologies.

[PSO2] To participate & succeed in IT oriented jobs/competitive examinations that offer inspiring & gratifying careers.

[PSO3] To recognize the importance of professional developments by pursuing postgraduate studies and positions.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I	15
	Sessional Exam II	15
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

Introduction: Human languages, models, ambiguity, processing paradigms; Phases in natural language processing, applications. Text representation in computers, encoding schemes; **Linguistics resources:** Introduction to corpus, elements in balanced corpus, WordNet, VerbNet; **Part of Speech** tagging- Stochastic POS tagging, HMM, Transformation based tagging (TBL), Handling of unknown words, named entities, multi word expressions; **Natural language grammars**: lexeme, phonemes, phrases and idioms, word order, agreement, tense, aspect and mood and agreement, Context Free Grammar, spoken language syntax; **Parsing-** Unification, probabilistic parsing, Tree-Bank; **Semantics:** Meaning representation, semantic analysis, lexical semantics, WordNet; **Word Sense Disambiguation**: Selection restriction, machine learning approaches, dictionary based approaches; **Discourse:** Reference resolution, constraints on co-reference, algorithm for pronoun resolution, text coherence, discourse structure; **Applications of NLP**: Spell-checking, Text Summarization and Information Retrieval ; **IBM Watson Machine Translation:** Overview, Sentiment Analysis; Text Entailment, Textual Alignment, Skip Bigram, LFACS, Logical Form Graphs.

F. TEXT BOOKS

T1. D. Jurafsky, J. H. Martin, "Speech and Language Processing", 2e, Pearson Education, 2009.

G. REFERENCE BOOKS

R1. C. Eugene, "Statistical Language Learning", MIT Press, 1999.

R2. T. Siddiqui, U. S. Tiwary, "Natural language processing and Information retrieval", OUP, 2008.

H. Lecture Plan:

Lec. No	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1.	**Introduction**	**Introduction to NLP**	Lecture	IT 1760.1	Class Quiz
2.	**Introduction**	Phases of NLP	Lecture	IT 1760.1	Class Quiz Home Assignments I Sessional End Term
3-4	**Introduction**	Text Representation and Encoding Schemes	Lecture	IT 1760.1	Class Quiz Home Assignments I Sessional End Term
5.	**Linguistics resources**	Introduction to corpus, What is balanced corpus	Lecture	IT 1760.1	Class Quiz Home Assignments I Sessional End Term
6.	**Linguistics resources**	WordNet, Verb-Net	Lecture	IT 1760.1	Class Quiz Home Assignments I Sessional End Term
7-8	**Linguistics resources**	Part of Speech tagging, Role of tagging in NLP models	Lecture	IT 1760.1	Class Quiz Home Assignments I Sessional End Term
9.	**Linguistics resources**	Stochastic POS tagging	Lecture	IT 1760.1	Class Quiz Home Assignments I Sessional End Term
10-11	**Linguistics resources**	HMM	Lecture	IT 1760.1	Class Quiz Home Assignments I Sessional

12.	**Linguistics resources**	Transformation based tagging (TBL)	Lecture	IT 1760.1	Class Quiz Home Assignments I Sessional End Term
13.	**Linguistics resources**	Handling of unknown words, named entities, multi word expressions	Lecture	IT 1760.1	Class Quiz Home Assignments I Sessional End Term
14.	**Natural language grammars**	Lexeme, phonemes, Phrases and idioms	Lecture	IT 1760.2	Class Quiz Home Assignments I Sessional End Term
15.	**Natural language grammars**	Roles of Word order in NLP models	Lecture	IT 1760.2	Class Quiz Home Assignments I Sessional End Term
16.	**Natural language grammars**	Agreement, tense, aspect and mood and agreement	Lecture	IT 1760.2	Class Quiz Home Assignments I Sessional End Term
17-18	**Natural language grammars**	Context Free Grammar, spoken language syntax	Lecture	IT 1760.2	Class Quiz Home Assignments I Sessional End Term
19-20	**Parsing**	Unification, problems of probabilistic parsing, examples of probabilistic parsing	Lecture	IT 1760.3	Class Quiz Home Assignments II Sessional End Term
21.	**Parsing**	Tree-Bank parsing	Lecture	IT 1760.3	Class Quiz Home Assignments II Sessional End Term
22.	**Semantics**	Meaning representation, semantic analysis in language processing	Lecture	IT 1760.3	Class Quiz Home Assignments II Sessional End Term
23.	**Semantics**	Lexical semantics, WordNet	Lecture	IT 1760.3	Class Quiz Home Assignments II Sessional End Term

24.	**Word Sense Disambiguation**	Selection restriction	Lecture	IT 1760.4	Class Quiz Home Assignments II Sessional End Term
25-27	**Word Sense Disambiguation**	Machine learning approaches	Lecture	IT 1760.4	Class Quiz Home Assignments II Sessional End Term
28.	**Word Sense Disambiguation**	Dictionary based approaches	Lecture	IT 1760.4	Class Quiz Home Assignments II Sessional End Term
29-30	**Discourse Analysis**	Role of Discourse in NLP models, Reference resolution	Lecture	IT 1760.4	Class Quiz Home Assignments II Sessional End Term
31.	**Discourse Analysis**	Constraints on co-reference	Lecture	IT 1760.4	Class Quiz Home Assignments II Sessional
32.	**Discourse Analysis**	Algorithm for pronoun resolution	Lecture	IT 1760.4	Class Quiz Home Assignments II Sessional End Term
33.	**Discourse Analysis**	Text coherence, discourse structure	Lecture	IT 1760.4	Class Quiz Home Assignments II Sessional End Term
34.	**Applications of NLP**	Spell-checking	Lecture	IT 1760.5	Class Quiz Home Assignments II Sessional
35.	**Applications of NLP**	Text Summarization and Information Retrieval	Lecture	IT 1760.5	Class Quiz Home Assignments II Sessional End Term
36.	**IBM Watson Machine Translation**	Overview	Lecture	IT 1760.5	Class Quiz Home Assignments II Sessional End Term
37.	**Applications of NLP**	Sentiment Analysis	Lecture/Expert Lec.	IT 1760.5	Class Quiz Home Assignments

38.	**Applications of NLP**	Text Entailment	Lecture/Expert Lec	IT 1760.5	Class Quiz Home Assignments End Term
39.	**Applications of NLP**	Textual Alignment	Lecture	IT 1760.5	Class Quiz Home Assignments End Term
40.	**Applications of NLP**	Skip Bigram	Lecture	IT 1760.5	Class Quiz Home Assignments End Term
41.	**Applications of NLP**	LFACS	Lecture	IT 1760.5	Class Quiz Home Assignments End Term
42.	**Applications of NLP**	Logical Form Graphs	Lecture	IT 1760.5	Class Quiz Home Assignments End Term

I. Course Articulation Matrix: (Mapping of COs with POs and PSOs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
[IT1760.1]	Understand the models and methods of Natural Language Processing for common NLP tasks.	3			2				2					1		
[IT1760.2]	Describe and analyse parts of speech used for any natural language with key concepts NLP.		1	3				2				2			1	2
[IT1760.3]	Design and Implement the grammatical components of a language and how it apply with NLP models				3	2								2	1	3
[IT1760.4]	Comprehend the models for word sense and discourse analysis.						2		2	3				3	2	
[IT1760.5]	Apply real world applications with of NLP models.	2		2								2	1	3		2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR
SCHOOL OF COMPUTING & INFORMATION TECHNOLOGY
DEPARTMENT OF INFORMATION TECHNOLOGY
COURSE HAND-OUT

Advance Machine Learning Techniques | IT 1761 | 3 Credits | 3 0 0 3

Session: Jul 19-Dec 19| Faculty: Dr. Akhilesh Kumar Sharma | Class: B.Tech Dept. Elective B.Tech IT (VII Sem)

A. Introduction: This course aims to discuss concepts and terminology associate with Statistics, intelligent Systems and machine learning and also provides a concise introduction to the fundamental concepts in machine learning and popular machine learning algorithms. The course also discuss the various concepts and applications of machine learning with pseudo code of advance algorithms and cover the standard and most popular supervised learning algorithms including linear regression, logistic regression and the basics of computational learning theory. This course also discuss regarding hypothesis space, overfitting, bias and variance, tradeoffs between representational power and learnability, evaluation strategies and cross-validation and performance analysis of various algorithms of machine learning.

B. Course Outcomes: At the end of the course, students will be able to

[IT1761.1]. Student will learn various application areas and tools and understand statistical techniques to build machine learning applications.

[IT1761.2]. Clearly distinguish between neural nets, generative learning, SVM, bias, variance supervised/unsupervised learning and dimensionality reduction etc. to support intelligent systems.

[IT1761.3]. To learn and design systems for various Machine learning algorithms and Gaussian and logistic and linear models.

[IT1761.4]. Evaluate the performance of different machine learning algorithms

[IT1761.5]. Propose machine learning solutions for different applications and statistical feature modelling and selection.

[IT1761.6]. Student will learn dimension reduction and unsupervised learning concepts for Machine learning.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

PROGRAM OUTCOMES

[PO.1]. Engineering knowledge: : Apply the knowledge of basic science and fundamental computing in solving complex engineering problems

[PO.2]. Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

[PO.3]. Design/development of Computing solutions: Design solutions for complex IT engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the Information oriented public health and safety, and the cultural, societal, and environmental considerations

[PO.4]. Conduct investigations of complex problems: Use IT domain research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations

[PO.6]. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. Individual and team work: Function effectively as an individual, and as a member or leader in diverse IT teams, and in multidisciplinary settings.

[PO.10]. Communication: Communicate effectively on complex computing engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

Program Specific Outcomes (PSOs)

At the end of the B Tech IT program, the student:

[PSO 1]: To apply creativity in support of the design, simulation, implementation and inference of existing and advanced technologies.

[PSO 2]: To participate & succeed in IT oriented jobs/competitive examinations that offer inspiring & gratifying careers.

[PSO 3]: To recognize the importance of professional developments by pursuing postgraduate studies and positions.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	15
	Sessional Exam II (Closed Book)	15
	Coursera Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Closed Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded and need to finish the course at coursera.	

E. Syllabus:

Introduction: overview of machine learning, related areas, applications, software tools, course objectives; **Parametric regression:** linear regression, polynomial regression, locally weighted regression, numerical optimization, gradient descent, kernel methods; **Generative learning:** Gaussian parameter estimation, maximum likelihood estimation, MAP estimation, Bayesian estimation, bias and variance of estimators, missing and noisy features, nonparametric density estimation, Gaussian discriminant analysis, naive Bayes; **Discriminative learning:** linear discrimination, logistic regression, logit and logistic functions, generalized linear models, softmax regression; **Neural networks:** the perceptron algorithm, multilayer perceptron's, back propagation, nonlinear regression, multiclass discrimination, training procedures, localized network structure, dimensionality reduction interpretation; **Support vector machines:** functional and geometric margins, optimum margin classifier, constrained optimization, Lagrange multipliers; Unsupervised learning: K-means clustering, expectation maximization, Gaussian mixture density estimation, mixture of naive Bayes, model selection; **Dimensionality reduction:** feature selection, principal component analysis, linear discriminant analysis, factor analysis, independent component analysis, multidimensional scaling, manifold learning.

F. TEXT BOOKS:

T1. Hastie T., Tibshirani R., Friedman J., "The Elements of Statistical Learning", 2e, Pearson 2008

T2. P. Harrington, "Machine Learning in Action", Manning Publication, 2012.

G. REFERENCES BOOKS:

R1. D. Barber, "Bayesian Reasoning and Machine Learning", Cambridge University Press, 2012.

R2. S. Ben-David, S. Shalev- Shwartz, "Understanding Machine Learning: From Theory to Algorithms", Cambridge University Press, 2014.

H. Lecture Plan:

NO	TOPICS	Session Outcome	Mode of Delivery	Corresponding CO	Mode Of Assessing CO
1.	Overview of machine learning, Related areas, applications, software tools, course objectives;	Recall the ML concepts application areas.	Presentation and lecture, chalk & talk	IT 1761.1	Mid Term I, Quiz, Assignment, End tern
2.	Linear regression Polynomial regression and its applications.	To understand the regression	Lecture & Coursera	IT 1761.1 and IT 1761.5	Mid Term I, Quiz, Assignment, End tern coursera
3.	Multiple regression, application areas	understand the	Lecture & Coursera	IT 1761.1 and IT 1761.5	Mid Term I, Quiz , Assignment, End ter

		multiple regression			
4.	locally weighted regression, numerical optimization, gradient descent,	understand the linear regression	Presentation and lecture, chalk & talk	IT 1761.2	Mid Term I, Quiz , Assignment, End ter
5.	Kernel tricks, kernel methods;	understand kernel methods	Presentation and lecture, chalk & talk	IT 1761.2	Mid Term I, Quiz , Assignment, End ter
6.	Gaussian parameter estimation, Maximum likelihood estimation,	understand Gaussian mixture	Presentation and lecture, chalk & talk	IT 1761.2	Mid Term I, Quiz , Assignment, End ter
7.	Prior and posterior probability estimates	understand bayes theorem	Presentation and lecture, chalk & talk	IT 1761.2	Mid Term I, Quiz , Assignment, End ter coursera
8.	MAP estimation, Bayesian estimation,	understand MAP	Presentation and lecture, chalk & talk	IT 1761.1	Mid Term I, Quiz , Assignment, End ter
9.	bias and variance of estimators Feature selection,	understand Bias & Variance	Presentation and lecture, chalk & talk	IT 1761.1	Mid Term I, Quiz , Assignment, End ter coursera
10.	outlier and noise,missing and noisy features,	understand outlier, noise	Presentation and lecture, chalk & talk	IT 1761.2	Mid Term I, Quiz , Assignment, End ter
11.	nonparametric density estimation,		Presentation and lecture, chalk & talk	IT 1761.2	Mid Term I, Quiz , Assignment, End ter
12.	Gaussian discriminant analysis,	understand Gaussian mixture	Presentation and lecture, chalk & talk	IT 1761.2	Mid Term II, Quiz , Assignment, End ter
13.	Bayes theorem, Naive Bayes;	understand NB est.	Lecture, Presentation and chalk & talk	IT 1761.2 and IT 1761.3	Mid Term II, Quiz , Assignment, End ter coursera
14.	Linear discrimination,		Lecture	IT 1761.2	Mid Term II, Quiz , Assignment, End ter
15.	logistic regression, logit and logistic functions,	understand logistic regression	Lecture & Coursera	IT 1761.3	Mid Term II, Quiz , Assignment, End ter coursera
16.	Generalized linear models, softmax regression;	understand regression	Lecture & Coursera	IT 1761.3	Mid Term II, Quiz , Assignment, End ter
17.	Introduction to Neural Networks	Understand NN	Lecture & Coursera	IT 1761.3 and IT 1761.2	Mid Term II, Quiz , Assignment, End ter coursera
18.	The perceptron algorithm,	Understand NN & perceptron	Lecture & Coursera	IT 1761.3	Mid Term II, Quiz , Assignment, End ter
19.	multilayer perceptron's, back propagation, error and bias	Understand NN & perceptron	Lecture & Coursera	IT 1761.3	Mid Term II, Quiz , Assignment, End ter
20.	nonlinear regression, multiclass discrimination,	Understand non Linear regression	Lecture, Presentation and chalk & talk	IT 1761.3	Mid Term II, Quiz , Assignment, End ter
21.	training procedures, localized network structure,	Understand training & NW structure	Lecture, Presentation and chalk & talk	IT 1761.3 and IT 1761.1	Mid Term II, Quiz , Assignment, End ter coursera
22.	dimensionality reduction interpretation;	Understand Dim. reduction	Lecture, Presentation and chalk & talk	IT 1761.4 and IT 1761.3	Mid Term II, Quiz , Assignment, End ter coursera
23.	Supervised learning, KNN	Understand KNN	Lecture & Coursera	IT 1761.4 and IT 1761.5	Mid Term II, Quiz , Assignment, End ter coursera
24.	Supervised Learning, precision and recall	Understand Accuracy	Lecture & Coursera	IT 1761.4 and IT 1761.5	Mid Term II, Quiz , Assignment, End ter coursera

25.	SVM, functional and geometric margins, optimum margin classifier,	Understand SVM	Lecture & Coursera	IT 1761.4 and IT 1761.2	Mid Term II, Quiz , Assignment, End ter coursera
26.	Unsupervised learning: K-means clustering, expectation maximization,	Understand clustering	Lecture	IT 1761.5 and IT 1761.6	Mid Term II, Quiz , Assignment, End ter coursera
27.	Gaussian mixture density estimation, mixture of naive Bayes,	Understand	Lecture	IT 1761.1 and IT 1761.3	Quiz & Assignment, End term
28.	Model selection; feature selection,	Understand model selection	Lecture	IT 1761.4	Quiz & Assignment, End term
29.	Principal component analysis,	Understand PCA	Lecture & Coursera	IT 1761.4 and IT 1761.6	Quiz & Assignment, End term
30.	linear discriminant analysis,	Understand LDA	Lecture	IT 1761.6	Quiz & Assignment, End term
31.	Revision Class-I	Recall concepts	Lecture	IT 1761.6	Quiz & Assignment, End term
32.	Revision Class-II	Recall concepts	Lecture	IT 1761.5 and IT 1761.6	Quiz & End Term, Assignment, End ter

I. Course Articulation Matrix: (Mapping of COs with POs)

CO	**STATEMENT**	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
[IT 1761. 1]	Student will learn various application areas and tools and understand statistical techniques to build machine learning applications.	2			2	3								1		
[IT 1761. 2]	Clearly distinguish between neural nets, generative learning, SVM, bias, variance supervised/unsupervised learning and dimensionality reduction etc. to support intelligent systems.		2		3	2							1		1	1
[IT 1761. 3]	To learn and design systems for various Machine learning algorithms and Gaussian and logistic and linear models.	2	3	2		1	1			1	1			1	1	
[IT 1761. 4]	Evaluate the performance of different machine learning algorithms				2		1								1	
[IT 1761. 5]	Propose machine learning solutions for different applications and statistical feature modelling and selection	3		3			2	1			1		1	2	1	1

[IT 1761. 6]	Student will learn dimension reduction and unsupervised learning concepts for Machine learning.	1			1									1		

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Department of Information Technology
Course Hand-out

Semantic Web| IT 1762| 3 Credits | 3 0 0 3

Session: July 18 – Dec 18 | Faculty: Venkatesh Gauri Shankar | Class: B.Tech VII Semester

Department Elective

A. Introduction: In this course, students will study a comprehensive understanding of the course of Semantic web to the describe and understanding of www and its semantic applications. This course also motivates towards use of web services and its uses with a wide variety of subject matter domains.

B. Course Outcomes: At the end of the course, students will be able to

[IT1762.1]. Describe World Wide Web with the current applications.
[IT1762.2]. Understand Semantic web with its different component and architecture.
[IT1762.3]. Analyse Semantic Web Services with the middleware
[IT1762.4]. Comparison between Syntactic web and Semantic web
[IT1762.5]. Understand and use of the web services in syntactic as well as semantic web.
[IT1762.6]. Describe many centralized platform on semantic web for resource description.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

PROGRAM OUTCOMES

[PO.1]. Engineering knowledge: : Apply the knowledge of basic science and fundamental computing in solving complex engineering problems

[PO.2]. Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

[PO.3]. Design/development of Computing solutions: Design solutions for complex IT engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the Information oriented public health and safety, and the cultural, societal, and environmental considerations

[PO.4]. Conduct investigations of complex problems: Use IT domain research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations

[PO.6]. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices.

[PO.9]. Individual and team work: Function effectively as an individual, and as a member or leader in diverse IT teams, and in multidisciplinary settings.

[PO.10]. Communication: Communicate effectively on complex computing engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

[PO.11]. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

[PO.12]. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES

[PSO.1]. To apply creativity in support of the design, simulation, implementation and inference of existing and advanced technologies.

[PSO.2]. To participate & succeed in IT oriented jobs/competitive examinations that offer inspiring & gratifying careers.

[PSO.3]. To recognize the importance of professional developments by pursuing postgraduate studies and positions.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Close Book)	15
	Sessional Exam II (Close Book)	15
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Close Book)	50
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

Introduction to advanced web technology: Technological issues, XML processing, RDF processing; **Middleware technologies:** DCOM ,CORBA, IIOP, RMI, RPC; **Taxonomies and ontologies for advanced web applications:** Ontology modeling, Languages for representing ontologies on the web, Rules and inferences; **Web services**: Design and modeling of web services, Technologies for Implementing web services, SOA, SOAP,Current applications of advanced web technologies. **Metadata classification:** from Syntax to Semantics. Metadata representation and choices for annotation. Extracting metadata from semi-structured data including research, techniques and tools. Extracting metadata from unstructured text including research, techniques and tools. Comprehensive literature review. **Automatic Classification**: Overview of research and techniques for automatic classification. Statistical, Machine Learning, Language Based and Knowledge Based techniques. Classifier committee.

F. TEXT BOOKS

T1. G. Antoniou, F. V. Harmelen, *"Semantic Web Primer",* MIT Press , 2008.

T2. J. C. Jackson, *"Web Technologies: A Computer Science Perspective",* Prentice Hall , 2006.

G. REFERENCE BOOKS

R1. P.K. Yuen, V. Lau, *"Practical Web Technologies"*, Addison Wesley, September 9, 2003

H. Lecture Plan:

LEC NO	Main Topic	Session outcome	Mode of delivery	Corresponding CO	Mode Of Assessing CO
1	**Introduction to advanced web technology and Middleware technologies**	Technological issues,	Lecture	IT1762.1	Mid Term I, Quiz-1 & End Term
2		XML processing,	Lecture	IT1762.1	Mid Term I, Quiz-1 & End Term
3		RDF processing;	Lecture	IT1762.1	Mid Term I, Quiz-1 & End Term
4		Python Version.	Lecture	IT1762.1	Mid Term I, Quiz-1 & End Term
5,6		DCOM ,	Flipped Class	IT1762.1	Mid Term I, Quiz-1 & End Term
7		CORBA,	Flipped Class	IT1762.1	Mid Term I, Quiz-1 & End Term
8,9		IIOP, RMI, RPC	Activity	IT1762.1	Mid Term I, Quiz-1 & End Term
10,11	**Taxonomies and ontologies for advanced web applications and Web services**	Ontology modelling,	Flipped Class	IT1762.2	Mid Term II, Quiz-2 & End Term
12		Languages for representing ontologies on the web,	Lecture	IT1762.2	Mid Term II, Quiz-2 & End Term
13		Rules and inferences;	Lecture	IT1762.2	Mid Term II, Quiz-2 & End Term
14,15		Design and modelling of web services,	Lecture	IT1762.2	Mid Term II, Quiz-2 & End Term
16,17		Technologies for Implementing web services,	Lecture	IT1762.2	Mid Term II, Quiz-2 & End Term
18,19		SOA, SOAP,	Flipped Class	IT1762.2	Mid Term II, Quiz-2 & End Term
20, 21		Current applications of advanced web technologies	Flipped Class	IT1762.2	Mid Term II, Quiz-2 & End Term
22, 23	**Metadata classification**	Syntax to Semantics. Metadata representation and choices for annotation.	Activity	IT1762.3 & IT1762.4	Mid Term II, Quiz-3 & End Term
24,25		Extracting metadata from semi-structured data including research,	Flipped Class	IT1762.3 & IT1762.4	Mid Term II, Quiz-3 & End Term
26, 27,28		Techniques and tools.	Lecture	IT1762.3	Mid Term II, Quiz-3 & End Term
29,30,31		Extracting metadata from unstructured text including research,	Lecture	IT1762.3	Mid Term II, Quiz-3 & End Term
32, 33		Techniques and tools for meta data	Lecture	IT1762.3 & IT1762.5	Mid Term II, Quiz-3 & End Term
34,35, 36		Comprehensive literature review.	Lecture	IT1762.4 & IT1762.3	Mid Term II, Quiz-3 & End Term

37,38		Comprehensive literature review.	Flipped Class	IT1762.4 & IT1762.3	Mid Term II, Quiz-3 & End Term
39,40,41	**Automatic Classification**	Overview of research and techniques for automatic classification. Statistical,	Flipped Class	IT1762.6 & IT1762.5	Quiz-4 & End Term
42, 43		Machine Learning,	Activity	IT1762.6 & IT1762.5	Quiz-4 & End Term
44,45		Language Based and Knowledge Based techniques.	Flipped Class	IT1762.6 & IT1762.5	Quiz-4 & End Term
46, 47, 48		Classifier committee.	Activity	IT1762.6 & IT1762.5	Quiz-4 & End Term

I. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
[T1762.1]	Describe World Wide Web with the current applications.	3			2				2					1		
[IT1762.2]	Understand Semantic web with its different component and architecture.		1	3				2				2			1	2
[IT1762.3]	Analyse Semantic Web Services with the middleware				3	2								2	1	3
[IT1762.4]	Comparison between Syntactic web and Semantic web						2		2	3				3	2	
[IT1762.5]	Understand and use of the web services in syntactic as well as semantic web.			2						1	2			3		2
[IT1762.6]	Describe many centralized platform on semantic web for resource description.	2						3					1	3		2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR
SCHOOL OF COMPUTING & INFORMATION TECHNOLOGY

DEPARTMENT OF INFORMATION TECHNOLOGY
Course Hand-out

Information & Web Security | IT1792 | 3 credits | [3 0 0 3]

Session: Aug 18 – Dec 18 | Faculty: Dr. Alka Choudhary | Class: B.Tech IT (VII Sem)

A. **Introduction: This course is offered by Dept. of Information Technology, the aim of the course to provide the students basic background on information systems. This is targeting students who wish to pursue career in the field of information security. The course includes understanding the principles for multi-layer security and management systems for the network. The focus is on techniques and protocol used for different types of security policies.**

B. **Course Objectives:** At the end of the course, students will be able to

[IT1792.1] To understand the concept of information security with classical cryptography.

[IT1792.2] Define the notion of cryptography and reinforce it with the knowledge of network.

[IT1792.3] Understand and analyse legacy and contemporary cryptographic strategies, identify the issues of network security.

[IT1792.4] Learn the design principles and implementation aspects of cyber security & forensics and evaluate them in different application scenarios

[IT1792.5] To master the web application security with different modern techniques.

C. **PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES**

[PO.1] Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

[PO.2] Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

[PO.3] Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations

[PO.4] Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5] Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

[PO.6] The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7] Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8] Ethics: Apply ethical principles and commit to professional ethilT and responsibilities and norms of the engineering practices

[PO.9] Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

[PO.10] Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11] Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12] Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

Program Specific Outcomes (PSOs)

At the end of the B Tech ITE program, the student:

[PSO.1].Apply creativity in support of the design, simulation, implementation and inference of existing and advanced technologies.

[PSO.2]. Participate & succeed in IT oriented jobs/competitive examinations that offer inspiring & gratifying careers.

[PSO.3]. Recognize the importance of professional developments by pursuing postgraduate studies and positions.

Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Close Book)	15
	Sessional Exam II (Close Book)	15
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Close Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

D. Syllabus

Introduction – Introduction: Security mindset, Computer Security Concepts (CIA), Threats, Attacks, and Assets. Software Security: Vulnerabilities and protections, malware, program analysis. Malicious software (Viruses, trojans, rootkits, worms, botnets) Memory exploits (buffer overflow, heap overflow, integer overflow, format string).Practical Cryptography: Encryption, authentication, hashing, symmetric and asymmetric cryptography, Digital Signatures and Certificates. Network Security: Network security issues, Sniffing, IP spoofing, Common threats, E-Mail security, IPSec, SSL, PGP, Intruders, Virus, Worms, Firewalls-need and features of firewall, Types of firewall, Intruder Detection Systems. Cyber Security: Cyber Crime and security, Security tools, Introduction to Digital Forensic, OS fingerprinting, TCP/IP stack masking, Social Engineering. Web Security and special topics: Web application Security, Privacy and Anonymity, public policy, User authentication, authentication-via-secret and session management. Cross Site Scripting, Cross Site Request Forgery, SQL Injection.

E. Text Books

T1. W. Stallings, "Cryptography and Network Security: Principles and Practice", Prentice Hall, 5th edition, 2010.

1. References:

R1. M. Bishop, "Introduction to Computer Security", Addison-Wesley, 2004

R2. J. A.Buchmann, "Introduction to Cryptography", Springer Verlag, 2001.

Sr.No.	Topics to be covered	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1	Introduction to the course	To acquaint and clear teachers expectations and understand student expectations	Lecture	NA	NA
2	Introduction to Security	Understanding of different key concepts of security.	Lecture	1792.1	Class Quiz Sessional 1 End Term
3	Computer Security Concepts (CIA)	Understanding of different functions involved in computer security concepts	Flipped Class	1792.2	Class Quiz Sessional 1 End Term
4	Introduction to Threats, Attacks	Understanding of basic component and standards of threats and attacks.	Lecture	1792.2	Class Quiz Sessional 1 End Term
5	Introduction to Assets.	Knowledge about different security assets	Lecture and Flipped Class	1792.2	Class Quiz Sessional 1 End Term
6	Introduction to software security	Understanding the working of software security	Lecture	1792.2	Class Quiz Sessional 1 End Term
7	Vulnerabilities and protections	Understanding the concept of security	Lecture	1792.2	Class Quiz Sessional 1 End Term
8	Introduction to malware	Knowledge of different malwares	Lecture	1792.2	Class Quiz Sessional 1 End Term
9	program analysis for software system	Knowledge of software systems		1792.2	Class Quiz Sessional 1 End Term
10	Introduction to Malicious software like Viruses, trojans	Knowledge of different malicious software's	Lecture	1792.2	Class Quiz Sessional 1 End Term

11	Introduction to Malicious software like rootkits, worms, botnets	Knowledge of different malicious software's	Lecture / Flipped Class	1792.2	Class Quiz Sessional 1 End Term
12	Introduction to Memory exploits (buffer overflow, heap overflow)	Understand the concepts of memory exploits	Lecture	1792.2	Class Quiz Sessional 1 End Term
13	Introduction to Memory exploits (integer overflow, format string)	Recall different memory exploits	Flipped Lecture	1792.3	Class Quiz Sessional 2 End Term
14-15	Introduction to cryptography Encryption, authentication, hashing	Recall different cryptography concepts	Flipped Class	1792.3	Class Quiz Sessional 2 End Term
16	symmetric and asymmetric cryptography	Understanding of types of cryptography	Lecture	1792.3	Class Quiz Sessional 2 End Term
17	Digital Signatures and Certificates	Explain digital signature and certificates	Lecture	1792.3	Class Quiz Sessional 2 End Term
18	Network security issues	Recall network security issues	Lecture	1792.4	Class Quiz Sessional 2 End Term
19	Sniffing	Understanding of sniffing	Lecture	1792.4	Class Quiz Sessional 2 End Term
20-21	IP spoofing	Know about IP spoofing	Lecture	1792.4	Class Quiz Sessional 2 End Term
22	Common threats and E-Mail security	Understanding of Email security	Lecture	1792.4	Class Quiz Sessional 2 End Term
23	IPSec and SSL	Understanding the root concept of SSL	Lecture	1792.4	Class Quiz Sessional 2 End Term
24	PGP, Intruders, Virus, Worms	Understanding Concepts of PGP	Lecture	1792.4	Class Quiz Sessional 2 End Term
25	Firewalls-need and features of firewall Types of firewall, Intruder Detection Systems	Knowing concept of firewalls	Lecture	1792.4	Class Quiz Sessional 2 End Term

26	Cyber Crime and security Security tools	Knowing Concept of Cyber security	Lecture	1792.4	Class Quiz Sessional 2 End Term
27	Introduction to Digital Forensic	Understanding concept of Digital forensic	Lecture	1792.5	Class Quiz End Term
28-29	OS fingerprinting	Know the concept of OS fingerprinting	Lecture	1792.5	Class Quiz End Term
30	TCP/IP stack masking	Understanding the concept of TCP/IP stack	Lecture	1792.5	Class Quiz End Term
32	Introduction to Social Engineering	Understanding to the social Engineering	Lecture	1792.5	Class Quiz End Term
34	Web application Security	Understanding the concept of web security	Lecture	1792.5	Class Quiz End Term
35	Privacy and Anonymity public policy	Understanding the public policy	Lecture	1792.5	Class Quiz End Term
36	User authentication authentication-via-secret and session management	Know the concept of User authentication	Lecture	1792.5	Class Quiz End Term
37	Cross Site Scripting	Know the concept of cross site scripting	Lecture	1792.5	Class Quiz End Term
38	Cross Site Request Forgery and SQL Injection.	Know the concept of SQL injection	Lecture	1792.5	Class Quiz End Term
39	Revision	Understanding the syllabus	Lecture	1792.5	Class Quiz End Term
40	Revision	Understanding the syllabus	Lecture	1792.5	Class Quiz End Term

I. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
[IT 1792.1]	To understand the concept of information security with classical cryptography.	3	2							1	3			2		
[IT 1792.2]	Define the notion of cryptography and reinforce it with the knowledge of network.		3	3	2					1				2		
[IT 1792.3]	Understand and analyse legacy and contemporary cryptographic strategies, identify the issues of network security.	3			3	2				1				3	2	
[IT 1792.4]	Learn the design principles and implementation aspects of cyber security & forensic and evaluate them in different application scenarios			3	2							3			2	3
[IT 1792.5]	To master the web application security with different modern techniques.		3		2									3		2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Department of Information and technology

Course Hand-out

Major Project| IT 1881 | 12 Credits

Session: Jan 2019-July 2019 | Faculty: Neha V Sharma | Class: B.Tech VIII Semester, Compulsory

A. Introduction: This course is offered by Dept. of Information Technology as a compulsory subject, targeting students who wish to pursue research & development in industries or higher studies in field of Information technology. The duration of B.Tech final year project is one Semester along with coursework of 8th semester. Students are required to undertake innovative and research oriented projects, which not only reflect their knowledge gained in the earlier semesters but also additional knowledge gained from their own effort. They must show the phase wise development of their project submitting the appropriate documents at the end of each phase. The student must put in effort to find answers to questions about the applications, which will also enhance the value of the project report. There will be one interim and one final seminar for evaluation of the project.

B. Course Outcomes: At the end of the course, students will be able to

[IT1881.1]. Design and model a system based on real life application and hence develop employability skills.

[IT1881.2]. Plan and execute well defined objectives.

[IT1881.3]. Work in team at component level and system level, Integrate or reuse with- existing components promoting Entrepreneurship

[IT1881.4]. Derive performance metrics and assess quantitatively the performance of system

[IT1881.5]. Report and present the findings in standard formats

A. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

PO1: Apply the knowledge of basic science and fundamental computing in solving complex engineering problems

PO2: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design solutions for complex IT engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the Information oriented public health and safety, and the cultural, societal, and environmental considerations

PO4: Use IT domain research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

PO5: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

PO6: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

PO7: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

PO8: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

PO9: Function effectively as an individual, and as a member or leader in diverse IT teams, and in multidisciplinary settings.

PO10: Communicate effectively on complex computing engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

PO11: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

PO12: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PSO 1: To apply creativity in support of the design, simulation, implementation and inference of existing and advanced technologies.

PSO 2: To participate & succeed in IT oriented jobs/competitive examinations that offer inspiring & gratifying careers.

PSO 3: To recognize the importance of professional developments by pursuing postgraduate studies and positions.

B. Course Articulation Matrix: (Mapping of COs with POs and PSOs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
[IT 1881.1]	Design and model a system based on real life application	3	2				1	2						3		
[IT 1881.2]	Plan and execute well defined objectives.			2	1	1										1
[IT 1881.3]	Work in team at component level and system level , Integrate or reuse with- existing components								1	2		2				
[IT 1881.4]	Derive performance metrics and assess quantitatively the performance of system				2										2	
[IT 1881.5]	Report and present the findings in standard formats										2		1			

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation