B.Tech –Computer and Communication Engineering | Academic Year: 2021-2022

PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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] Imbibe the basic concepts and applications of computer-based Communication or networking, information sharing, signal processing, web-based systems, smart devices, and communication technology.

[PSO.2] Investigate prominent areas in the field of Computer and Communication Engineering to provide feasible solutions.

[PSO.3] Apply the contextual knowledge in the field of Computing and Communication to assess social, health, safety, and security issues relevant to the professional engineering practice.

Vision

Inculcate academic excellence and research aptitude for global competency and leadership

Mission

- Nurture the technical skillset of students to enable them to create an innovative solution
- Sharpen the problem-solving skills through project-based learning.
- Serve society by inspiring young minds for research and innovation with ethical values.

Program Educational Objectives

PEO1: Graduates shall exhibit leadership skills to foster academic excellence with productive research and social reforms engaging in lifelong learning with ethical practices.

PEO2: Graduates shall pursue higher education to upgrade technical competency in the field of computation.

PEO3: Graduates shall showcase industry readiness with a strong understanding of logical, analytical, critical thinking with teamwork.

Program Articulation Matrix																
Sem.	**Course Code**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
III	**CC2101**	3	3	3	2	2	0	0	0	1	1	2	3	3	3	2
	CC2102	3	2	1	0	0	0	1	0	1	2	0	1	3	2	1
	CC2103	3	2	2	0	0	0	0	0	0	0	0	2	3	2	2
	CC2104	3	2	2	2	0	0	0	0	1	1	1	2	3	1	3
	EO2001	0	2	2	3	2	1	2	0	2	0	2	3	0	0	0
	MA2101	3	3	3	2	2	0	0	0	1	1	2	3	3	3	2
	CC2130	3	2	2	2	2	0	0	0	0	0	0	2	3	2	1
	CC2131	2	2	3	0	0	0	0	0	0	0	0	2	3	1	2
	CC2132	1	2	2	1	1	0	0	0	1	0	0	2	2	0	3
IV	**CC2201**	2	0	3	0	3	0	2	0	2	0	0	0	3	1	3
	CC2202	3	2	3	3	1	0	0	1	1	1	0	1	3	3	1
	CC2203	3	2	3	1	2	2	1	2	3	1	1	2	1	1	2
	CC2230	1	1	2	2	1	1	0	1	1	1	1	0	1	1	0
	CC2231	1	2	3	2	3	0	0	1	1	1	1	1	1	3	2
	CC2232	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1
	MA2201	3	2	1	2	1	2	3	3	2	1	2	1	3	3	2
	BB0025	2	3	0	1	2	2	3	0	0	0	0	0	3	2	2
V	**CC3101**	2	2	2	2	1	1	1	1	2	2	2	2	2	1	1
	CC3102	0	3	3	2	1	1	0	0	2	2	2	1	1	3	3
	CC3103	3	2	2	0	0	2	2	0	1	0	0	0	0	1	0
	CC3104	2	2	2	3	3	2	2	0	1	1	1	2	2	2	2
	CC3130	1	1	2	2	1	1	0	1	1	1	1	0	0	0	1
	CC3131	0	3	3	2	1	0	0	0	2	0	2	1	0	3	3
	CC3140	2	2	3	3	3	1	2	2	2	2	3	3	2	2	3
	CC3141	2	2	3	3	2	2	0	0	0	0	2	2	2	2	0
VI	**CC3201**	3	2	1	1	1	1	1	1	1	2	0	1	3	3	1
	CC3202	3	2	2	2	2	0	0	0	0	0	0	2	3	2	2
	CC3203	3	3	3	2	1	0	0	0	0	0	0	2	1	2	1
	CC3230	1	3	1	3	3	1	0	3	3	2	0	1	3	2	1
	CC3231	2	2	2	3	3	1	1	1	2	1	1	1	2	2	3
	BB0026	2	2	2	1	2	1	1	0	0	0	0	0	2	1	2
	CC3240	2	2	2	1	3	0	0	0	0	0	1	2	3	2	3
	CC3241	3	3	3	1	3	1	1	1	1	2	1	2	2	3	2
	CC3270	2	2	3	2	3	1	1	1	1	1	1	1	2	2	1
VII	**CC1701**	3	2	3	0	3	0	0	1	1	1	0	1	1	2	3
	CC1702	3	3	3	3	2	3	1	2	2	0	0	1	3	2	2
	CC1753	3	1	3	3	3	0	0	0	0	0	0	3	3	1	3
	CC1754	2	3	2	3	3	1	0	0	1	1	0	1	1	1	1
	CC1755	3	2	1	0	3	0	0	0	0	0	0	2	2	2	1
	CC1756	3	2	2	1	1	1	0	1	2	1	3	1	3	3	3
	CC1730	1	1	1	2	2	0	0	0	0	0	0	0	2	2	2
	CC1731	2	2	3	2	2	2	1	2	2	1	2	1	3	2	2
VIII	**CC1881**	2	3	3	3	3	3	1	3	3	2	2	3	2	3	2

MANIPAL UNIVERSITY
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School of Computing and Information Technology

Department of Computer and Communication Engineering

Engineering Mathematics III | MA2101 | 3 Credits | 3 0 0 3

Session: August 2021– December 2021 | Faculty: Dr Reema Jain | Class: II Year B.Tech. III Sem. (A)

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

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

[2101.1]. Describe the concept of Partial Order Relations, lattices and their applications.

[2101.2]. Describe the concepts of Graph Theory and apply the graph algorithms to evaluate and analyze the problems, which enhance the analytical skills.

[2101.3]. Describe the concepts of Trees and apply the tree algorithms to analyze the shortest path problems, which enhance the analytical skills.

[2101.4]. Describe basic counting techniques and their applications to evaluate the relevant problems

[2101.5]. Describe the concept of Predicates, logics, and their properties which enhance the logical and programming skills and make them employable in the relevant industry.

[2101.6]. Describe the concept of Algebraic structure and Group theory, Boolean Algebra which helps to increase the logical skills.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

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

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

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

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

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

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

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

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

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

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

Program Specific Outcomes (PSOs)

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

PSO1. Imbibe the basic concepts and applications of computer-based Communication or networking, information sharing, signal processing, web-based systems, smart devices, and communication technology.

PSO2. Investigate prominent areas in the field of Computer and Communication Engineering to provide feasible solutions.

PSO3. Apply the contextual knowledge in the field of Computing and Communication to assess social, health, safety, and security issues relevant to the professional engineering practice.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I	20
	Sessional Exam II	20
	In class Quizzes and/or Assignments, Activity feedbacks	20
End Term Exam (Summative)	End Term Exam	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance 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 online class session 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/ online classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

Boolean Algebra: Partial ordering relations, Poset, Lattices, Basic Properties of Lattices. Distributive and complemented lattices, Boolean lattices and Boolean Algebra. Propositional and Predicate Calculus: Well formed formula, connectives, quantifications, Inference theory of propositional and predicate calculus. Elementary configuration: Permutations and Combinations, Generating function, Principle of inclusion and exclusion Partitions, compositions. Ordering of permutations: Lexicographical and Fikes. Graph theory: Basic definitions, Degree, regular graphs, Eulerian and Hamiltonian graphs, Trees and Properties, Center, radius and diameter of a graph, Rooted and binary trees, Matrices associated with graphs, Algorithms for finding shortest path, Algorithm. Group theory: Semi groups, Monoids, Groups subgroups, Normal Subgroups, Cosets, Lagrange's Theorem, Cyclic groups.

References:

1. C. L. Liu, *Elements of Discrete Mathematics*, (2e), McGraw Hill, New Delhi, 2007.

2. J. P. Trembaly, R. Manohar, *Discrete Mathematics Structures with application to computer science*, McGraw Hill, 2012.

3. E. S. Page, L. B. Wilson, *An Introduction to Computational Combinatorics*, Cambridge Univ. Press, 1979.

4. N. Deo, *Graph theory with Applications to computer science*, Prentice Hall of India, 2012.

F. Lecture Plan:

L. No.	Topic	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing CO
1	Introduction about the course content, teaching methodology & Assessment Plan	To develop the understanding about the course	Lecture	NA	NA
2	Introduction about the set theory and relations	Knowledge of basics of Relation	Lecture	2101.1	Mid Term I, Quiz & End Term
3	Partial ordering relations, Poset	Knowledge of basics of Relation	Lecture	2101.1	Mid Term I, Quiz & End Term
4	Hasse diagram of posets	Explore different way of representation	Lecture	2101.1	Mid Term I, Quiz & End Term
5	Hasse diagram of posets	Explore different way of representation	Lecture	2101.1	Mid Term I, Quiz & End Term
6	Lattices, Basic Properties of Lattices	Learn new way of representation	Lecture	2101.1	Mid Term I, Quiz & End Term
7	Distributive and complemented lattices	Explore new properties of relations	Lecture	2101.1	Mid Term I, Quiz & End Term
8	Graphs, digraphs, Simple graph, multi graph, pseudo graph	Basic knowledge of Graph formation	Lecture	2101.2	Mid Term I, Quiz & End Term
9	Degree of a vertex in a graph, adjacency and incidence.	Basic definitions and representation in matrix form	Lecture	2101.2	Mid Term I, Quiz & End Term
10	Some basic properties, Subgraphs	Properties of graphs	Lecture	2101.2	Mid Term I, Quiz & End Term
11	Complete graphs Regular graph, bipartite graphs	Different types of graphs	Lecture	2101.2	Mid Term I, Quiz & End Term
12	Graph isomorphism	Equivalence of two graphs	Lecture	2101.2	Mid Term I, Quiz & End Term
13	Walk, path, cycle in a graph	Different types of graphs	Lecture	2101.2	Mid Term I, Quiz & End Term
14	Eulerian and Hamiltonian Graphs	Application of graph with important graphs	Lecture	2101.2	Mid Term I, Quiz & End Term
15	Trees and Properties	Extended form of type of graphs	Lecture	2101.3	Mid Term II, Quiz & End Term
16	Trees and Properties Examples & problems	Basic knowledge of tree	Lecture	2101.3	Mid Term II, Quiz & End Term

17	Centre, radius and diameter of a graph	Basic knowledge of tree	Lecture	2101.3	Mid Term II, Quiz & End Term
18	Rooted and binary trees	Type of the trees and properties	Lecture	2101.3	Mid Term II, Quiz & End Term
19	Matrices associated with graphs	Basic definitions and representation in matrix form	Lecture	2101.3	Mid Term II, Quiz & End Term
20	Algorithms for finding shortest path	How to apply the graph theory to find shortest path	Lecture	2101.3	Mid Term II, Quiz & End Term
21	Algorithms for finding shortest path	How to apply the graph theory to find shortest path	Lecture	2101.3	Mid Term II, Quiz & End Term
22	Algorithm and related problem	Practice questions	Lecture	2101.3	Mid Term II, Quiz & End Term
23	Basic Principle of Counting- Product rule, Sum rule	Understand a way of counting	Lecture	2101.4	Mid Term II, Quiz & End Term
24	Review on Permutations and Combinations	Revision of few fundamental concepts	Lecture	2101.4	Mid Term II, Quiz & End Term
25	Problems under Permutations and Combinations, Ordering of permutations	Exercise new problems	Lecture	2101.4	Mid Term II, Quiz & End Term
26	Principle of inclusion and exclusion Partitions, compositions.	Understand a new way of counting	Lecture	2101.4	Mid Term II, Quiz & End Term
27	Definition of Generating Function, examples, finding generating function for the sequence of real numbers	Able to make association between sequence & series	Lecture	2101.4	Mid Term II, Quiz & End Term
28	Propositions, conjunction and disjunction of propositions, negation of a proposition, implications,	Basics of Predicate calculus	Lecture	2101.5	Mid Term II, Quiz & End Term
29	Converse, contrapositive and inverse of a proposition, contradiction and tautology	Properties of Predicate calculus	Lecture	2101.5	Mid Term II, Quiz & End Term
30	Contradiction and tautology, logical equivalences	Identify nature of language	Lecture	2101.5	Mid Term II, Quiz & End Term
31	Predicates - ways of expressing sentences using predicates	Application of predicate calculus	Lecture	2101.5	Mid Term II, Quiz & End Term
32	Quantifiers - expressing sentences using predicates and quantifiers and quantified express into sentences	Extension of language writing	Lecture	2101.5	Mid Term II, Quiz & End Term
33	Inference theory of propositional and predicate calculus	Application of predicate calculus	Lecture	2101.5	Mid Term II, Quiz & End Term
34	Semi-groups, monoids definition and examples	Basics of Algebraic structure	Lecture	2101.6	Quiz & End Term
35	Group definition and examples, some basic theorems	Extension of Algebraic structure with some properties	Lecture	2101.6	Quiz & End Term
36	subgroups, Normal Subgroups,	extended properties of the group	Lecture	2101.6	Quiz & End Term
37	Cosets, Lagrange's Theorem, Cyclic groups	New property of Groups	Lecture	2101.6	Quiz & End Term

38	Axiomatic definition of Boolean Algebra and examples	Will be able to identify comparison between elements	Lecture	2101.6	Quiz & End Term
39	Boolean lattices	Can able to make subsets with some interesting properties	Lecture	2101.6	Quiz & End Term

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

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
2101.1	Describe the concept of Partial Order Relations, lattices and their applications.	3	2	1							1	2	1	2	1	2
2101.2	Describe the concepts of Graph Theory and apply the graph algorithms to evaluate and analyze the problems, which enhance the analytical skills.	3	3	3	2	1				1	1	1	2	2	1	1
2101.3	Describe the concepts of Trees and apply the tree algorithms to analyze the shortest path problems, which enhance the analytical skills.	3	2	3	1	2				1			3	3	1	1
2101.4	Describe basic counting techniques and their applications to evaluate the relevant problems	3	3	3	2	1							2	1	1	1
2101.5	Describe the concept of Predicates, logics, and their properties which enhance the logical and programming skills and make them employable in the relevant industry	2	1	1	1								1	1	1	1
2101.6	Describe the concept of Algebraic structure and Group theory, Boolean Algebra which helps to increase the logical skills.	2	2	2	1	1							2	3	3	2

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

H. 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
2101.1	Describe the concept of Partial Order Relations, lattices and their applications.															
2101.2	Describe the concepts of Graph Theory and apply the graph algorithms to evaluate and analyze the problems, which enhance the analytical skills.															
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2101.6	Describe the concept of Algebraic structure and Group theory, Boolean Algebra which helps to increase the logical skills.															

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

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MANIPAL UNIVERSITY JAIPUR
School of Computing and Information Technology
DEPARTMENT OF COMPUTER AND COMMUNICATION ENGINEERING
Course Hand-out

Economics | EO 2001 | 3 Credits | 3003

Session: July 21 – December 21 | Course coordinator: Dr Manas Roy | Class: B. Tech | Semester III

Faculty: 1. Dr Manas Roy, 2. Varuni Sharma

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

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

[2001.1] Describe the basic principles of micro and macroeconomic analysis.
[2001.2] Aware of the tools and techniques of economics and be able to prepare projects.
[2001.3] Recognize the problems and give solutions which in turn will lead to create employability.
[2001.4] Interpret and illustrate decision making process in practical life and hence enhance employability.
[2001.5] Apply the learning of economic concepts in their life.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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[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 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 are not just a slogan; it is to be practised in each action. Thus, a B Tech should understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

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

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

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

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

PROGRAM SPECIFIC OUTCOMES (PSOs)

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

[PSO1]. Imbibe the basic concepts and applications of computer-based Communication or networking, information sharing, signal processing, web-based systems, smart devices, and communication technology.

[PSO2]. Investigate prominent areas in the field of Computer and Communication Engineering to provide feasible solutions.

[PSO3]. Apply the contextual knowledge in the field of Computing and Communication to assess social, health, safety, and security issues relevant to the professional engineering practice.

D. ASSESSMENT RUBRICS:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	20
	Sessional Exam II (Closed Book)	20
	In class Quizzes and Assignments (Accumulated and Averaged)	10
	Assignments	10
End Term Exam (Summative)	End Term Exam	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to 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; Microeconomics: Consumer behaviour, cardinal and ordinal approaches of utility, law of diminishing marginal utility, theory of demand and supply, law of demand, exceptions to the law of demand, change in demand and change in quantity demanded, elasticity of demand and supply, consumer surplus and producer; Indifference curve, properties, consumer equilibrium, Price and income effect; **Production:** Law of production, production function, SR and LR production function, law of returns and returns to scale, Isoquant curve, characteristics, Iso-cost, producer's equilibrium; **Cost and revenue analysis:** Cost concepts, Opportunity cost, Incremental and sunk cost, Recurring and non-recurring cost, fixed and variable cost, short run and long- run cost and revenue curves**;** **Introduction to markets:** Characteristics and types, **Introduction to Macro Economics:** National Income, Monetary Policy, Fiscal Policy, Inflation and Business Cycle; **Economic decision making:** Cash flow and rate of return analysis, Pay - back period, Internal rate of return(IRR), Net present value(NPV), Time value of money.

F. TEXT- BOOKS

1. H.L Ahuja, Macroeconomics Theory and Policy, (20e) S. Chand Publication.

2. Peterson H C et.al., Managerial Economics, (9e), Pearson, 2012
3. P L Mehta, Managerial Economics, Sultan Chand & Sons, New Delhi, 2012.
4. G J Tuesen & H G Tuesen, Engineering Economics, PHI, New Delhi, 2008.
5. James L Riggs, David D Bedworth, Sabah U Randhawa, Engineering Economics, Tata - McGraw Hill, 2018.

G. LECTURE PLAN:

Lec. No	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1	Overview of the course structure, Introduction to Economics	To acquaint and clear the overview of the course	Lecture	NA	NA
2	Objective and scope of the course	Discussion of the objective of the course for the engineers, its scope, differences between micro and macro economics	Lecture	NA	NA
3,4,5,6	Introduction to Consumer Behaviour, Cardinal approaches of utility	Describe the concept of cardinal approach of utility, Law of DMU and equi-marginal utility	Lecture	2001.1	Class Test Mid Term I
7,8	Law of demand and supply	Describe the concept of demand, supply,	Lecture	2001.1	Class Test Mid Term I
9,10,11,12	Elasticity of demand and supply	Elasticity of demand and supply with examples, conceptual questions	Lecture	2001.1	Class Test Mid Term I
13,14,15,	Ordinal approaches of utility, Consumer and producer's surplus	Recall of the differences between the concept of the cardinal approach and ordinal approach of utility , IC analysis, Consumers equilibrium, IE,SE,PE, Consumer and Producer surplus	Lecture	2001.5	Class Test Mid Term I End Term
16	Revision of previous lectures	Recall all the concepts discussed in previous classes	Lecture, Activity		Home Assignment Mid Term I

					End term
17	Discussion of the topics related to assignment	Discussion about the assignment topics	Lecture	2001.5	Class Test Mid Term I End Term
18,19	Production, laws of production and return to scale	Discussion of the concept of production, recognize production function, producers equilibrium, RTS	Lecture	2001.4	Class Test Mid Term II End Term
20,21	Cost and revenue analysis	Discussion of the concept of different types of cost and cost function, recognize SR and LR cost curves, revenues	Lecture	2001.4	Class Test Mid Term II End Term
22,23	Types of Market Competition	Aware of market morphology with examples, Interpret the forms of market situations	Lecture	2001.3	Class Test Mid Term II End Term
24	Revision of previous lectures	Recall all the concepts discussed in previous classes	Lecture	2001.5	Class Test Mid Term II End Term
25	Discussion of the topics related to assignment	Recall the discussion about the assignment topics	Lecture, Activity	2001.5	Home Assignment Mid Term II End term
26,27	Macro Economics: National income and its concepts	Interpret and illustrate the concept of CB and various tools	Lecture	2001.2	Home Assignment Class Test End Term
28,29	Monetary and fiscal policies	Interpret and illustrate the concept of NI,GDP,GNI,PI etc., circular flow	Lecture	2001.2	Home Assignment Class Test End Term
30	Inflation	Concept of monetary and fiscal policies, Aware of its instruments, importance and limitations	Lecture	2001.3	Home Assignment Class Test End Term
31	Business Cycle	Concept of Business Cycles, Role of monetary and fiscal policy to counter business cycles	Lecture	2001.3	Home Assignment Class Test End Term
32, 33,34	Economic Decision Making	Cash flow and rate of return analysis, payback period,	Lecture	2001.3	Home Assignment Class Test

		IRR, NPV and Time value of money			End Term
35	Revision of Previous Lectures	Recall the discussion about the assignment topics	Lecture	2001.5	End Term
36	Conclusion and Course Summarization	Recall all the concepts discussed in previous classes	Lecture	2001.5	End Term
37	Quiz-I	Microeconomics	Quiz	NA	Internal Assessment
38	Quiz-II	Macroeconomics	Quiz	NA	Internal Assessment
39	Quiz-III	Microeconomics Macroeconomics Economic Decision Making	Quiz	NA	Internal Assessment

H. 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	
EO 2001.1	Describe the basic principles of micro and macroeconomic analysis		2	2													
EO 2001.2	Aware of the tools and techniques of economics and be able to prepare projects				2			2		1		2					
EO 2001.3	Recognize the problems and give solutions which in turn will create employability			2	3	2						2					
EO 2001.4	Interpret and illustrate decision making process in practical life						1			2		1	2				

	and hence enhance employability																
EO 2001.5	Apply the learning of economic concepts in their life						1	2					3				

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and IT

Department of Computer and Communication Engineering
Course Hand-out

Digital Design and Computer Architecture | CC 2101 | 4 Credits | 3 0 1 4

Session: July 21 – Nov. 21 | Faculty: Dr. Kusum Lata Jain, Dr. Vijay Kumar Sharma | Class: III Semester

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

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

- **[2101.1].** Describe digital components and digital logic circuits for computer system
- **[2101.2].** Describe various data representations and analyse the design of fast arithmetic circuits.
- **[2101.3].** Formulate assembly language programs for a given high level language construct.
- **[2101.4].** Describe various parts of a system memory hierarchy and caching techniques.
- **[2101.5].** Evaluate the performance of CPU, memory and I/O operations.
- **[2101.6].** Build the required skills to read and research the current literature in computer architecture.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

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

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

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

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

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

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

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

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

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

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

Program Specific Outcomes (PSOs)

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

[PSO.1] Imbibe the basic concepts and applications of computer-based Communication or networking, information sharing, signal processing, web-based systems, smart devices, and communication technology.

[PSO.2] Investigate prominent areas in the field of Computer and Communication Engineering to provide feasible solutions.

[PSO.3] Apply the contextual knowledge in the field of Computing and Communication to assess social, health, safety, and security issues relevant to the professional engineering practice.

D. Assessment Plan:

Criteria	Description	Date	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	Oct 7 – Oct 12	20
	Sessional Exam II (Closed Book)	Nov 04 – Nov 06	20
	Quizzes and Assignments (Accumulated and Averaged)	Regularly	20
End Term Exam (Summative)	End Term Exam (Closed Book)	Nov 29 – Dec 13	40
	Total		100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.		

E. SYLLABUS

Digital logic circuits: logic gates, Boolean algebra, map simplification, combinational circuits, flip-flops, sequential circuits; Digital components: Integrated circuits, decoders, multiplexers, registers, shift registers, binary counters; Memory unit: Von-Neumann model for computer/ VonNeumann architecture, performance; Machine instructions and programs: numbers, arithmetic operations and characters, memory locations and addresses, instructions and instruction sequencing, addressing modes, assembly language, additional instructions, encoding of machine instructions; Arithmetic: addition and subtraction of signed numbers, design of fast adders, multiplication of positive numbers, signed operand multiplication, fast multiplication, integer division, floating point numbers and operations; Introduction to CPU design: instruction interpretation and execution, micro-operation and their RTL specification, memory hierarchy, main memory, types and interfacing; Cache Memory: organization and operations, levels of caches; memory management module: paging and segmentation, virtual memory, disk memory, raids, back-up memory; RISC and CISC processors; Introduction to input/output processing: programmed controlled i/o transfer, interrupt controlled I/O transfer, DMA controller; Pipelining and pipeline hazards: design issues of pipeline architecture; Instruction level parallelism and advanced issues: introduction to interconnection network and practical issues.

References:

1. M. M. Mano, Computer System Architecture, (3e), Pearson Education, 2014.

2. C. Hamacher, Z. Vranesic, S. Zaky, Computer Organization, (6e), McGraw Hill, 2011.

3. J. P. Hayes, Computer Architecture and Organization, (3e), McGraw Hill, 2017.

4. T. L. Floyd, Digital Fundamentals, (10e), Pearson Education, 2014.

5. W. Stallings, Computer Organization and Architecture–Designing for Performance, (8e), Pearson Education, 2010.

H. Lecture Plan:

Lectures	Major Topics	Topics	Mode of Delivery	Corresponding CO	Mode Of Assessing CO
1-2	**Introduction**	Basic of computer Structure, Von-Neumann architecture , , Performance	**Lecture**	**2101.1,2101.3**	Mid Term I, Quiz & End Term
3-4	**Digital logic circuits**	Boolean algebra, logic gates,	**Lecture**	**2101.1**	Mid Term I, Quiz & End Term
5		map simplification, combinational circuits	**Lecture**	**2101.1**	Mid Term I, Quiz & End Term
6		sequential circuits, flip-flops	**Lecture**	**2101.1**	Mid Term I, Quiz & End Term
7	**Digital components:**	Integrated circuits, decoders,	**Lecture**	**2101.1**	Mid Term I, Quiz & End Term
8		Multiplexers	**Lecture**	**2101.1**	Mid Term I, Quiz & End Term
9		Registers, shift registers, binary counters	**Lecture**	**2101.1**	Mid Term I, Quiz & End Term
10	Machine Instructions and Programs	Numbers, Arithmetic Operations And Characters	Flipped Class	**2101.2**	Mid Term I, Quiz & End Term
11		Memory Locations and Addresses, Memory Operations	Lecture	**2101.2**	Mid Term I, Quiz & End Term

12		Instructions and Instruction Sequencing	Lecture	**2101.2**& **2101.3**	Mid Term I, Quiz & End Term
13		addressing modes	Lecture	**2101.2**& **2101.3**	Mid Term I, Quiz & End Term
14		assembly language,	Lecture	**2101.2**& **2101.3**	Mid Term I, Quiz & End Term
15		additional instructions, encoding of machine instructions	Lecture	**2101.2**& **2101.3**	Mid Term I, Quiz & End Term
16	Arithmetic	Addition and Subtraction of Signed Numbers	Flipped Class	**2101.2**	Mid Term I, Quiz & End Term
17		Design of Fast Adders	Lecture	**2101.2**& 1301.6	Mid Term I, Quiz & End Term
18		Carry Look Ahead Adders- Bit Stage Cell,	Lecture	**2101.2**& 1301.5	Mid Term I, Quiz & End Term
19		4 Bit CLA			Mid Term I, Quiz & End Term
20		Carry Look Ahead Adders 16 Bit	Lecture	**2101.2**& 1301.5	Mid Term I, Quiz & End Term
21		Tutorial	Activity	**2101.2**	Mid Term I, Quiz & End Term
22		Multiplication of Positive Numbers-Array Sequential Circuit	Flipped Class	**2101.2**& 1301.5	Mid Term I, Quiz & End Term
		MID TERM I			
23		Signed Operand Multiplication-Booth Algorithm	Lecture	**2101.2**	Mid Term II, Quiz & End Term
24		Fast Multiplication-Bit Pair Recoding Of Multipliers	Lecture	**2101.2**	Mid Term II, Quiz & End Term
25		Carry-save addition of summands	Flipped Class	**2101.2**	Mid Term II, Quiz & End Term

26		Integer Division-Restoring	Lecture	**2101.2**	Mid Term II, Quiz & End Term
27		Integer Division- Nonrestoring	Lecture	**2101.2**	Mid Term II, Quiz & End Term
28		Floating Point Numbers & Operation-Standards Exceptions, check to uncheck Exception	Lecture	**2101.2**	Mid Term II, Quiz & End Term
29		Arithmetic Operations on Floating Point Numbers	Lecture	**2101.2**	Mid Term II, Quiz & End Term
30		Examples on Arithmetic Operation on Floating Point Numbers	Lecture	**2101.2**	Mid Term II, Quiz & End Term
32		Tutorial	Activity	**2101.2**	Mid Term II, Quiz & End Term
33	Memory Systems	Memory Systems: Basic Concepts	Flipped Class	**2101.4**	Mid Term II ,Quiz & End Term
34		Speed, Size & Cost	Lecture	**2101.4**& **2101.5**	Mid Term II ,Quiz & End Term
35		Cache Memories- Mapping Functions	Lecture	**2101.4**& **2101.5**	Mid Term II ,Quiz & End Term
36		Replacement Algorithms	Lecture	**2101.4**& **2101.5**	Mid Term II ,Quiz & End Term
37		Example Of Mapping Techniques	Flipped Class	**2101.4**	Mid Term II , Quiz & End Term
		MID TREM II (Optional)			
38		Performance Considerations: Hit Rate & Miss Penalty, Caches on Processor Chip	Lecture	**2101.4**& **2101.5**	Mid Term II , Quiz & End Term
39		Virtual Memories	Lecture	**2101.4**& **2101.6**	Mid Term II , Quiz & End Term
40		Address Translation	Lecture	**2101.4**	Mid Term II , Quiz & End Term
41		Tutorial	Activity	**2101.4**	Mid Term II , Quiz & End Term
42		Accessing I/O Devices, Interrupts	Lecture	**2101.5**	Quiz & End Term
43		Programmed controlled I/O transfer	Lecture	**2101.5**	Quiz & End Term

44	Input / Output Processing	Program Controlled interrupt	Lecture	**2101.5**	Quiz & End Term
45		Interrupt called I/O transfer	Lecture	**2101.5**	Quiz & End Term
46		DMA	Lecture	**2101.5**&**2101.6**	Quiz & End Term
47	Instructional Level Parallelism	Pipelining	Flipped Class	**2101.5**	Quiz & End Term
48		Data Hazards	Lecture	**2101.5**	Quiz & End Term
49		Instruction Scheduling: Static and Dynamic	Lecture	**2101.6**& **2101.6**	Quiz & End Term
49		Control Hazard	Lecture	**2101.5**	Quiz & End Term
50		Branch Prediction	Lecture	**2101.5**	Quiz & End Term
51		Tutorial	Activity	**2101.5**	Quiz & End Term
		ENDTERM			

F. 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
2101.1	Describe the interconnection between various functional units of a computer system and able to assess the performance of a computer.	2	1									2	1	2	1	
2101.2	Describe various data representations and analyse the design of fast arithmetic circuits.	3	2										1	1	1	
2101.3	Formulate assembly language programs for a given high level language construct.	2	2	1								2	1	1		
2101.4	Describe various parts of a system memory hierarchy and caching techniques.	3	2										1		1	1
2101.5	Evaluate the performance of CPU, memory and I/O operations.	3	2	1									2	1	1	2
2101.6	Build the required skills to read and research the current literature in computer architecture.												2	1		

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

MANIPAL UNIVERSITY
JAIPUR
(University under Section 2(f) of the UGC Act)

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

DEPARTMENT OF COMPUTER AND COMMUNICATION ENGINEERING

Course Hand-out

Data Communications| CC2102| 4 Credits | 3 1 0 4

Session: Aug 2021-Dec 2021 | Faculty: Dr Gulrej Ahmed, Dr. Amita Nandal, Dr. Deepak Sinwar, Dr. Arvind Dhaka| Class: B.Tech III SEM

A. **Introduction:** This course is offered by Department of Computer & Communication Engineering which 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 Communications.

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

[CC 2102.1] Interpret the fundamental concepts of data communication, transmission media, and transmission impairments on analog and digital transmission.

[CC 2102.2] Outline the principles of signal encoding techniques used for digital data to digital signal conversion and analog data to digital signal conversion and compare them.

[CC 2102.3] Apply the knowledge of various error detection and correction techniques to find and overcome error encountered during transmission, and discuss flow control and error control techniques.

[CC 2102.4] Distinguish between different types of multiplexing techniques and spread spectrum techniques.

[CC 2102.5] Discuss various multiple access techniques and IEEE 802.X LAN Standards.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

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

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

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

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

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

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

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

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

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

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

D. Program Specific Outcomes (PSOs)

[PSO.1] Imbibe the basic concepts and applications of computer-based Communication or networking, information sharing, signal processing, web-based systems, smart devices, and communication technology.

[PSO.2] Investigate prominent areas in the field of Computer and Communication Engineering to provide feasible solutions.

[PSO.3] Apply the contextual knowledge in the field of computing and communication to assess social, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional engineering practice.

E. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Close Book)	20
	Sessional Exam II (Close Book)	20
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	20
End Term Exam (Summative)	End Term Exam (Close Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	

F. SYLLABUS

Introduction: General block diagram of communication system, Data communications, Protocol, Need for Protocol Architecture, OSI Model, TCP/IP Protocol Architecture; 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); Spread Spectrum: The Concept of Spread Spectrum, Frequency Hopping Spread Spectrum (FHSS), Direct Sequence Spread Spectrum (DSSS); Multiple Access- Aloha, Carrier Sense Multiple Access (CSMA), Carrier Sense Multiple Access with Collision Detection (CSMA/CD), Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA), Code-Division Multiple Access (CDMA); Introduction to IEEE 802.X LAN Standards.

G. Reference Books

1. I. W. Stallings, Data and Computer Communications, (10e), Pearson Education, 2014.
2. B. A. Forouzan, Data Communications & Networking, (5e), McGraw Hill, 2013.
3. D. P. Bertsekas, R. G. Gallager, Data Networks, (2e), Prentice Hall of India, 2011.
4. A. S. Tenenbaum, Computer Networks, (5e), Prentice Hall of India, 2008.
5. L. L. Peterson, B. S. Davie, Computer Networks: A Systems Approach, (5e), Morgan Kaufmann Publishers, 2011.

H. Lecture Plan:

Lecture No.	Major Topics	Topics	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1	**Introduction and course handout briefing**	**Course handout**	**Lecture**	**NA**	**NA**
1.	Introduction to Data Communication	Introduction: General block diagram of communication system, Data communications	Lecture	[2102.1]	Class Quiz Mid Term - 1 End Term
2.		Protocol, Need for Protocol Architecture, OSI Model	Lecture	[2102.1]	Class Quiz Mid Term - 1 End Term
3.		TCP/IP Protocol Architecture	Lecture & Activity	[2102.1]	Class Quiz Mid Term - 1 End Term
4.	Data Transmission	Concepts and Terminology – Simplex, Half-Duplex, Full-Duplex, Frequency, Bandwidth	Lecture	[2102.1]	Class Quiz Mid Term - 1 End Term
5.		Time Domain and Frequency Domain Concepts, Data Rate	Lecture & Problem Solving Practice	[2102.1]	Class Quiz Mid Term - 1 End Term
6.			Lecture	[2102.1]	

	Analog and Digital Data Transmission	Analog and Digital Data and Signals,			Class Quiz Mid Term - I End Term
7.		Analog and Digital Transmission	Lecture	[2102.1]	Class Quiz Mid Term - I End Term
8.	Transmission Impairments	Attenuation, Delay Distortion, Noise	Lecture & Problem Solving Practice	[2102.1]	Class Quiz Mid Term - I End Term
9.	Channel Capacity	Data Rate and Nyquist Bandwidth	Lecture	[2102.2]	Class Quiz Mid Term - I End Term
10.		Shannon Capacity Formula	Lecture & Problem Solving Practice	[2102.2]	Class Quiz Mid Term - I End Term
11.	Transmission Media: Guided Transmission Media	Twisted Pair & CAT Types	Lecture & Activity	[2102.2]	Class Quiz Mid Term - I End Term
12.		Coaxial Cable, Optical Fiber	Lecture	[2102.2]	Class Quiz Mid Term - I End Term
13.	Wireless Transmission	Antennas , Terrestrial Microwave	Lecture	[2102.2]	Class Quiz Mid Term - I End Term
14.		Satellite Microwave, Broadcast Radio, Infrared	Lecture & Problem Solving Practice	[2102.2]	Class Quiz Mid Term - I End Term
15.	Wireless Propagation	Ground Wave Propagation, Sky Wave Propagation	Lecture & Activity	[2102.2]	Class Quiz Mid Term - I End Term
16.		Line-of-Sight Propagation	Lecture & Problem Solving Practice	[2102.2]	Class Quiz Mid Term - I End Term
17.	Line-of-sight Propagation	Free Space Loss, Atmospheric Absorption,	Lecture &	[2102.2]	Class Quiz Mid Term - I End Term

		Multipath, Refraction	Problem Solving Practice		
FIRST SESSIONAL EXAM					
18.	Signal Encoding Techniques: Digital-To-Digital Conversion	Analog and Digital Signals, Line Coding Schemes: Unipolar, Polar	Lecture & Problem Solving Practice	[2102.2]	Class Quiz Mid Term - I End Term
19.		NRZ & Bipolar – AMI	Lecture & Problem Solving Practice	[2102.2]	Class Quiz Mid Term - I End Term
20.		Biphase – Manchester & Differential Manchester	Lecture & Problem Solving Practice	[2102.2]	Class Quiz Mid Term - I End Term
21.		Modulation Rate and Scrambling Techniques	Lecture & Problem Solving Practice	[2102.2]	Class Quiz Mid Term - I End Term
22.	Digital Data – Analog Signal	ASK & FSK	Lecture	[2102.2]	Class Quiz Mid Term - I End Term
23.		PSK – BPSK	Lecture	[2102.2]	Class Quiz Mid Term - I End Term
24.		MFSK	Lecture	[2102.2]	Class Quiz Mid Term - I End Term
25.		QAM	Lecture	[2102.2]	Class Quiz Mid Term - I End Term
26.	Analog-To-Digital Conversion	Pulse Code Modulation	Lecture & Problem Solving Practice	[2102.2]	Class Quiz Mid Term - I End Term
27.		Delta Modulation	Lecture	[2102.2]	Class Quiz Mid Term - I End Term

28.	Digital Data Communication Techniques	Asynchronous and Synchronous Transmission	Lecture	[2102.3]	Class Quiz Mid Term - I End Term
29.		Type of Error, Redundancy, Detection Vs Correction	Lecture	[2102.3]	Class Quiz Mid Term - II End Term
30.		Cyclic Redundancy Check	Lecture	[2102.3]	Class Quiz Mid Term - II End Term
31.		Polynomials & CRC Architecture	Lecture & Problem Solving Practice	[2102.3]	Class Quiz Mid Term - II End Term
32.		Error Correction and Block Code Principle	Lecture & Problem Solving Practice	[2102.3]	Class Quiz Mid Term - II End Term
33.		Line Configurations	Lecture	[2102.3]	Class Quiz Mid Term - II End Term
34.	Data Link Control Protocols	Framing	Lecture	[2102.3]	Class Quiz Mid Term - II End Term
35.		Flow Control - Stop-and-Wait Protocol	Lecture & Problem Solving Practice	[2102.3]	Class Quiz Mid Term - II End Term
36.		Sliding Window	Lecture & Problem Solving Practice	[2102.3]	Class Quiz Mid Term - II End Term
37.		Error Control: Stop-and-Wait ARQ	Lecture & Problem Solving Practice	[2102.3]	Class Quiz Mid Term - II End Term
38.	Data Link Control Protocols	Go-Back-N ARQ	Lecture & Problem Solving Practice	[2102.3]	Class Quiz Mid Term - II End Term
39.		Selective Repeat ARQ	Lecture & Problem Solving Practice	[2102.3]	Class Quiz Mid Term - II End Term
40.			Lecture	[2102.3]	

		High-Level Data Link Control (HDLC)			Class Quiz Mid Term - II End Term
41.	Multiplexing	Introduction to Multiplexing, Frequency Division Multiplexing (FDM)	Lecture	[2102.4]	Class Quiz Mid Term - II End Term
42.					
43.		Time-Division Multiplexing (TDM)	Lecture & Activity	[2102.4]	Class Quiz Mid Term - II End Term
44.	Spread Spectrum	The Concept of Spread Spectrum, Frequency Hopping Spread Spectrum (FHSS)	Lecture	[2102.4]	Class Quiz Mid Term - II End Term
45.		Slow and Fast FHSS	Lecture & Problem Solving Practice	[2102.4]	Class Quiz Mid Term - II End Term
46.		Direct Sequence Spread Spectrum (DSSS) Performance Consideration – FHSS and DSSS	Lecture & Problem Solving Practice	[2102.4]	Class Quiz Mid Term - II End Term
47.					
48.		Code Division Multiple Access (CDMA)	Lecture & Problem Solving Practice	[2102.4]	End Term
49.	IEEE 802.X LAN Standards	Introduction,	Lecture	[2102.5]	End Term
50.		LAN Standards	Lecture	[2102.5]	End Term
END TERM EXAM					

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

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES														
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
[CC 2102.1]	Interpret the fundamental concepts of data communication, transmission media, and transmission impairments on analog and digital transmission.	1	1							1	2		1	2	1	
[CC 2102.2]	Outline 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	
[CC 2102.3]	Apply the knowledge of various error detection and correction techniques to find and overcome error encountered during transmission, and discuss flow control and error control techniques.	3	2	1							1			2	2	1
[CC 2102.4]	Distinguish between different types of multiplexing techniques and spread spectrum techniques.	2								1	2			2	1	
[CC 2102.5]	Discuss various multiple access techniques and IEEE 802.X LAN Standards.	2						1					1	1	1	

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

A. 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
[CC 2102.1]	Interpret the fundamental concepts of data communication, transmission media, and transmission impairments on analog and digital transmission.															
[CC 2102.2]	Outline the principles of signal encoding techniques used for digital data to digital signal conversion and analog data to digital signal conversion and compare them.															
[CC 2102.3]	Apply the knowledge of various error detection and correction techniques to find and overcome error encountered during transmission, and discuss flow control and error control techniques.															
[CC 2102.4]	Distinguish between different types of multiplexing techniques and spread spectrum techniques.															
[CC 2102.5]	Discuss various multiple access techniques and IEEE 802.X LAN Standards.															

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and IT

DEPARTMENT OF COMPUTER AND COMMUNICATION ENGG.

Course Hand-out

Data Structures and Algorithms | CC2103 | 4 Credits | 3 1 0 4

Session: Aug 21 – Dec 21 | Faculty: Manoj K Bohra, Prashant Hemrajani, Suman Bhakar, Jitendra S Yadav | Class: III CCE

A. Introduction: This course is offered by Computer and Communication 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:

[CC 2103.1] explain basic concepts of various data structures

[CC 2103.2] describe how arrays, linked lists, stacks, queues, trees and graphs are represented in memory and their operations

[CC 2103.3] 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

[CC 2103.4] 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]. Imbibe the basic concepts and applications of computer-based Communication or networking, information sharing, signal processing, web-based systems, smart devices, and communication technology.

[PSO.2]. Investigate prominent areas in the field of Computer and Communication Engineering to provide feasible solutions.

[PSO.3]. Apply the contextual knowledge in the field of Computing and Communication to assess social, health, safety, and security issues relevant to the professional engineering practice.

D. Assessment Plan:

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

E. SYLLABUS

Introduction: algorithm specification; Performance analysis: time and space complexity, asymptotic notation; C revision: pointer declaration and definition, memory allocation functions, array of

pointers, structures in C, arrays of structures, structures and functions; Recursion in C; Linked list: implementation, various types and operations; Stack: implementations using array and linked list, operations and its applications; Queue: implementations using array and linked list, operations and its applications; Tree: terminologies, different types, implementations of binary tree using array and linked structure, binary search tree, different operations (recursive, non-recursive), red-black tree, AVL trees, B-tree, 2-3 tree, tree applications; Graph: representations, BFS, DFS; Searching techniques and hashing; Sorting.

F. Text Book

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:

Class Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1.	Introduction to the subject, course plan, course outcomes and assessment plan.	To acquaint and clear teachers expectations and understand student expectations	Lecture	NA	NA
2.	Introduction to data structures, Algorithm Specifications, How to Write Algorithms	define data structure and list various data structure.	Lecture	CC2103.1	Class Quiz End Term
3.	Performance Analysis- Time and Space Complexity, Asymptotic Analysis, Example, Functions in 'C', Example Programs on Functions	analyze time complexity of simple algorithms.	Lecture	CC2103.1 CC2103.1	Class Quiz Home Assignments I Sessional End Term
4.	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	CC2103.1 CC2103.2	Class Quiz Home Assignments I Sessional End Term
5.	Sorting Algorithms – Selection Sort, Bubble Sort and Insertion Sort	construct searching and sorting algorithms and write programs using single dimensional arrays.	Lecture	CC2103.2	Class Quiz Home Assignments I Sessional End Term
6.	Multidimensional Arrays, Two Dimensional Arrays: Declaration, Initialization, Addition of Two Matrices, Row Major and Column Major Representation	explain row major and column major memory allocation in 2-D arrays, Apply knowledge on two dimensional arrays in writing programs	Lecture	CC2103.1 CC2103.2	Class Quiz Home Assignments I Sessional End Term
7.	Example Programs on Two Dimensional Arrays, Row Major and Column Major Representation	apply knowledge on two dimensional arrays in writing programs.	Lecture	CC2103.2 CC2103.3	Class Quiz Home Assignments I Sessional End Term
8.	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	CC2103.1 CC2103.2	Class Quiz Home Assignments I Sessional End Term
9.	Dynamic Memory Allocation: Dynamic Array creation, Dynamic structure creation.	apply knowledge on pointers in writing programs.	Lecture	CC2103.1 CC2103.2	Class Quiz Home Assignments I Sessional End Term
10.	Problems solving by students on array	analyze the applicability of array as appropriate Data Structure to solve the problem and develop an	Tutorial	CC2103.3	Class Quiz Home Assignments I Sessional

		algorithm/program to provide the solution to a given problem through it.			End Term
11.	Problems solving by students on array	structure mapping and model a given real world problem into array.	Tutorial	CC2103.3	Class Quiz Home Assignments I Sessional End Term
12.	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	CC2103.1 CC2103.2	Class Quiz Home Assignments I Sessional End Term
13.	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	CC2103.1 CC2103.2	Class Quiz Home Assignments I Sessional End Term
14.	Singly Linked List: Operations (Continued)	implement singly linked list storage structure and basic operations (insertion, deletion and searching) defined over it.	Lecture	CC2103.1 CC2103.2	Class Quiz Home Assignments I Sessional End Term
15.	Circular Linked List: Introduction, Operations	understand and implement circular linked list storage structure and basic operations (insertion, deletion and searching) defined over it.	Lecture	CC2103.1 CC2103.2	Class Quiz Home Assignments I Sessional End Term
16.	Doubly Linked List: Introduction, Operations	understand and implement circular linked list storage structure and basic operations (insertion, deletion and searching) defined over it.	Lecture	CC2103.1 CC2103.2	Class Quiz Home Assignments I Sessional End Term
17.	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	CC2103.3	Class Quiz Home Assignments I Sessional End Term
18.	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	CC2103.3	Class Quiz Home Assignments I Sessional End Term
19.	Problems solving by students on linked list	structuring, mapping and model a given real world problem into linked list.	Tutorial	CC2103.3	Class Quiz Home Assignments I Sessional End Term
20.	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	CC2103.1 CC2103.3	Class Quiz Home Assignments II Sessional End Term
21.	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	CC2103.1 CC2103.2	Class Quiz Home Assignments II Sessional End Term

22.	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	CC2103.3	Class Quiz Home Assignments II Sessional End Term
23.	Evaluation of Expression written in Reverse Polish Notation Evaluation of Expression written in Infix Notation	evaluate the postfix(infix) expression using stacks	Lecture	CC2103.3	Class Quiz Home Assignments II Sessional End Term
24.	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	CC2103.3	Class Quiz Home Assignments II Sessional End Term
25.	Conversion of Expression from one Notation to Another	convert an infix expression to prefix notation using stack	Lecture	CC2103.3	Class Quiz Home Assignments II Sessional End Term
26.	Problems solving by students on stack applications	develop recursive code, to handle the problem using stacks, to analyze the applicability of stack with respect to a given problem	Tutorial	CC2103.3	Class Quiz Home Assignments II Sessional End Term
27.	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	CC2103.1 CC2103.2	Class Quiz Home Assignments II Sessional End Term
28.	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	CC2103.1 CC2103.2	Class Quiz Home Assignments II Sessional End Term
29.	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	CC2103.1 CC2103.2	Class Quiz Home Assignments II Sessional End Term
30.	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	CC2103.3	Class Quiz Home Assignments II Sessional End Term
31.	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	CC2103.1 CC2103.2	Class Quiz Home Assignments II Sessional End Term
32.	Binary Search Tree: Deletion of Node, Determining Height	describe about deletion of a node in BST and computing height	Lecture	CC2103.2	Class Quiz Home Assignments II Sessional End Term

33.	Binary Search Tree: Traversal (In-order, Pre-order and Post- order)	explain different traversal in BST	Lecture	CC2103.2	Class Quiz Home Assignments II Sessional 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	CC2103.1 CC2103.2	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	CC2103.2	Class Quiz Home Assignments End Term
36.	2-3 Tree	Applications AVL tree	Lecture	CC2103.1 CC2103.2	Class Quiz Home Assignments End Term
37.	Red black Tree	Describe the definition and its operations	Lecture	CC2103.1 CC2103.2	Class Quiz Home Assignments End Term
38.	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	CC2103.1 CC2103.2	Class Quiz Home Assignments End Term
39.	Problems solving by students on tree and its use	construct BST and AVL tree from given sequence of values	Tutorial	CC2103.3	Class Quiz Home Assignments End Term
40.	Problems solving by students on tree and its use	construct heap from given sequence of values and implement priority queue	Tutorial	CC2103.3	Class Quiz Home Assignments End Term
41.	Graphs: Introduction, Basic Terminology, Applications, Representation of Graphs: Adjacency Matrix Representation	describe representation of graph in term of adjacency matrix with their complexity	Lecture	CC2103.1 CC2103.2	Class Quiz Home Assignments End Term
42.	Representation of Graphs: Adjacency List Representation	describe representation of graph in term of adjacency list with their complexity	Lecture	CC2103.1 CC2103.2	Class Quiz Home Assignments End Term
43.	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	CC2103.2	Class Quiz Home Assignments End Term
44.	Minimum Spanning Tree, Prims Algorithm, Kruskal's Algorithm	understand the application of graph such as TSP problem	Lecture	CC2103.2	Class Quiz Home Assignments End Term
45.	Shortest Path Algorithms: Dijkstra's Algorithm, Floyd's Algorithm	understand the application of graph such as computer networking(Routing System)	Lecture	CC2103.2	Class Quiz Home Assignments End Term
46.	Hashing: Introduction, Applications, Hash Functions	describe different hashing techniques/functions	Lecture	CC2103.1 CC2103.2 CC2103.4	Class Quiz Home Assignments End Term

47.	Hash Collisions, Collision Resolution: Open Addressing, Chaining	describe different collision resolving techniques with examples	Lecture	CC2103.1 CC2103.2	Class Quiz Home Assignments End Term
48.	Problems solving by students on soring and its application	develop program for searching and sorting	Tutorial	CC2103.3	Home Assignments End Term

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

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES **(POs)**												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES **(PSOs)**		
		PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
[CC2103.1]	explain basic concepts of various data structures	3	2										2	3		
[CC2103.2]	describe how arrays, linked lists, stacks, queues, trees and graphs are represented in memory and their operations		1	2									2		2	2
[CC2103.3]	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
[CC2103.4]	describe and analyze various sorting algorithms like bubble, selection, insertion, merge sort, heap sort and quick sort		1	2									2	2		1

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

DEPARTMENT OF COMPUTER AND COMMUNICATION ENGINEERING

Course Hand-out

Object Oriented Programming using Java | CC 2104 | 4 Credits | 3 1 0 4

Session: Aug 21-Nov 21 | Faculty: Dr. Punit Gupta, Dr. Sourabh Singh Verma, Mr. Vivek Sharma and Dr. Ghanshyam Raghuwanshi | Class: BTech CCE III SEM | Sec: A|B|C|D

A. Introduction: This course is offered by the Department of Computer and Communication Engineering as object oriented techniques have revolutionized the software development process and are used tremendously in IT industry to develop software products of various kinds. The course is designed to give students an in-depth understanding of the basic concepts of object-oriented programming such as encapsulation, inheritance and polymorphism using Java programming language as an aid in tool. The course curriculum and structure has been divided into eight basic modules which covers the programming aspects related with object oriented domain such as exception handling, multithreading, GUI programming, event handling etc. The course will be taught with the help of several teaching aides such as power point presentation and via live debugging and execution demonstrations of several programming problems using Eclipse tool. The main objective of the course is to teach students about the basics of classes and objects using Java programming language, to enable the students to properly use the basic object oriented pillars such as encapsulation, inheritance and polymorphism, to enable the students to understand the basic difference between a class and an interface, to teach students about the implementation aspect of various basic data structures such as Linked Lists and Arrays using object oriented techniques.

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

[CC 2104.1] Apply to compile and execute Java Application using Command Based Interface as well as using Eclipse Tool.

[CC 2104.2] Identify and implement the concepts of encapsulation and abstraction using class, objects and interfaces for better programming skills.

[CC 2104.3] Describe and Implement various inheritance and polymorphism forms using Java Classes and Interfaces.

[CC 2104.4] Implement various collection data structure such as linked lists, queues, stacks using Java's collection framework

[CC 2104.5] Apply, Learn and finally implement the use of advanced programming constructs/features such as exception handling, multithreading and event handling in real-life programming domains.

[CC 2104.6] Visualize a real world problem in the form of various collaborating classes and objects for enhancing employability.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

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

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

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

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

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

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

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

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

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

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

[PSO.1] Imbibe the basic concepts and applications of computer-based Communication or networking, information sharing, signal processing, web-based systems, smart devices, and communication technology.

[PSO.2] Investigate prominent areas in the field of Computer and Communication Engineering to provide feasible solutions.

[PSO.3] Apply the contextual knowledge in the field of Computing and Communication to assess social, health, safety, and security issues relevant to the professional engineering practice**.**

Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	20
	Sessional Exam II (Closed Book)	20
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	20
End Term Exam (Summative)	End Term Exam (Closed Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked	

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

D. 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;

E. REFERENCE BOOKS

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

F. Lecture Plan:

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

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

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

CO	STATEMENT	Correlation with Program Outcomes(POs)												Correlation with Program Specific Outcomes (**PSOs**)		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
[CC 2104.1]	Apply to compile and execute Java Application using Command Based Interface as well as using Eclipse Tool.	**1**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**1**	**1**	**1**	**1**	**2**	**-**	**-**
[CC 2104.2]	Identify and implement the concepts of encapsulation and abstraction using class, objects and interfaces for better programming skills.	**2**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**1**	**2**	**-**	**-**
[CC 2104.3]	Describe and Implement various inheritance and polymorphism forms using Java Classes and Interfaces.	**3**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**1**	**3**	**-**	**-**
[CC 2104.4]	Implement various collection data structure such as linked lists, queues, stacks using Java's collection framework	**3**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**1**	**2**	**-**	**-**
[CC 2104.5]	Apply, Learn and finally implement the use of advanced programming constructs/ features such as exception handling, multithreading and event handling in real-life programming domains.	**3**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**1**	**2**	**1**	**2**
[CC 2104.6]	Visualize a real world problem in the form of various collaborating classes and objects for enhancing employability.	**1**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**1**	**-**	**-**	**2**	**2**	**1**	**3**

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

DEPARTMENT OF COMPUTER AND COMMUNICATION ENGINEERING

Course Hand-out

Data Communications Lab| CC2130| 3 Credits | 0 0 2 1

Session: Aug 2021-Dec 2021 | Faculty: Dr Gulrej Ahmed, Dr. Amita Nandal, Dr. Deepak Sinwar, Dr. Arvind Dhaka| Class: B.Tech III SEM

A. Introduction: This laboratory course is offered by the Department of Computer and Communication Engineering and aims to facilitate the practical understanding of the concepts and principals being discussed in the course - Data Communications. Students will be able to perform experiments related to digital modulation techniques, analog data to digital signal encoding techniques, multiplexing techniques and multiple accessing techniques & wireless open access research protocol (WARP) boards.

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

[CC 2130.1] Analyze and interpret signals and working of basic equipment (Function Generator and Digital Storage Oscilloscope (DSO)).

[CC 2130.2] Demonstrate various digital modulation, demodulation techniques in data communications.

[CC 2130.3] Identify multiplexing and multiple accessing techniques and trace the corresponding waveforms.

[CC 2130.4] Experiment with packet tracer & wireless open access research protocol (WARP) boards to get real time exposure of Data Link Layer operations.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

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

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

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

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

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

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

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

settings.

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

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

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

D. Program Specific Outcomes (PSOs)

[PSO.1] Imbibe the basic concepts and applications of computer-based Communication or networking, information sharing, signal processing, web-based systems, smart devices, and communication technology.

[PSO.2] Investigate prominent areas in the field of Computer and Communication Engineering to provide feasible solutions.

[PSO.3] Apply the contextual knowledge in the field of computing and communication to assess social, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional engineering practice.

E. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Continuous assessment (Lab records, Performance in Lab, Viva- Voce and mini-project)	70
End Term Exam (Summative)	End Term Exam (2 Hr. Lab Exam including Viva-Voce)	30
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

F. SYLLABUS

Signal Modulation Techniques: ASK, PSK, FSK, Pulse Code Modulation (PCM), Delta Modulation; CDMA; Various Line Coding Techniques; Packet Tracer: Introduction, PC to PC Communication using Crossover Cable, Star Topology Using Hub and Switch as Network Devices; Study using Wireless Open Access Research Platform (WARP).

G. Reference Books

1. W. Stallings, Data and Computer Communications, (10e), Pearson Education, 2014.
2. B. A. Forouzan, Data Communications & Networking, (5e), McGraw Hill, 2013.
3. D. P. Bertsekas, R. G. Gallager, Data Networks, (2e), Prentice Hall of India, 2011.
4. A. S. Tenenbaum, Computer Networks, (5e), Prentice Hall of India, 2008.
5. L. L. Peterson, B. S. Davie, Computer Networks: A Systems Approach, (5e), Morgan Kaufmann Publishers, 2011.

H. Laboratory Plan:

Lab No	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1.	Introduction and Course Hand-out briefing	To acquaint and clear teachers expectations and understand student expectations	Lecture/Discussion	NA	NA
2.	To analyze signal using Function Generator and Digital Storage Oscilloscope (DSO)	To get acquainted with the working of essential equipment (Function Generator and Digital Storage Oscilloscope (DSO))	Demonstration and Practically performing	CC2130.1	Internal Evaluation End Term Exam
3.	To analyze a PCM system and interpret the modulated and demodulated waveforms	To perform and visualize waveforms that occur at various steps involved in PCM; Sampling, Quantization and Encoding.	Demonstration and Practically performing	CC2130.2	Internal Evaluation Project End Term Exam
4.	To analyze a BPSK modulation system and interpret the modulated and demodulated waveforms.	To identify the need of analog modulation and visualize how the two different phases of carrier is used to represent the digital signal	Demonstration and Practically performing	CC2130.2	Internal Evaluation Project End Term Exam
5.	To analyze a DPCM system and interpret the modulated and demodulated waveforms.	To identify the need of DPCM as compared to PCM and visualize the DPCM modulated and demodulated signals.	Demonstration and Practically performing	CC2130.2	Internal Evaluation Project End Term Exam
6.	To analyze a Delta modulation system and interpret the modulated and demodulated waveforms.	To comprehend the advantages of Delta modulation over PCM and understand the issues involved in Delta modulation.	Demonstration and Practically performing	CC2130.2	Internal Evaluation Project End Term Exam
7.	To analyze Frequency Division Multiplexing and De-multiplexing technique and draw its waveforms.	To visualize the FDM multiplexing technique by performing it experimentally	Demonstration and Practically performing	CC2130.3	Internal Evaluation End Term Exam
8.	To analyze a CDMA-DSSS modulation system and interpret the modulated and demodulated waveforms.	To firmly grasp the working principle of spread spectrum and visualize the use of PN Sequence to spread and de-spread the signal at transmitter and receiver.	Demonstration and Practically performing	CC2130.3	Internal Evaluation End Term Exam
9.	To understand working of packet tracer & create star topology using switch.	To get acquainted with the simulated environment of software tool by Cisco.	Demonstration and Practically performing	CC1530.4	Internal Evaluation End Term Exam
10.	To understand working of WARP boards.	To get acquainted with WARP boards.	Demonstration and Practically performing	CC2130.4	Internal Evaluation End Term Exam
11.	To perform networking with WARP boards.	To get acquainted with networking with WARP boards.	Demonstration and Practically performing	CC2130.4	Internal Evaluation End Term Exam

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

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CC 2130.1	Analyze and interpret signals and working of basic equipment (Function Generator and Digital Storage Oscilloscope (DSO)).	**3**												**3**		
CC 2130.2	Demonstrate various digital modulation, demodulation techniques in data communications.	**3**	**2**	**2**	**2**	**2**								**2**		
CC 2130.3	Identify multiplexing and multiple accessing techniques and trace the corresponding waveforms.	**3**	**2**	**2**										**2**	**1**	
CC 2130.4	Experiment with packet tracer and wireless open access research protocol (WARP) boards to get real time exposure of Data Link Layer operations.	**3**	**2**	**2**	**2**	**2**							**2**	**3**	**2**	**1**

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

J. Course Outcome Attainment Level Matrix:

CO	STATEMENT	ATTAINMENT OF PROGRAM OUTCOMES **THRESHOLD VALUE: 40%**												ATTAINMENT OF PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CC 2130.1	Analyze and interpret signals and working of basic equipment (Function Generator and Digital Storage Oscilloscope (DSO)).															
CC 2130.2	Demonstrate various digital modulation, demodulation techniques in data communications.															
CC 2130.3	Identify multiplexing and multiple accessing techniques and trace the corresponding waveforms.															
CC 2130.4	Experiment with packet tracer and wireless open access research protocol (WARP) boards to get real time exposure of Data Link Layer operations.															

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and IT

DEPARTMENT OF COMPUTER AND COMMUNICATION ENGG.

Course Hand-out

Data Structures and Algorithms Lab | CC2131 | 1 Credits | 0 0 2 1

Session: Aug 21 – Dec 21 | Faculty: Manoj K Bohra, Prashant Hemrajani, Suman Bhakar, Jitendra S Yadav | Class: 3rd Sem. CCE

A. Introduction: This course is offered by Computer and Communication 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:

[CC 2131.1] explain basic concepts of various data structures

[CC 2131.2] implement various data structures and their operations

[CC 2131.3] 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

[CC 2131.4] 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]. Imbibe the basic concepts and applications of computer-based Communication or networking, information sharing, signal processing, web-based systems, smart devices, and communication technology.

[PSO.2]. Investigate prominent areas in the field of Computer and Communication Engineering to provide feasible solutions.

[PSO.3]. Apply the contextual knowledge in the field of Computing and Communication to assess social, health, safety, and security issues relevant to the professional engineering practice.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Continuous Assessments	60
Exam (Summative)	Exam (Small Project/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 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

Array: application using arrays (1-D, 2-D), string operations; Linked list: applications (singly, doubly, circular, etc) like polynomial addition and multiplications, etc, Stack and queue: applications of stacks (like arithmetic expression conversion and evaluation, etc), applications of queue; Binary tree: creation, deletion and traversal techniques, Binary search tree operations, AVL tree; sorting and searching techniques.

F. Text Book

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

G. REFERENCES

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.*

R6. *https://www.geeksforgeeks.org*

R7. *https://www.hackerearth.com/*

H. Lecture Plan:

Class Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1.	Programs based on 1-D array operations	describe and implement various operations on 1-D array	Lab	CC2131.1 CC2131.3	Internal Evaluation Home Assignments External Evaluation
2.	Programs based on 2-D array operations	describe and implement various operations on 2-D array	Lab	CC2131.1 CC2131.3	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	CC2131.1 CC2131.2	Internal Evaluation Home Assignments External Evaluation
4.	Programs to implement singly linked-list list operations	describe and implement various operations on one way linked list	Lab	CC2131.2 CC2131.3	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	CC2131.1 CC2131.2	Internal Evaluation Home Assignments External Evaluation
6.	Programs to implement stack and its operations	describe and simulate stack and its operations	Lab	CC2131.2 CC2131.3	Internal Evaluation Home Assignments External Evaluation
7.	Programs based on implementation of stack	describe and implement various application programs on stack	Lab	CC2131.1 CC2131.2	Internal Evaluation Home Assignments External Evaluation
8.	Programs based on implementation of queue and its operations	describe and implement various application programs on queue, and priority queue	Lab	CC2131.2 CC2131.3	Internal Evaluation

					Home Assignments External Evaluation
9.	Programs to implement tree and its operations	describe and implement various operations on Binary search tree	Lab	CC2131.1 CC2131.2 CC2131.3	Internal Evaluation Home Assignments External Evaluation
10.	Programs based on implementation of trees	describe and implement various operations on Binary search tree	Lab	CC2131.3	Internal Evaluation Home Assignments External Evaluation
11.	Programs to implement graph and its operations	describe and implement various operations on graph	Lab	CC2131.1 CC2131.2	Internal Evaluation Home Assignments External Evaluation
12.	Programs based on implementation of graphs	describe and implement programs on application of graph	Lab	CC2131.2 CC2131.3	Internal Evaluation Home Assignments External Evaluation
13.	Programs to perform sorting using different sorting techniques over data	describe and implement various sorting and searching techniques	Lab	CC2131.2 CC2131.4	Internal Evaluation Home Assignments External Evaluation

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

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES **(POs)**												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES **(PSOs)**		
		PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
[CC2131.1]	explain basic concepts of various data structures	2	2										2	3		
[CC2131.2]	implement various data structures and their operations		1	3									2		1	2
[CC2131.3]	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		1	2
[CC2131.4]	describe and analyze various sorting algorithms like bubble, selection, insertion, merge sort, heap sort and quick sort		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 COMPUTER AND COMMUNICATION ENGINEERING

Course Hand-out

Object Oriented Programming using Java Lab | CC 2132 | 1 Credit | 0 0 2 1

Session: Aug 21-Dec 21 | Faculty: Dr. Punit Gupta, Dr. Sourabh Singh Verma, Mr Vivek Sharma and Dr. Ghanshyam Raghuwanshi | Class: BTech CCE III SEM | Sec: A|B|C|D

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

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

[CC 2132.1] Apply to compile and execute Java Application using Command Based Interface as well as using Eclipse Tool.

[CC 2132.2] Identify basic programming construct of Java language Learn and implement the concepts of encapsulation and abstraction using class, objects and interfaces for better programming skills.

[CC 2132.3] Identify and develop different classes based on real world scenario.

[CC 2132.4] Analyze and experiment with different class to demonstrate polymorphism and inheritance and exception handling model

[CC 2132.5] Apply Multi-threading Model and built classes to demonstrate multi-threading programming.

[CC 2132.6] Visualize a real world problem in the form of various collaborating classes and objects for enhancing employability.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

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

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

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

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

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

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

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

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

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

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

[PSO.1] Imbibe the basic concepts and applications of computer-based Communication or networking, information sharing, signal processing, web-based systems, smart devices, and communication technology.

[PSO.2] Investigate prominent areas in the field of Computer and Communication Engineering to provide feasible solutions.

[PSO.3] Apply the contextual knowledge in the field of Computing and Communication to assess social, health, safety, and security issues relevant to the professional engineering practice**.**

D. Assessment Plan:

Criteria	Description	Maximum Marks
Criteria	**Description**	**Maximum Marks**
Internal Assessment (Summative)	Weekly evaluation (record+execution+viva+Mini Project)	60
End Term Exam (Summative)	End Term Exam	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who misses a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work at home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

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

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

F. REFERENCE BOOKS

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

G. Lecture Plan:

Class Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1-2	Introduction to Eclipse IDE and Java Basics	Understand project structure of eclipse and learn how to compile and run java program.	Lecture	CO 1	Continuous Evaluation, Project
3-4	Reading Inputs and Basics of Class Design	Demonstrate the use of class and Build class to model real world object and their behaviour	Lecture Demonstration	CO 1 and CO 2	Continuous Evaluation, Project
5-6	Packages, Arrays and Vectors in Java Inheritance in Java	Understand polymorphism and experiment with different class to model inheritance	Demonstration	CO 2 and CO 3	Continuous Evaluation, Project
7-8	Exception Handling in Java , String Handling in Java	Analyze different exception classes and experiment with different construct to handle them.	Lecture Demonstration	CO 2 and CO 3	Continuous Evaluation, project, End Term
9-10	Multithreading in Java	Illustrate multithreading programming and solve real world problem using multithreading model	Lecture Demonstration	CO 2, CO 3 and CO 4	Continuous Evaluation, project, End Term
11-12	Collections Framework in Java	Analyze real world scenario and develop GUI and event handler to solve problem	Lecture Demonstration	CO 2, CO 3 and CO 5	Continuous Evaluation, project, End Term

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

CO	STATEMENT	Correlation with Program Outcomes(POs)												Correlation with Program Specific Outcomes (**PSOs**)		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
[CC 2132.1]	Learn to compile and execute Java Application using Command Based Interface as well as using Eclipse Tool.	1				1								1		
[CC 2132.2]	Identify basic programming construct of Java language Learn and implement the concepts of encapsulation and abstraction using class, objects and interfaces for better programming skills.	1	1	1		1								1		
[CC 2132.3]	Identify and develop different classes based on real world scenario.	1	2	2	1	1								2		3
[CC 2132.4]	Analyze and experiment with different class to demonstrate polymorphism and inheritance and exception handling model	1	2	2	1	1								2		
[CC 2132.5]	Apply Multithreading Model and built classes to demonstrate multi-threading programming.	1	2	2	1	1								2		
[CC 2132.6]	Visualize a real world problem in the form of various collaborating classes and objects for enhancing employability	1	2	1	1	-	-	-	-	1	-	-	2	2	-	3

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Computer and Communication Engineering

Course Hand-out

Value, Ethics & Governance | BB 0025 | 1 Credits | 2 0 0 2

Session: Jan 22 – May 22 | Faculty: Dr Anjalee Narayan | Class: BTech IV Semester

A. COURSE INTRODUCTION: This course helps students to improve understanding of values, ethics and governance so that we help them become responsible citizens of the country.

B. COURSE OUTCOMES: At the end of the course, students will be able to

[0025.1] To improve understanding of values, ethics, and corporate governance so that we produce responsible citizens for the larger society.
[0025.2] Define the meaning and relevance of value and ethics and apply in personal and professional life.
[0025.3] Describe the importance of three Gunas for self-development, lifelong learning, and growth.
[0025.4] Explain the relevance of Companies Act 2013 with reference to corporate world.
[0025.5] Find issues and identify solutions related to public and private governance systems.
[0025.6] Demonstrate the social and environmental responsibilities of corporate for sustainability, harmony and growth.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

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

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

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

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

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

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

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

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

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

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

Program Specific Outcome

[PSO.1] Imbibe the basic concepts and applications of computer-based Communication or networking, information sharing, signal processing, web-based systems, smart devices, and communication technology.

[PSO.2] Investigate prominent areas in the field of Computer and Communication Engineering to provide feasible solutions.

[PSO.3] Apply the contextual knowledge in the field of Computing and Communication to assess social, health, safety, and security issues relevant to the professional engineering practice.

D. ASSESSMENT PLAN:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I	20
	Sessional Exam II	20
	In Class Assignments	20
End Term Exam (Summative)	End Term Exam	40
	Total	100

E. SYLLABUS

Value: Meaning & Relevance of Value Education. **Mantra for Success**: Meaning & perspective of Values, Morals & Ethics, Determinants of human nature (Three Gunas), Kinds of Value and their relevance with examples. Understanding Harmony at Various Levels, Nature, in existence. **Relevance of Personality traits like** Attitude & Behaviour, Sigmund Freud Theory of Ego, Character, introspection, Motivation. **Leadership traits:** 4Qs (PQ, IQ, EQ, SQ), Professional Ethics, Ethical Conflict, Ethical Dilemmas. **Governance:** Understanding of Public and Private sector Governance systems, **Companies Act 2013:** Its Salient Features, Roles & Responsibilities of Directors & Regulatory Authorities. Public Finance: – Scope, Principals, Role of Audit & Control, Relevance of Ethics in Governance. **Corporate Social Responsibility (CSR):** Meaning, Importance and Responsibility under CSR, CSR Models, Best Practices & Triple Bottom Line concept.

F. TEXTBOOKS

No textbooks for this course/ Recorded video of contents are provided.

G. REFERENCE BOOKS

- Gaur R.R., Sangal R. and. Bagaria, G.P: "A Foundation Course in Human Values Professional Ethics," Excel Books, 2010.
- Sadri S & Sadri, J Business Excellence Through Ethics & Governance, 2nd edition, 2015
- Mathur, U C Corporate Governance and business ethics, MacMillan India Ltd, Latest Edition
- Baxi, C V: Corporate Governance, Excel Books, Latest Edition

- Sadri S, Sinha A K and Bonnerjee, P: Business Ethics: concepts and cases, TMH, Latest Edition

H. LECTURE PLAN:

SESSION NO.	TOPICS	Session Objective	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
Lecture/Video 1	Introduction of the course, Syllabus	To acquaint and clear teacher's expectations and understand student expectations.	Lecture, Presentation	BB0025.1	Mid Term I End Term Exam
Lecture/Video 2	Introduction: Values: Meaning & Relevance of value education	To learn the Basics of Value Education and its relevance.	Lecture, Presentation	BB0025.1	Mid Term I End Term Exam
Lecture /Video 3	Success: Meaning in perspective of morals & ethics	To understand the concept of success achieved with or without morals / ethics/ values.	Lecture, Presentation	BB0025.1	Mid Term I End Term Exam
Lecture/Video 4	Three Gunas and their relevance, Nature, and kinds of value with examples	To understand basic traits in one's personality, its causes and relevance with value-based living.	Lecture, Presentation	BB0025.3	Mid Term I End Term
Lecture/Video 5	Understanding Harmony at Various Levels, Nature, in existence	To acquaint with the concepts of harmony at various levels.	Lecture, Presentation	BB0025.1 BB0025.2	Mid Term I End Term
Lecture/Video 6	Relevance of Personality	To acquaint & develop positive traits of personality in oneself.	Lecture, Presentation	BB0025.3	Mid Term I End Term
Lecture/Video 7	Relevance of Attitude & Behaviour	To acquaint & develop positive traits of personality in oneself.	Lecture, Presentation	BB0025.2	Mid Term I End Term
Lecture/Video 8	Sigmund Freud Theory of Ego	To understand the concepts of theory of ego	Lecture, Presentation	BB0025.3	Mid Term I End Term
Lecture/Video 9	Character, introspection, Motivation	To acquaint & develop positive traits of personality in oneself and understand negative traits.	Lecture, Presentation	BB0025.2	Mid Term I End Term
Lecture/Video 10	Leadership traits	To realize importance of	Lecture, Presentation	BB0025.2	Mid Term I End Term

		leadership and to imbibe in life.			
Lecture/Video 11	4Qs (PQ, IQ, EQ, SQ)	To acquaint with 4Qs.	Lecture, Presentation	BB0025.2	Mid Term I End Term
Lecture/Video 12	Professional Ethics	To understand the role of professional ethics in the life & deal with dilemmas.	Lecture, Presentation	BB0025.1 BB0025.2	Mid Term I End Term Exam
Lecture/Video 13	Ethical Conflict	To understand the importance of ethical conflict.	Lecture, Presentation	BB0025.1 BB0025.2	Mid Term I End Term Exam
Lecture/Video 14	Ethical Dilemmas	To understand the role of professional ethics in the life & deal with dilemmas.	Lecture, Presentation	BB0025.1 BB0025.2	Mid Term I End Term Exam
Lecture/Video 15	Introduction to Governance	To acquaint with the concept of Governance.	Lecture, Presentation	BB0025.5	Mid Term II End Term
Lecture/Video 16	Public Sector Governance: Part I	To understand various aspects of public sector governance.	Lecture, Presentation	BB0025.5	Mid Term II End Term
Lecture/Video 17	Public Sector Governance: Part II	To understand various aspects of public sector governance.	Lecture, Presentation	BB0025.5	Mid Term II End Term
Lecture/Video 18	Companies Act 2013: Roles & Responsibilities of Directors & Regulatory Authorities	To explain various Regulations and practices of Corporate Governance internationally & understand key role of directors.	Lecture, Presentation	BB0025.4	Mid Term II End Term
Lecture/Video 19	Companies Act 2013: Salient Features	To explain various Regulations and practices of Corporate Governance internationally & understand key role of directors.	Lecture, Presentation	BB0025.4	Mid Term II End Term
Lecture/Video 20	Private Sector Governance	To understand meaning of proprietary & partnership in a firm / company and its perspectives.	Lecture, Presentation	BB0025.5	Mid Term II End term
Lecture/Video 21	Public Finance: – Scope & Principals	To understand basics of Public Finance, audit & control.	Lecture, Presentation	BB0025.5	End Term

Lecture/Video 22	Public Finance: - Audit & Control	To understand basics of Public Finance, audit & control.	Lecture, Presentation	BB0025.5	End Term
Lecture/Video 23	Relevance of Ethics in Governance	To recognize the necessity of ethics & transparency in Governance.	Lecture, Presentation	BB0025.1 BB0025.5	End Term
Lecture/Video 24	CSR: Meaning, Importance and Responsibility under CSR	To understand the relevance of giving back to society by a corporate & its importance in society.	Lecture, Presentation	BB0025.6	End Term
Lecture/Video 25	CSR: Models and Best Practices	To understand the various models of CSR used by corporates and their best practices.	Lecture, Presentation	BB0025.6	End Term
Lecture/Video 26	CSR: Policy	To understand CSR policy of India and its impact on Business organisation.	Lecture, Presentation	BB0025.6	End Term
Lecture/Video 27	Triple Bottom Line	To understand the concept of TBL in organizational frameworks.	Lecture, Presentation	BB0025.6	End Term

I. COURSE ARTICULATION MATRIX: (MAPPING OF COS WITH POS)

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

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOME												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO8	PO9	PO10	PO11	PO 12	PSO 1	PSO 2	PSO 3
BB0025.1	To improve understanding of values, ethics, and corporate governance so that we produce responsible citizens for the larger society.	1						2							1	
BB0025.2	Define the meaning and relevance of value and ethics and apply in personal and professional life.		2													2
BB0025.3	Describe the importance of three Gunas for self-development, lifelong learning, and growth.		3					3							2	
BB0025.4	Explain the relevance of Companies Act 2013 with reference to corporate world.	2												3		
BB0025.5	Find issues and identify solutions related to public and private governance systems.				1	2										
BB0025.6	Demonstrate the social and environmental responsibilities of corporate for sustainability, harmony, and growth.						2	2								

MANIPAL UNIVERSITY
JAIPUR

School of Computing and Information Technology

Department of CCE, CSE, IT

Course Hand-out

Engineering Mathematics IV | MA2201| 3 Credits | 2 1 0 3

Session: January 2022– May 2022 | Faculty: Dr Reema Jain | Class: B.Tech. IV Sem

A. Introduction: This course is offered by Dept. of Mathematics & Statistics as a regular course to make the students acquainted with the subject of probability and statistics at an early stage. Probability and statistics is an important foundation for computer science fields such as machine learning, artificial intelligence, computer graphics, randomized algorithms, image processing, and scientific simulations. In this course, students will expand their knowledge of probabilistic methods and apply them to diverse computational problems. The first part of the course offers in depth knowledge of probability theory (random event, probability, characteristics of random variables, probability distributions and moment generating functions) which is necessary for simulation of random processes. In the second part, sampling theory is discussed. Each concept is explained through various examples and application-oriented problems.

B. Course Outcomes: After completing this course, the students will be able to

[2201.1] Apply the concept of probability and related theorems in solving various real world problems.

[2201.2] Understand the key concept of random variable, its probability distributions including mean, expectation, variance and moments.

[2201.3] Implement the variation and the relation between two random variables by using the concept of correlation.

[2201.4] Comprehend the concept of random sample and its sampling distribution which will enhance the logical & analytical skills.

[2201.5] Apply the statistics for testing the significance of the given large and small sample data by using t-test, F-test and Chi-square test.

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 CSE 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 CSE 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 CSE 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. program, the students will:

PSO1. Imbibe the basic concepts and applications of computer-based Communication or networking, information sharing, signal processing, web-based systems, smart devices, and communication technology.

PSO2. Investigate prominent areas in the field of Computer and Communication Engineering to provide feasible solutions

PSO3. Apply the contextual knowledge in the field of Computing and Communication to assess social, health, safety, and security issues relevant to the professional engineering practice.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I	20
	Sessional Exam II	20
	Quizzes and Assignments	20
End Term Exam (Summative)	End Term Exam	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work in home, especially before an online class session 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/ online classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

Basic Set theory, Axioms of probability, Sample space, conditional probability, total probability theorem, Baye's theorem. One dimensional and two dimensional random variables, mean and variance, properties, Chebyschev's inequality, correlation coefficient, Distributions, Binomial, Poisson, Normal and Chisquare. Functions of random variables: One dimensional and Two dimensional, F & T distributions, Moment generating functions, Sampling theory, Central limit theorem, Point estimation, MLE, Interval estimation, Test of Hypothesis: significance level, certain best tests; Chi square test.

References:

1. P. L. Meyer, Introduction to probability and Statistical Applications, (2e), Oxford and IBH publishing, 1980.
2. Miller, Freund and Johnson, Probability and Statistics for Engineers, (8e), Prentice Hall of India, 2011.
3. Hogg and Craig, Introduction to mathematical statistics, (6e), Pearson Education, 2012.
4. Sheldon M Ross, Introduction to Probability and Statistics for Engineers and Scientists, Elsevier, 2010

F. LECTURE PLAN

Lecture Number	Topic	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing CO
1	Introduction of the Course	Develop the understanding about the course	Lecture, Discussion & Examples	NA	NA
2	Basic Set Theory	Students will get the acquaintance with the basic concept of Set Theory	Lecture, Discussion & Examples	2201.1	Quiz, Sessional & End Term Exam.
3	Axioms of Probability	Learn about the basic concept of Probability	Lecture, Discussion & Examples	2201.1	Quiz, Sessional & End Term Exam.
4	Conditional Probability	Understand the Conditional Probability	Lecture, Discussion & Examples	2201.1	Quiz, Sessional & End Term Exam.
5	Total Probability Theorem	Learn about Total Probability Theorem	Lecture, Discussion & Examples	2201.1	Quiz, Sessional & End Term Exam.
6	Baye's Theorem	Learn about Baye's Theorem	Lecture, Discussion & Examples	2201.1	Quiz, Sessional & End Term Exam.
7	Tutorial-Problem Solving Session	Apply the concepts in real world problems	Discussion & Examples	2201.1	Quiz, Sessional & End Term Exam.
8	Random Variable: One Dimensional	Learn about Random Variable	Lecture, Discussion & Examples	2201.2	Quiz, Sessional & End Term Exam.
9	Classification: Discrete & Continuous Random Variable	Understand the classification of Random Variables	Lecture, Discussion & Examples	2201.2	Quiz, Sessional & End Term Exam.
10	Mathematical Expectation and Variance	Develop the notion of Mean & variance	Lecture, Discussion & Examples	2201.2	Quiz, Sessional & End Term Exam.
11	Chebyschev's Inequality	Understand the concept of Chebyschev's Inequality	Lecture, Discussion & Examples	2201.2	Quiz, Sessional & End Term Exam.
12	Moments & Moment Generating Function	Elaborate the concept of Mgf	Lecture, Discussion & Examples	2201.2	Quiz, Sessional & End Term Exam.
13	Tutorial-Problem Solving Session	Apply the concepts in real world problems	Discussion & Examples	2201.2	Quiz, Sessional & End Term Exam.
14	Random variable: Two Dimensional	Elaborate the concept of Random Variable in two dimensions	Lecture, Discussion & Examples	2201.3	Quiz, Sessional & End Term Exam.

15	Joint Distribution Function	Get the knowledge of Joint Distribution Function	Lecture, Discussion & Examples	2201.3	Quiz, Sessional & End Term Exam.
16	Marginal Distribution & Conditional Distribution	Get the knowledge of Marginal & Conditional Distributions	Lecture, Discussion & Examples	2201.3	Quiz, Sessional & End Term Exam.
17	Expectation	Elaborate the concept in two dimensions	Lecture, Discussion & Examples	2201.3	Quiz, Sessional & End Term Exam.
18	Functions of Random Variables	Develop the notion of Functions of Random Variables	Lecture, Discussion & Examples	2201.3	Quiz, Sessional & End Term Exam.
19	Covariance	Understand the concept of Covariance	Lecture, Discussion & Examples	2201.3	Quiz, Sessional & End Term Exam.
20	Conditional Expectation	Elaborate the notion of Expectation	Lecture, Discussion & Examples	2201.3	Quiz, Sessional & End Term Exam.
21	Correlation Coefficient	Calculate the Correlation Coefficient	Lecture, Discussion & Examples	2201.3	Quiz, Sessional & End Term Exam.
22	Tutorial-Problem Solving Session	Apply the concepts in real world problems	Discussion & Examples	2201.3	Quiz, Sessional & End Term Exam.
23	Probability Distributions: Binomial Distribution	Get the knowledge of Binomial Distribution	Lecture, Discussion & Examples	2201.2	Quiz, Sessional & End Term Exam.
24	Poisson Distribution	Get the knowledge of Poisson Distribution	Lecture, Discussion & Examples	2201.2	Quiz, Sessional & End Term Exam.
25	Normal Distribution	Get the knowledge of Normal Distribution	Lecture, Discussion & Examples	2201.2	Quiz, Sessional & End Term Exam.
26	Chi-square Distribution	Understand Chi-square Distribution	Lecture, Discussion & Examples	2201.2	Quiz, Sessional & End Term Exam.
27	t-Distribution	Understand t-Distribution	Lecture, Discussion & Examples	2201.2	Quiz, Sessional & End Term Exam.
28	F- Distribution	Understand F-Distribution	Lecture, Discussion & Examples	2201.2	Quiz, Sessional & End Term Exam.
29-30	Brief overview about Sampling Theory	Develop the concept of Sampling Theory	Lecture, Discussion & Examples	2201.4	Quiz, Sessional & End Term Exam.
31	Point Estimation	Understand the concept of estimators	Lecture, Discussion & Examples	2201.4	Quiz, Sessional & End Term Exam.
32	MLE (Maximum Likelihood Estimate)	Understand the concept of estimators	Lecture, Discussion & Examples	2201.4	Quiz, Sessional & End Term Exam.
33	Central Limit Theorem	Understand the concept of Central Limit Theorem	Discussion & Examples	2201.4	Quiz, Sessional & End Term Exam.
34	Interval Estimation	Understand the concept of estimators	Lecture, Discussion & Examples	2201.4	Quiz, Sessional & End Term Exam.
35	Testing of Hypothesis: Statistical Hypothesis, Null Hypothesis, Alternate Hypothesis & Types of Error	Analyze the Hypothesis	Lecture, Discussion & Examples	2201.5	Quiz, Sessional & End Term Exam.

36	Level of Significance & Critical Region	Analyze the Hypothesis	Lecture, Discussion & Examples	2201.5	Quiz, Sessional & End Term Exam.
37	Procedure for Testing of Hypothesis	Analyze the Hypothesis	Lecture, Discussion & Examples	2201.5	Quiz, Sessional & End Term Exam.
38	Test of Significance based on t-Distribution	Apply the tests of Hypothesis	Lecture, Discussion & Examples	2201.5	Quiz, Sessional & End Term Exam.
39	Test of Significance based on F-Distribution	Apply the tests of Hypothesis	Lecture, Discussion & Examples	2201.5	Quiz, Sessional & End Term Exam.
40	Chi square Test	Apply the tests of Hypothesis	Lecture, Discussion & Examples	2201.5	Quiz, Sessional & End Term Exam.
41	Tutorial-Problem Solving	Apply the concepts in real world problems	Discussion & Examples	2201.5	Quiz, Sessional & End Term Exam.

G. COURSE ARTICULATION MATRIX (MAPPING OF COs WITH POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
MA2201.1	Apply the concept of probability and related theorems in solving various real world problems.	3	2	1	2	1	2	3	3	2	1	2	1	3	2	1
MA2201.2	Understand the key concept of random variable, its probability distributions including mean, expectation, variance and moments.	3	2	1	2	1	1	3	3	2	1	2	1	3	1	2
MA2201.3	Implement the variation and the relation between two random variables by using the concept of correlation.	3	2	1	2	1	1	3	3	2	1	2	1	3	1	1
MA2201.4	Comprehend the concept of random sample and its sampling distribution which will enhance the logical & analytical skills.	3	2	1	2	1	2	3	3	2	1	2	1	2	2	2
MA2201.5	Apply the statistics for testing the significance of the given large and small sample data by using t-test, F-test and Chi-square test.	3	2	1	2	1	2	3	3	2	1	2	1	3	3	2

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Department of Computer and Communication Engineering
Course Hand-out

Computer Networks | CC2201 | 4 Credits | 3 1 0 4

Session: Jan 2022 – May 22 | Faculty: Dr. Arjun Singh/Dr. Deepak Sinwar/Dr. Arvind Dhaka/ Mr. Vidhyadhar J Aski / Ms. Somya Goyal | Class: IV Semester

A. 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.

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

[2201.1]: Interpret and Describe the basic concepts of TCP/IP model, IPV4, class full addressing, sub netting and classless addressing.

[2201.2]: Analysis and Implement the Routing and its types.

[2201.3]: Demonstrate the Internet control protocols, IPV6 transitions.

[2201.4]: Analyse the Transport Layer and Its protocols, congestion control.

[2201.5]: Describe the Application Layer, its protocols and Network Security.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

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

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

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

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

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

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

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

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

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

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

Program Specific Outcome

[PSO.1] Imbibe the basic concepts and applications of computer-based Communication or networking, information sharing, signal processing, web-based systems, smart devices, and communication technology.

[PSO.2] Investigate prominent areas in the field of Computer and Communication Engineering to provide feasible solutions.

[PSO.3] Apply the contextual knowledge in the field of Computing and Communication to assess social, health, safety, and security issues relevant to the professional engineering practice.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Close/Open Book)	20
	Sessional Exam II (Close/Open Book)	20
	CWS	15 marks from Introduction to Networks, 5 marks quiz/assignments
End Term Exam (Summative)	End Term Exam (Close/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.	

1. Students will be registered for two CISCO networks academy courses: Introduction to Networks and Switching, Routing, and Wireless Essentials (SRWE). Registration is compulsory for every student.
2. CC2230 Computer Networks Lab experiments: for each lab students will be assigned a module from SRWE. Faculty members are advised to conduct the extra lab sessions apart from regular lab to teach the basics of Packet Tracer and make students comfortable with the simulator. If it is required students may use Lab 011-1AB, to perform the experiments on CISCO switches and Routers.
3. For CC2201, in CWS marks, out of 20, 15 marks will be awarded based on the performance in "Introduction to Networks". At the starting of each week (Monday), faculty will activate the assignments from the www.netacd.com portal.
4. For CC2230, in CWS marks, out of 60, 30 marks will be awarded from the "SRWE" and the rest 20 marks will be based on mini-project and 10 marks will be awarded for the lab experiments file. After each lab, faculty will activate the assignments from the www.netacd.com portal.
5. Students need to submit a mini project configured on packet tracer (e.g. simulation and configuration of MUJ network, find out the bottlenecks and proposed solution, or secure the MUJ network/any other organization). The mini-project must be large enough to exhibit the learning of both certificates.
6. CISCO placed MUJ alumni will be invited to motivate and inspire the students.

E. SYLLABUS

Network Layer: network layer design issues**, routing algorithms, congestion control algorithms, Quality of Service (QoS), MPLS;** Classful addressing, subnetting, classless addressing, variable length blocks, block allocation, NAT; IPV4: header format, fragmentation, options, checksum; ARP & DHCP: introduction, packet format, message types; ICMP: message format, message types; Dynamic routing protocols: RIP, OSPF & BGP, Multicasting Protocol: IGMP; Introduction to IPV6; **Transport Layer:** elements of transport protocols: addressing, connection establishment, connection release, congestion control, transport services, transport layer protocols, state diagrams; UDP: UDP datagram, UDP services, checksum; TCP: TCP services, TCP features, segment, TCP connection establishment, data transfer, connection termination, TCP window management, flow control, congestion control, timer management; **Application Layer:** DNS: Name space, domain resource records, Electronic Mail - SMTP, POP, IMAP, MIME, HTTP, HTTPS, SNMP.

F. References:

R1. B. A. Forouzan, *TCP/IP Protocol Suite*, (5e), McGraw Hill, 2010.
R2. A. S. Tenenbaum, *Computer Networks*, (7e), Prentice Hall of India, 2016.
R3. D. E. Comer, *Internetworking with TCP/IP Principles, Protocols and Architecture*, (6e), Pearson Education, 2014.
R4. W. Stallings, *Data and Computer Communications*, (10e), Pearson Education, 2014.

G. Lecture Plan:

lecture	Topics	Session Outcome	Corresponding CO	Mode of delivery	Mode of Assessing CO
1	Introduction of course	Understanding of course, objectives, evaluation		lecture	
2	Store-and-Forward Packet Switching, Services Provided to the Transport Layer	Understanding of packet switching and services provided to transport layer	2201.1	lecture	Mid Term I, Quiz & End Term
3	Implementation of Connectionless Service, Implementation of Connection-Oriented Service	learn implementation of connectionless and connection-oriented service	2201.1	lecture	Mid Term I, Quiz & End Term
4	Characteristics and Types, The Optimality Principle	Understanding of types and characteristics of routing protocols and optimality principle	2201.2	lecture	Mid Term I, Quiz & End Term
5	Shortest Path Routing, Flooding	Understanding of shortest path routing algorithm	2201.2	lecture	Mid Term I, Quiz & End Term
6	Distance Vector Routing,	Understanding of distance vector routing algorithm	2201.2	lecture	Mid Term I, Quiz & End Term
7	Link State Routing, Hierarchical Routing,	Understanding of link state routing protocol and Hierarchical routing	2201.2	lecture	Mid Term I, Quiz & End Term
8	IP Addresses, Classful addressing,	Knowledge of IP Address	2201.2	lecture	Mid Term I, Quiz & End Term

	Classless addressing				
9	Subnetting	Understanding of need of subnetting	2201.2	lecture	Mid Term I, Quiz & End Term
10	Subnetting	Understanding implementation of subnetting	2201.2	lecture	Mid Term I, Quiz & End Term
11	CIDR—Classless Interdomain Routing	Understanding of CIDR	2201.3	lecture	Mid Term I, Quiz & End Term
12	NAT—Network Address Translation	Learn Network address translation	2201.3	lecture	Mid Term I, Quiz & End Term
13	DHCP, ARP, RARP	Understanding of network protocols	2201.3	lecture	Mid Term I, Quiz & End Term
14	ICMP, IPV4 header format	Understanding of network protocols	2201.3	lecture	Mid Term I, Quiz & End Term
15	Fragmentation	Learn concept of fragmentation	2201.2	lecture	Mid Term I, Quiz & End Term
16	RIP, OSPF, BGP	Understanding of dynamic routing protocols	2201.2	lecture	Mid Term I, Quiz & End Term
17	RIP, OSPF, BGP	Understanding of dynamic routing protocols	2201.2	lecture	Mid Term I, Quiz & End Term
18	General Principles of Congestion Control, Congestion Prevention Policies	Understanding of congestion principles and prevention	2201.1	lecture	Mid Term I, Quiz & End Term
19	Congestion Control in Virtual-Circuit Subnets	Understanding of congestion control in virtual circuit subnets	2201.1	lecture	Mid Term I, Quiz & End Term
20	Congestion Control in Datagram Subnets	Understanding of congestion control in Datagram subnets	2201.1	lecture	Mid Term I, Quiz & End Term
21	Requirements	Understanding of Quality of Service requirements	2201.1	lecture	Mid Term I, Quiz & End Term
22	Techniques for Achieving Good Quality of Service	Understanding of Techniques for achieving good QoS	2201.1	lecture	Mid Term I, Quiz & End Term
23	Techniques for Achieving Good Quality of Service	Understanding of Techniques for achieving good QoS	2201.2	lecture	Mid Term I, Quiz & End Term

	First Sessional Examination				
24	Introduction to Transport Layer, Transport Service Primitives	Understanding of transport layer and service primitives	2201.4	lecture	Mid Term II, Quiz & End Term
25	Elements of Transport Protocols, Addressing,	Understanding of elements of transport protocols	2201.4	lecture	Mid Term II, Quiz & End Term
26	Connection Establishment, Connection Release	Understanding of connection establishment and release process	2201.4	lecture	Mid Term II, Quiz & End Term
27	Flow Control and Buffering	Understanding of flow control and buffering in transport layer	2201.4	lecture	Mid Term II, Quiz & End Term
28	Multiplexing	Understanding of Multiplexing in transport layer	2201.4	lecture	Mid Term II, Quiz & End Term
29	UDP,UDP Header	Understanding of UDP	2201.4	lecture	Mid Term II, Quiz & End Term
30	TCP Service Model, TCP Protocol	Understanding of TCP	2201.4	lecture	Mid Term II, Quiz & End Term
31	TCP Segment Header,	Understanding of TCP segment header	2201.4	lecture	Mid Term II, Quiz & End Term
32	TCP Connection Establishment, TCP Connection Release	Understanding of TCP connection establishment and release process	2201.4	lecture	Mid Term II, Quiz & End Term
33	TCP Transmission Policy, Window Management	Understanding of TCP transmission policy and window management	2201.4	lecture	Mid Term II, Quiz & End Term
34	Connection Control	Understanding of Conection control	2201.4	lecture	Mid Term II, Quiz & End Term
35	Timer Management	Understanding of timer management	2201.4	lecture	Mid Term II, Quiz & End Term
36	Introduction to Application Layer	Understanding of application layer	2201.5	lecture	Mid Term II, Quiz & End Term
37	DNS—The Domain Name System	Understanding of DNS	2201.5	lecture	Mid Term II, Quiz & End Term

38	SMTP, POP	Understanding of email	2201.5	lecture	Mid Term II, Quiz & End Term
39	IMAP, MIME	understanding of email	2201.5	lecture	Mid Term II, Quiz & End Term
40	HTTP	Understanding of web and protocol	2201.5	lecture	Mid Term II, Quiz & End Term
41	HTTPS	Understanding of secure web protocol	2201.5	lecture	Mid Term II, Quiz & End Term
42	SNMP	Understanding of network management protocol	2201.5	lecture	Mid Term II, Quiz & End Term

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

CO	Statement	Correlation with Program Outcomes													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CC2201.1	Understand and learn basic concept of TCP/IP model, IPV4, class full addressing, sub netting and classless addressing.	2		3		3								3	1	2
CC2201.2	Implement the Routing and its types			2										1	1	3
CC2201.3	Demonstrate the Internet control protocols, IPV6 transitions.					1								1	1	
CC2201.4	Analyse the Transport Layer and Its protocols, congestion control.					1								1	1	

CC2201.5	Describe the Application Layer, its protocols and Network Security.							2		2					1	1		

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

I. Course Outcome Attainment Level Matrix:

CO	Statement	ATTAINMENT OF PROGRAM OUTCOMES **THRESHOLD VALUE: 40%**														
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CC2201.1	Understand and learn basic concept of TCP/IP model, IPV4, class full addressing, sub netting and classless addressing.															
CC2201.2	Implement the Routing and its types															
CC2201.3	Demonstrate the Internet control protocols, IPV6 transitions.															
CC2201.4	Analyse the Transport Layer and Its protocols, congestion control.															

CC2201.5	Describe the Application Layer, its protocols and Network Security.															

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Department of Computer and Communication Engineering
Course Hand-out

Relational Database Management Systems | CC 2202 | 4 Credits | 3 1 0 4

Session: Jan'22 – May'22 | Course Coordinator: Dr. Geeta Rani | Class: B.Tech 2nd Year / 4th Semester

Faculty: 1. Dr VS Dhaka, 2. Dr Geeta Rani, 3. Dr. Saurabh Singh Verma 4. Dr Shashank Singh 5. Mr Jitendra Singh Yadav

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

CC2202.1: Illustrate the advantages of using database management systems over file based systems in an organization with no ambiguity.

CC2202.2: Construct the Entity Relationship Model for a real life application by identifying accurate relationship between different entities, cardinality, mapping and various constraints.

CC2202.3: Solve the queries written in SQL, Relation Algebra, and Relational Calculus for correctly inserting, updating, accessing or deleting the data related to real-life applications.

CC2202.4: Identify the correct normal form of a database by analyzing its' given relations and convert it into a desired normal form.

CC2202.5: Summarize and correctly interpret the transaction processing, concurrency control, recovery mechanisms, storage structures and access techniques used in a database.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

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

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

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

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

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

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

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

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

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

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

[PSO.1]. Imbibe the basic concepts and applications of computer-based Communication or networking, information sharing, signal processing, web-based systems, smart devices, and communication technology.

[PSO.2]. Investigate prominent areas in the field of Computer and Communication Engineering to provide feasible solutions.

[PSO.3]. Apply the contextual knowledge in the field of Computing and Communication to assess social, health, safety, and security issues relevant to the professional engineering practice.

D. Assessment Plan:

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

E. SYLLABUS

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

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

F. Text Books

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

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

G. Reference Books

R1. 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	CC2202.1	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	CC2202.1	Mid Term I, & End Term
3.	Data Models, Schemas and Instances. Categories of Data Models.	Classify and Compare different Data Models.	PPT, Lecture, Class Notes	CC2202.1	Mid Term I, Assignment & End Term
4.	Three Schema Architecture, Data Independence (Logical & Physical).	Classify and Compare various architectures and data independence.	PPT, Lecture, Class Notes	CC2202.1	Mid Term I, Assignment & 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	CC2202.1	Mid Term I, Assignment & 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	CC2202.1 & CC2202.2	Mid Term I, Assignment & 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	CC2202.1 & CC22022.2	Mid Term I, Assignment & 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	CC2202.1 & CC2202.2	Mid Term I, Assignment & End Term
9.	Enhanced EntityRelationship (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	CC2202.1 & CC2202.2	Mid Term I, Assignment & 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	CC2202.1 & CC2202.2	Mid Term I, Assignment & End Term
11.	Relational Model Concepts: Domain, Attributes, Tuples and Relations.	Understand the concepts of relational model	PPT, Lecture, Class Notes	CC2202.1 & CC2202.2	Mid Term I, Assignment & 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	CC2202.1 & CC2202.2	Mid Term I, Assignment & End Term
13.	Entity Integrity, Referential Integrity and Foreign Keys.	Understand various concepts of key constraints.	PPT, Lecture, Class Notes	CC2202.1 & CC2202.2	Mid Term I, Assignment & End Term
14.	Relational database design using ER-toRelational Mapping.	Understand mapping of ER models into relations	PPT, Lecture, Class Notes	CC2202.1 & CC2202.2	Mid Term I, Assignment & End Term
15.	Mapping EER Model constructs to Relations.	Understand mapping of EER models into relations	PPT, Lecture, Class Notes	CC2202.1 & CC2202.2	Mid Term I, Assignment & End Term
16.	Relational Algebra: Unary Relational Operations SELECT and PROJECT.	Understand unary relational operations like SELECT and PROJECT	PPT, Lecture, Class Notes	CC2202.3	Mid Term I, Assignment & End Term

17.	Sequences of Operations and the RENAME Operation.	Understand the sequences of operations and the RENAME Operation.	PPT, Lecture, Class Notes	CC2202.3	Mid Term I, Assignment & End Term
18.	Relational Algebra Operation from Set Theory: UNION, INTERSECTION, CARTESIAN PRODUCT (CROSS PRODUCT) Operations.	Interpret different Relational Algebra operations and apply the techniques and rules in different problems	PPT, Lecture, Class Notes	CC2202.3	Mid Term I, Assignment & End Term
19.	Binary Relational Operations: JOIN and DIVISION Operation	Interpret JOIN and DIVISON operations and apply the techniques and rules in different problems.	PPT, Lecture, Class Notes	CC2202.3	Mid Term I, Assignment & 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	CC2202.3	Mid Term I, Assignment & 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	CC2202.3	Mid Term II, Assignment & 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	CC2202.3	Mid Term II, Assignment & End Term
23.	The Existential and Universal Quantifiers, Safe Expressions.	Understand existential and universal and existential quantifiers.	PPT, Lecture, Class Notes	CC2202.3	Mid Term II, Assignment & End Term
24.	Domain Relational Calculus.	Understand concepts of domain relational calculus.	PPT, Lecture, Class Notes	CC2202.3	Mid Term II, Assignment & End Term
25.	SQL Data Definition and Data Types, Specifying Constraints in SQL, Schema change	Understand fundamentals of SQL	PPT, Lecture, Class Notes	CC2202.3	Mid Term II, Assignment & End Term

	statements in SQL.				
26.	Basic queries in SQL, More complex SQL queries: Comparisons involving NULL and Three-Valued Logic, Nested Queries, Tuples, and Set/Multiset Comparisons.	Interpret SQL and apply the techniques and rules in different problems	PPT, Lecture, Class Notes	CC2202.3	Mid Term II, Assignment & 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	CC2202.3	Mid Term II, Assignment & 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	CC2202.3	Mid Term II, Assignment & 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	CC2202.3	Mid Term II, Assignment & End Term
30.	Views (Virtual tables) in SQL, Specifying General Constraints as assertion and Triggers, Additional features of SQL.	Interpret SQL and apply the techniques and rules in different problems	PPT, Lecture, Class Notes	CC2202.3	Mid Term II, Assignment & End Term
31.	Database Design: Redundant information in tuples and update anomalies, insertion anomalies, deletion anomalies and modification anomalies.	Understand the concepts of different anomalies and how they can be removed	PPT, Lecture, Class Notes	CC2202.4	Mid Term II, Assignment & 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	CC2202.4	Mid Term II, Assignment & End Term
33.	Functional Dependencies: Definition of functional dependencies, Inference rules for functional dependencies.	Understand concepts of functional dependencies	PPT, Lecture, Class Notes	CC2202.4	Mid Term II, Assignment & 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	CC2202.4	Mid Term II, Assignment & 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	CC2202.4	Mid Term II, Assignment & End Term
36.	Normal Forms: First normal form, Second normal form.	Understand 1NF and 2NF	PPT, Lecture, Class Notes	CC2202.4	Mid Term II, Assignment & End Term
37.	Third normal form and Boyce-Codd normal form.	Understand 3NF and BCNF	PPT, Lecture, Class Notes	CC2202.4	Mid Term II, Assignment & End Term
38.	Multivalued dependencies and fourth normal form.	Understand concepts of multivalued dependencies	PPT, Lecture, Class Notes	CC2202.4	Mid Term II, Assignment & End Term
39.	Introduction to transaction processing, Desirable properties of transactions.	Understand and summarize transaction processing	PPT, Lecture, Class Notes	CC2202.5	Assignment & End Term

40.	Characterizing schedules based on recoverability.	Understand and summarize concepts of recoverability of schedules	PPT, Lecture, Class Notes	CC2202.5	Assignment & End Term
41.	Characterizing schedules based on Serializability: Serial, Nonserial and conflict serializable schedules.	Understand and summarize concepts of schedules	PPT, Lecture, Class Notes	CC2202.5	Assignment & End Term
42.	View equivalence and View Serializability.	Understand and summarize concepts of serializability	PPT, Lecture, Class Notes	1402.5	Assignment & End Term
43.	Concurrency control techniques: Two Phase locking Techniques (Binary Lock, Shared/Exclusive Lock).	Understand and summarize concurrency control techniques.	PPT, Lecture, Class Notes	CC2202.5	Assignment & End Term
44.	Basic 2PL, Strict 2PL, Rigorous 2PL.	Understand the concepts of locking for concurrency control	PPT, Lecture, Class Notes	CC2202.5	Assignment & 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	CC2202.5	Assignment & 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	CC2202.5	Assignment & End Term
47.	Granularity of Data items and Multiple Granularity Locking.	Understand concepts of multiple granularity locking	PPT, Lecture, Class Notes	CC2202.5	Assignment & End Term
48.	Database Recovery Techniques: Recovery Concepts, Recovery Technique based on Deferred Update.	Understand and summarize recovery techniques.	PPT, Lecture, Class Notes	CC2202.5	Assignment & 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	CC2202.5	Assignment & End Term
50.	File Storage: File structures (Fixed Length Record, Variable Length Record), Record Blocking and Spanned	Explain different database storage structure and access technique	Lectures, Flipped Classroom	CC2202.5	Assignment & End Term
	versus Un-spanned Records.				
51.	RAID organization and Levels, Hashing Techniques (Internal and External Hashing).	Explain RAID organization and Hashing techniques	Lectures, Flipped Classroom	CC2202.5	Assignment & End Term

52.	Indexing Structure: Single Level ordered indexes (Primary, Clustering, and Secondary).	Explain different indexing techniques	PPT, Lecture, Class Notes	CC2202.5	Assignment & End Term
53.	Multilevel Indexes, Dynamic multilevel indexes using B-Trees.	Explain different indexing techniques	PPT, Lecture, Class Notes	CC2202.5	Assignment & End Term
54.	Dynamic multilevel indexes using B+-Trees.	Explain different indexing techniques	PPT, Lecture, Class Notes	CC2202.5	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
CC 2202.1	Illustrate the advantages of using database management systems over file based systems in an organization with no ambiguity.	2												3		
CC 2202.2	Construct the Entity Relationship Model for a real life application by identifying accurate relationship between different entities, cardinality, mapping and various constraints.	1	2	3		1			1	1	1		1		3	
CC 2202.3	Interpret different query languages SQL, Relation Algebra, calculus and acquire the skill apply the techniques and rules in different real-life problems.	3							1							1
CC 2202.4	Identify the correct normal form of a database by analyzing its' given relations and convert it into a desired normal form.	1	2	2	3				1	1	1		1		3	
CC 2202.5	Summarize and correctly interpret the transaction processing, concurrency control, recovery mechanisms, storage structures and access techniques used in a database.	3							1					2	1	

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

J. Course Outcome Attainment Level Matrix:

CO	STATEMENT	ATTAINMENT OF PROGRAM OUTCOMES **THRESHOLD VALUE: 40%**											ATTAINMENT OF PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CC 2202.1	Illustrate the advantages of using database management systems over file based systems in an organization with no ambiguity.															
CC 2202.2	Construct the Entity Relationship Model for a real life application by identifying accurate relationship between different entities, cardinality, mapping and various constraints.															
CC 2202.3	Interpret different query languages SQL, Relation Algebra, calculus and acquire the skill apply the techniques and rules in different real-life problems.															
CC 2202.4	Identify the correct normal form of a database by analyzing its' given relations and convert it into a desired normal form.															
CC 2202.5	Summarize and correctly interpret the transaction processing, concurrency control, recovery mechanisms, storage structures and access techniques used in a database.															

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Department of Computer and Communication Engineering

Course Hand-out

Operating Systems| **CC2203**| 4 Credits | 3 0 1 3

Session: Jan 22– May 22 | Class: IV Semester

Dr. Kusum Lata Jain | Dr. Ghanshayam Raghuwanshi | Dr. Suman Bhakar |Dr. Vaishali Yadav| Dr. Hemata Goyal

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

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

[CC2203.1]. Describe the objectives, structure, functionality and types of operating systems.

[CC2203.2]. Write System programs for process and thread creation, execution, inter-process communication.

[CC2203.3]. Compare various algorithms used for process scheduling. Apply concepts related to concurrency to achieve the same for cooperating processes and deadlock

[CC2203.4] evaluate the performance of different memory management techniques.

[CC2203.5] Describe disk scheduling and Security problem

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

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

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

- **[PO.5]. Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations
- **[PO.6]. The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice
- **[PO.7]. Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
- **[PO.8]. Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices
- **[PO.9]. Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

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

PROGRAM SPECIFIC OUTCOMES

[PSO.1] Imbibe the basic concepts and applications of computer-based Communication or networking, information sharing, signal processing, web-based systems, smart devices, and communication technology.

[PSO.2] Investigate prominent areas in the field of Computer and Communication Engineering to provide feasible solutions.

[PSO.3] Apply the contextual knowledge in the field of Computing and Communication to assess social, health, safety, and security issues relevant to the professional engineering practice.

D. Assessment Plan:

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

E. SYLLABUS

Introduction: evolution of operating system, classification of operating system, operating system structure, services, functions, design and implementation, system programs, system calls, virtual machines, system boot; processes: concept, process scheduling, operations on processes, inter-process communication; Linux threads: basic concepts, multithreaded models, thread libraries; **CPU scheduling**: scheduling criteria, scheduling algorithms, thread scheduling; **Process synchronization:** concept of synchronization, critical section problem, Dekker's algorithm, peterson's solution, synchronization hardware, semaphores, classical problems on synchronization, monitors; **Deadlock:** deadlock concept, deadlock characterization, methods for handling deadlock, prevention, avoidance, detection, recovery from deadlock; **Memory management**: concept of logical and physical memory, swapping, contiguous memory allocation, paging, page table structure, segmentation, paging combined with segmentation, working of intel-32/64; Virtual memory management: demand paging, copy-on write, page replacement, allocation of frames, thrashing, memory mapped files, allocating kernel memory; **Files**: file concept, access methods, directory structure, file system mounting, file sharing; **Disk:** architecture, scheduling algorithms; **Security problem**: program threats, system and network threats; Case study: Linux / Solaris / Mac / Windows operating system.

References:

A. Silberschatz, P. B. Galvin and Greg Gagne, "Operating System Concepts", Eighth Edition, Wiley.

A.S. Tanenbaum, "Modern Operating Systems", III Edition, Prentice Hall India.

William Stallings, "Operating Systems", VII Edition, Pearson.

F. Lecture Plan:

Lecture No	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1	Introduction and Course Hand-out briefing	To acquaint and clear teachers' expectations and understand student expectations	Lecture	NA	NA
2,3, 4	**Introduction:** evolution of operating system, classification of operating system, services, functions	Describe the objectives, different types of operating systems, functions and services	Lecture	CC2203.1	Quiz MTE-1 End Term
5,6	**System structure:** system programs, system calls, virtual machines, system boot	Explain execution of system calls, interrupts, various operating system structures and booting process	Lecture	CC2203.1	Quiz MTE-1 End Term
7,8,9,10,11	**Process:** Process Concept, Process scheduling Operations on processes Inter-process Communication	Describe process state transitions, process control block, and context switching and write system programs for process creation, execution, inter-process communication.	Lecture	CC2203.2	Quiz MTE-1 End Term Programming Assignment
12,13,14,15	**Multithreaded Programming:** Linux threads: basic concepts, multithreaded models, thread libraries;	Describe significance of threads, multithreaded models and write system programs using PThreads	Lecture	CC2203.2	Quiz MTE-1 End Term Programming Assignment
14,15,16,17 , 18,19	**CPU scheduling:** Basic concepts, scheduling criteria, Scheduling Algorithms.	Compare various algorithms used for process scheduling based on various scheduling criteria	Lecture Tutorial	CC2203.3	Quiz Mid Term I End Term
FIRST SESSIONAL EXAM					
20, 21, 22, 23, 24, 25,26	**Process Synchronization:** concept of synchronization, critical section problem, Dekker's algorithm, peterson's solution, synchronization hardware, semaphores, classical problems on synchronization, monitors	Apply concepts related to concurrency to achieve the same for cooperating processes	Lecture Tutorial	CC2203.3	Quiz MTE-2 End Term Tutorial
27, 28,29,30	**Deadlock:** deadlock concept, deadlock characterization, methods for handling deadlock, prevention, avoidance, detection, recovery from deadlock;	Write programs for synchronization problems	Lecture	CC2203.3	Quiz MTE-2 End Term Project
31, 32, 33, 34, 35	**Memory management**: concept of logical and physical memory, swapping, contiguous memory allocation, paging, page table structure, segmentation, paging combined with segmentation,	Apply various deadlock handling strategies to solve resource allocation problems	Lecture Tutorial	CC2203.4	Quiz MTE-2 End Term Tutorial

36, 37,38,39,40	Virtual memory management: demand paging, copy-on write, page replacement, allocation of frames, thrashing, memory mapped files, allocating kernel memory;	Evaluate the performance of different memory management techniques	Lecture Tutorial	CC2203.4	Quiz MTE-2 End Term Tutorial
41,42,43	**Files**: file concept, access methods, directory structure, file system mounting, file sharing;	Describe the concept of virtual memory, and compare various page replacement algorithms	Lecture Tutorial	CC2203.4	Quiz End Term Tutorial
SECOND SESSIONAL EXAM					
44, 45, 46,	**Disk:** architecture, scheduling algorithms;	Compare various file allocation methods and free space management techniques	Lecture Tutorial	CC2203.5	Quiz End Term
47,48, 49	**Security problem**: program threats, system and network threats;	Analyse various disk scheduling strategies	Lecture Tutorial	CC2203.5	Quiz End Term
50,51,52,	Case study: Linux / Solaris / Mac / Windows operating system.	Apply various techniques used for file security in operating systems	Lecture	CC2203.5	End Term
END TERM EXAM					

G. 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
CC2203.1	Describe the objectives, structure, functionality and types of operating systems	3	2	1		2	1						1	1	1	
CC2203.2	Write System programs for process and thread creation, execution, inter-process communication.	2	2	2									1			
CC2203.3	Compare various algorithms used for process scheduling. Apply concepts related to concurrency to achieve the same for cooperating processes and deadlock	2	2	3									1	1		2
CC2203.4	Evaluate the performance of different memory management techniques	2	2	3			2		2	3			2			
CC2203.5	Describe disk scheduling and Security problem	2	2	2						1	1		2			

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

MANIPAL UNIVERSITY
JAIPUR

SCHOOL OF COMPUTING & INFORMATION TECHNOLOGY

DEPARTMENT COMPUTER & COMMUNICATION ENGINEERING
COURSE HAND-OUT

Computer Networks Lab| CC2230| 1 Credit | 0 0 2 1

Session: Jan 2022– May 2022 | Faculty: Dr. Arjun Singh/Dr. Deepak Sinwar/Mr. Vidhyadhar J. Aski /Dr. Arvind Dhaka/Ms. Somya Goyal| Class: IV 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

[CC2230.1]:	Identify the basic factors that driving the need of networking and understanding the uses s of packet tracer.
[CC2230.2]:	Configuration and simulation of various topologies e.g. star, ring and Mess.
[CC2230.3]:	Identify the suitable routing algorithm and configuration of protocol using packet tracer.
[CC2230.4]:	Configuration of NAT protocol and VLAN on packet tracer.

C PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

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

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

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

[PO.6]. The engineer and society: The engineers are called society builders and transformers. B. Tech CCE graduate should be able to apply reasoning informed by

the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

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

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

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

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

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

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

Program Specific Outcome

[PSO.1] Imbibe the basic concepts and applications of computer-based Communication or networking, information sharing, signal processing, web-based systems, smart devices, and communication technology.

[PSO.2] Investigate prominent areas in the field of Computer and Communication Engineering to provide feasible solutions.

[PSO.3] Apply the contextual knowledge in the field of Computing and Communication to assess social, health, safety, and security issues relevant to the professional engineering practice.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Received the marks from Netacad courses. Students need to submit a mini project configured on packet tracer (e.g. simulation and configuration of MUJ network, find out the bottlenecks and proposed	60 out of 60, 30 marks will be awarded from the "SRWE" and the rest 20 marks will be based on mini-project and 10 marks will be awarded for the lab experiments file. After each lab, faculty will activate

	solution, or secure the MUJ network/any other organization). The mini-project must be large enough to exhibit the learning of both certificates.	the assignments from the www.netacd.com portal.
End Term Exam (Summative)	End Term (Final Exam+VIVA)	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

Experiment with Packet Tracer: Introduction to Packet tracer and networking device components; Router Mode, Switch/Router basic commands; designing of star topology using HUB and Switch, IP configuration of end devices; configuring DHCP server, static routing, RIP, OSPF, VLAN and NAT; Network programming: Transmission Control Protocol (TCP) socket and User Datagram Protocol (UDP) socket; Network Utilities: PING, NETSTAT, IPCONFIG, IFCONFIG, ARP, TRACE-ROUTE

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. Netacd.com

G . Lab Plan

Lab No.	**Topics**	**Session Outcome**	**Mode of Delivery**	**Corresponding CO**	**Mode of Assessing the Outcome**
1	Introduction to Packet tracer and networking device components. Router Mode, Switch/Router basic commands.	Understand and troubleshoot packet tracer, types of interface and networking devices. Identify and configuration of various router and switch modes	Demonstration at system	CC2230.1	Continuous Evaluation End Term Examination
2	Star Topology using HUB and Switch, IP configuration of end devices, show command, copy command, password setting, hostname setting	Configuration of various topology and troubleshooting.	Lecture Demonstration at system	CC2230.2	Continuous Evaluation End Term Examination
3	DHCP configuration	Configuration of DHCP protocol.	Lecture Demonstration at system	CC2230.3	Continuous Evaluation End Term Examination
4	Configuration of Static Routing Protocol Configuration of RIPv1 and RIPv2. Configuration of OSPF and troubleshooting	implementation of static and dynamic routing protocols	Lecture Demonstration at system	CC2230.3	Continuous Evaluation End Term Examination
5-8	Configuration of VLAN and troubleshooting	Configuration of VLAN and troubleshooting	Demonstration at system	CC2230.3	Continuous Evaluation End Term Examination
9	NAT Protocol Configuration and troubleshooting	Configuration of NAT protocol	Demonstration at system	CC2230.4	Continuous Evaluation End Term Examination
10	Network Utilities- Ping, Netstat, Ipconfig, Ifconfig, Arp, Trace-route	Use of different network utilities to manage the networks.	Demonstration at system	CC2230.4	Continuous Evaluation End Term Examination

11-12	Security and WLANs	Implement the security on switches and routers	Demonstration at system	CC2230.4	Continuous Evaluation End Term Examination

Each week student need to complete one module in CISCO network academy portal.

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
[CC2230.1]:	Identify the basic factors that driving the need of networking and understanding the uses s of packet tracer.	1	1	2	2	1	1		1	1		1		1	1	
[CC2230.2]:	Configuration and simulation of various topologies e.g. star, ring and star.	1	1	1										1		
[CC2230.3]:	Identify the suitable routing algorithm and configuration of protocol using packet tracer.	1	1	1										1		
[CC2230.4]:	Configuration of NAT protocol and VLAN on packet tracer.	1		1					1	1	1	1		1		

I. Course Outcome Attainment Level Matrix:

CO	STATEMENT	ATTAINMENT OF PROGRAM OUTCOMES **THRESHOLD VALUE: 40%**														
		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
[CC2230.1]:	Identify the basic factors that driving the need of networking and understanding the uses s of packet tracer.															

[CC2230.2]:	Configuration and simulation of various topologies e.g. star, ring and star.															
[CC2230.3]:	Identify the suitable routing algorithm and configuration of protocol using packet tracer.															
[CC2230.4]:	Configuration of NAT protocol and VLAN on packet tracer.															

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Department of Computer and Communication Engineering
Course Hand-out

Relational Database Management Systems Lab | CC 2231 | 1 Credits | 0 0 2 1

Session: Jan'22 – May'22 | Course Coordinator: Dr. Geeta Rani | Class: B.Tech 2nd Year / 4th Semester

Faculty: 1. Dr Jitendra Singh Yadav 2. Dr Geeta Rani, 3. Dr. Saurabh Singh Verma 4. Dr Punam Kumari 5. Dr Shashank Singh

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

CC2231.1: Construct the ER, and EER diagrams for a given scenario with correct identification of entities, attributes and relations among different entities.

CC2231.2: Write the queries to build a database, insert, update, delete, transfer, secure, and manage the data in a database, with no anomaly.

CC2231.3: Use different types of triggers in a given database and to create a hypothetical situation to undo the changes in a table.

CC2231.4: Demonstrate the role of stored procedures and transactions with no ambiguity in a database built for a real life application.

C PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

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

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

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

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

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

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

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

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

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

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

[PSO.1]. Imbibe the basic concepts and applications of computer-based Communication or networking, information sharing, signal processing, web-based systems, smart devices, and communication technology.

[PSO.2]. Investigate prominent areas in the field of Computer and Communication Engineering to provide feasible solutions.

[PSO.3]. Apply the contextual knowledge in the field of Computing and Communication to assess social, health, safety, and security issues relevant to the professional engineering practice.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Continuous evaluation: Viva and demonstration of experiments done in each lab, and/or lab assignments	40
	Lab project (Synopsis and report + constraints + data entry and query writing + GUI design)	5 + 5 + 5 + 5 = 20
End Term Exam (Summative)	End Term Exam (CLOSED BOOK)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

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

R2. Avi Silberschatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", TMH, New Delhi, 2006

G. Lecture Plan

Lab No.	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1	• Introduction to basic DDL, DML and DCL commands and domain types in SQL. • DDL statements to create, drop, alter, view and rename the Database.	• Understand basic concepts of DDL, DML and DCL • Demonstrate working of various DDL statements	Lecture Demonstration at system	CC2231.1	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 preexistent. • 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	CC2231.2	Continuous Evaluation, End Term Examination
3-4	• Add primary key constraint to a preexistent 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	CC2231.1 CC2231.2	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	CC2231.3	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	CC2231.3	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	CC2231.3	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	CC2231.3	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	CC2231.4	Continuous Evaluation, Project, End Term Examination

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
[CC2231.1]:	Construct the ER, and EER diagrams for a given scenario with correct identification of entities, attributes and relations among different entities.	1	1	3	2	3			1	1	1	1	1	1	3	
[CC2231.2]:	Write the queries to build a database, insert, update, delete, transfer, secure, and manage the data in a database, with no anomaly.	1	2	3		3			1	1	1	1	1	1	3	
[CC2231.3]:	Use different types of triggers in a given database and to create a hypothetical situation to undo the changes in a table.	1			2	3			1	1	1	1	1	1	2	
[CC2231.4]:	Demonstrate the role of stored procedures and transactions with no ambiguity in a database built for a real life application.	1			2	3			1	1	1	1	1	1	3	2

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

J. Course Outcome Attainment Level Matrix:

CO	STATEMENT	ATTAINMENT OF PROGRAM OUTCOMES **THRESHOLD VALUE: 40%**												ATTAINMENT OF PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
[CC2231.1]:	Construct the ER, and EER diagrams for a given scenario with correct identification of entities, attributes and relations among different entities.															
[CC2231.2]:	Write the queries to build a database, insert, update, delete, transfer, secure, and manage the data in a database, with no anomaly.															
[CC2231.3]:	Use different types of triggers in a given database and to create a hypothetical situation to undo the changes in a table.															
[CC2231.4]:	Demonstrate the role of stored procedures and transactions with no ambiguity in a database built for a real life application.															
[CC2231.1]:	Construct the ER, and EER diagrams for a given scenario with correct identification of entities, attributes and relations among different entities.															

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and IT

DEPARTMENT OF COMPUTER AND COMMUNICATION ENGINEERING

Course Hand-out

Operating Systems Lab | CC 2232 1 Credit | 0 0 2 1

Session: Jan 21-May 21 | Class: B. Tech. IV SEM

Dr. Kusum Lata Jain | Dr. Ghanshayam Raghuwanshi | Dr. Suman Bhakar |Dr. Hemalat Goyal| Dr. Vaishali Yadav

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

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

[CC 2232.1]: Explain basic Unix commands and write shell Scripts.
[CC 2232.2]: Build Skills to develop system programs using file and process system calls.
[CC 2232.3]: Compare various algorithms used for process scheduling.
[CC 2232.4]: Describe concepts related to concurrency and achieve the same for cooperating processes, apply various deadlock handling strategies to solve resource allocation problems.
[CC 2232.5]: 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 teamwork: 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.

PROGRAM SPECIFIC OUTCOMES

[PSO.1] Imbibe the basic concepts and applications of computer-based Communication or networking, information sharing, signal processing, web-based systems, smart devices, and communication technology.

[PSO.2] Investigate prominent areas in the field of Computer and Communication Engineering to provide feasible solutions.

[PSO.3] Apply the contextual knowledge in the field of Computing and Communication to assess social, health, safety, and security issues relevant to the professional engineering practice.

D. ASSESSMENT PLAN:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Continuous evaluation (Record + Execution + Viva)	50
	Lab project	10
End Term Exam (Summative)	End Term Exam (CLOSED BOOK)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

E. SYLLABUS

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

TEXT BOOKS

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

REFERENCE BOOKS

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

F. Lecture Plan

Lab No.	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1-3	**Introduction- Linux Operating System, Unix Commands and Shell Scripts**	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 scripts.	Lecture Demonstration at system	**CC 2232.1**	Continuous Evaluation End Term Examination
4	**System Calls**	Program writing using file system related system calls.	Lecture Demonstration at system	**CC 2232.2**	Continuous Evaluation End Term Examination
5-6	**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	**CC 2232.2**	Continuous Evaluation End Term Examination
7	**Thread**	Implementation of concept of Multi-Threading using PThread in Linux OS.	Lecture Demonstration at system	**CC 2232.2**	Continuous Evaluation End Term Examination
8	**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	**CC 2232.3**	Continuous Evaluation End Term Examination
9-10	**Process Synchronization**	Implementation of Producer-Consumer, Reader-Writer Synchronization Problems using Semaphores	Lecture Demonstration at system	**CC 2232.4**	Continuous Evaluation End Term Examination
11	**Deadlock**	Apply Bankers Algorithm for Deadlock Avoidance.	Lecture Demonstration at system	**CC 2232.4**	Continuous Evaluation End Term Examination
12-13	**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	**CC 2232.5**	Continuous Evaluation End Term Examination

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
[CC 2232.1]:	Explain basic Unix commands and write shell Scripts.	**1**	**1**	**2**	**2**	**1**	**1**		**1**	**1**		**1**		**1**	**1**	**1**
[CC 2232.2]:	Build skills to develop system programs using file and process system calls and PThread API.	**1**	**1**	**1**										**1**		
[CC 2232.3]:	Compare various algorithms used for process scheduling.	**1**	**1**	**1**										**1**		
[CC 2232.4]:	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**	
[CC 2232.5]:	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 & Information Technology

DEPARTMENT OF COMPUTER AND COMMUNICATION ENGG

Course Hand-out

Software Engineering | CC3101 | 4 Credits | 4 0 0 4

Session: Aug 21 - Nov 21 | Faculty: Prof. Dinesh Kumar Saini and Ms. Somya Goyal| Class V SEM

INTRODUCTION: This course is offered by the Department of computer and communication engineering as elective subject for the students to familiarize students with the concepts, steps and building block of software engineering.it also provides knowledge about basic working of the organization, importance of requirement engineering. It helps them to analyses the requirement and create proper design document with the help of tools. The course also deals with testing to check whether software meets the requirements and also to estimate cost to build the software

A. COURSE OUTCOMES: At the end of the course, students will be able to:

[CC 3101.1] The basic knowledge and concept of Software Engineering and importance of requirement engineering to solve the real time problems
[CC 3101.2] Use of tools and utilities to create proper design document and also to check the quality of code.
[CC 3101.3] Design and develop the software based on the requirements.
[CC 3101.4] Identifying and applying appropriate technique to solve the real time problems.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

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

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

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

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

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

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

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

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

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

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

[PSO.1] Imbibe the basic concepts and applications of computer-based Communication or networking, information sharing, signal processing, web-based systems, smart devices, and communication technology.
[PSO.2] Investigate prominent areas in the field of Computer and Communication Engineering to provide feasible solutions.
[PSO.3] Apply the contextual knowledge in the field of Computing and Communication to assess social, health, safety, and security issues relevant to the professional engineering practice**.**

D. ASSESSMENT PLAN:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Examination I (closed book)	20
	Sessional Examination II (Closed Book)	20
	QUIZ, Video Assignment, MOOC Certification	20
End Term Exam (Summative)	End Term Exam (Closed Book)	40
	Total	**100**
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

E. SYLLABUS

Software Engineering: introduction, importance, evaluation, characteristics, and components. Software applications; Software development process models: waterfall model, prototyping model, spiral model, RAD model; agile modelling; Requirement engineering: problem analysis, requirement verification, requirement validation modularity; Software project management: cost estimation, project scheduling, risk management, quality assurance, project monitoring. Estimation techniques: size estimation- LOC estimation, function count, cost estimation, Halstead size estimation, Software design: analysis modeling, functional modeling, behavioral modeling; unified modeling language; Software architecture; Data design: data modeling, data structures; Software testing: white box (unit and integration), black box (system level, egression); Software maintenance: maintenances characteristics, maintainability, maintenances tasks, maintenances side effects; Current trends in software engineering

F. REFERENCE BOOKS

1. R. S. Pressman, “Software Engineering: A Practitioners Approach”, McGraw Hill,2015.
2. K.K. Aggarwal and Y. Singh, “Software Engineering”, New Age International Publishers, 2008
3. P. Jalote, “Software Engineering”, Wiley, 2010
4. I. Sommerville, “Software Engineering”, Addison Wesley, 2013

G. LECTURE PLAN

SN	TOPICS	SESSION OUTCOME	MODE OF DELIVERY	CORRESPONDING CO	MODE OF ASSESING THE OUTCOME
1-4	Introduction: Defining Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences From Conventional Engineering Processes, Software quality attributes	Identify the need of Software Engineering, Software Crisis and Software Quality Attributes	Lecture	CC3101.1	Quiz
5-10	Software Development Life Cycle (SDLC) Models: Water Fall Model, Evolutionary model Prototype Model, Spiral Model, Iterative Enhancement , Component based model ,RAD (rapid application development),Agile model.	To identify & apply the Software model for the appropriate Project	Lecture	CC3101.1	Quiz MTE 1,2 End semester
11-15	Models Basic Concept of Software Requirement Specifications (SRS):Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, information Modeling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Documents	Identify the importance and relevance of Requirement Analysis To Draw the different diagrams which will lead to Design Development	Lecture	CC3101.1 CC3101.2 CC3101.3 CC3101.4	Quiz MTE1,2 End sem
16-18	Software Quality Assurance (SQA): Verification and Validation	Identify and apply the Quality Assurance	Lecture	CC3101.1 CC3101.2 CC3101.3 CC3101.4	Quiz MTE1,2 End sem
19-25	Basic Concept of Software Design: Architectural Design, Low Level Design Modularization, Coherence & coupling, Design Structure Charts, Pseudo Codes, Flow Chart. UML Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Design patterns, General process to be followed for quality of code understanding MVC architecture	Identify , Apply the design to the real time Application Project	Lecture	CC3101.1 CC3101.2 CC3101.3 CC3101.4	Quiz MTE2 End sem

26-30	Cost estimation: Product Metric and different estimation technique based on Functional Point, Loc and calculation time and cost based on size using COCOMO model.	To Calculate the Cost incurred to develop the software and their techniques	Lecture	CC3101.1 CC3101.2 CC3101.3	Quiz MTE2 End sem
31-36	Software Testing: Testing Objectives, Unit Testing, integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top Down and Bottom Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products. Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code inspection, Compliance with Design and Coding Standards.	Apply testing techniques and identify the bugs and importance of testing phase	Lecture	CC3101.1 CC3101.2 CC3101.3 CC3101.4	Quiz MTE2 End sem
37-41	Software Configuration Management: An SCM Scenario, Elements of a Configuration Management System, Baselines, Software Configuration, SCM Repository, SCM Process, Configuration Audit	Identify the need of Software Configuration and management	Lecture	CC3101.1 CC3101.3 CC3101.4	Quiz End sem
42-46	Software Maintenance: Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance	To apply the techniques for Software Maintenance	Lecture	CC3101.1 CC3101.3 CC3101.4	Quiz End sem

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

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO1 2	PS01	PS02	PSO3
[CC3101.1]	The basic knowledge and concept of Software Engineering and importance of requirement engineering to solve the real time problems	2	1	1	1	1	1	1	1	2	1	1	1	1	1	1
[CC3101.2]	Usage of tools and utilities to create proper design document and also to check the quality of code.		1	1	1	1										
[CC3101.3]	Design and develop the software based on the requirements		2	2	2	1	1	1	1	1	1	2	2	2	1	1
[CC3101.4]	Identifying and applying appropriate technique to solve real time problems	2	2	2	1	1	1	1	1	1	2	2	2	1	1	1

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Department of Computer and Communication Engineering
Course Hand-out

Design and Analysis of Algorithms | CC 3102 | 4 Credits | 3 1 0 4
Session: Aug'21 – Dec'21 | Course Coordinator: Dr Geeta Rani | Class: 3nd Year / 5th Semester
Faculty: 1. Dr. Geeta Rani, 2. Dr. Suman Bhakar

A. Introduction: This course aims to discuss techniques for designing efficient algorithms and 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 the designed algorithms.
(ii) Write 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) Demonstrate efficient algorithms in common engineering design situations.

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

[CS3102.1] Analyse the running times of algorithms using asymptotic analysis.
[CS3102.2] Demonstrate and Design algorithms using divide-and-conquer paradigm to solve business problems hence enhance skills.
[**CS3102.3]** Illustrate the concept of greedy and dynamic-programming approach to solve real life problems to enhance entrepreneurship capabilities.
[CS3102.4] Demonstrate the concept of backtracking and branch & bound algorithms.
[**CS3102.5]** Synthesize and analyse various advanced algorithms concept such as graphs, string matching, approximation algorithms and complexity classes to enhance 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 Program Specific Outcomes.

[PSO1]. Imbibe the basic concepts and applications of computer-based Communication or networking, information sharing, signal processing, web-based systems, smart devices, and communication technology.

[PSO2]. Investigate prominent areas in the field of Computer and Communication Engineering to provide feasible solutions.

[PSO3]. Apply the contextual knowledge in the field of Computing and Communication to assess social, health, safety, and security issues relevant to the professional engineering practice.

D. Assessment Rubrics:

Criteria	Description	Date	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I	As per Academic Calendar	20
	Sessional Exam II	As per Academic Calendar	20
	Quizzes and Assignments	Regularly	20
End Term Exam (Summative)	End Term Exam	As per Academic Calendar	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.
Make-up Policy: As per University Norms **Chamber Consultation:** online as per Instructor **Notice:** Via email/ Teams/WhatsApp (Use University Microsoft Account) **Consultancy** **Hours:** To be Announced later	

E. Syllabus:

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

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

F. Text Books

T1. E. Horowitz, S. Sahni and S. Rajasekaran, *"Computer Algorithms"*, 2nd Edition, University Press, 2007.

T2. T. H. Cormen, C. E. Leiserson, R.L.Rivest, and C. Stein, *"Introduction to Algorithms*", 3rd Edition, MIT press, 2009.

G. Reference Books

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

H. Lecture Plan:

Lec. No.	TOPICS	Session Outcomes	Mode of Delivery	Corresponding CO	Mode of Assessing CO
1.	Introduction to Algorithms, Specification of Algorithm, Complexity	Analyse growth of function	Slides / Black Board	3102.1	Quiz 1 and Sessional-I and End-Sem
2.	Asymptotic Notation- Analysis of Algorithm,	Analyse running times of algorithms using asymptotic analysis	Slides / Black Board	3102.1	Quiz 1 and Sessional-I and End-Sem
3.	Time & Space Complexity – Hands-on	Analyse running times of algorithms using asymptotic analysis	Slides / Black Board	3102.1	Quiz 1 and Sessional I and End-Sem
4.	Insertion Sort and Analysis, QA-Discussions	Analyse running times of algorithms using asymptotic analysis	Slides / Black Board	3102.1	Quiz 1 and Sessional-I and End-Sem
5.	Selection Sort and Bubble Sort Analysis, QA-Discussions	Analyse running times of algorithms using asymptotic analysis	Slides / Black Board	3102.1	Quiz 1 and Sessional-I and End-Sem
6.	Divide and Conquer: Merge Sort and Analysis, QA-Discussions	Describe the divide-andconquer paradigm and explain when an algorithmic design situation calls for it	Slides / Black Board	3102.2	Quiz 1 and Sessional-I and End-Sem

7.	Quick Sort and Analysis,	Analyse algorithm using Recurrence relation	Slides / Black Board	3102.2	Quiz 1 and Sessional-I and End-Sem
8.	Master Theorem and its cases	Analyse algorithm using Recurrence relation	Slides / Black Board	3102.2	Quiz 2 and Sessional-I and End-Sem
9.	Randomized Quick sort Analysis	Analyse algorithm using Recurrence relation	Slides / Black Board	3102.2	Quiz 2 and Sessional-I and End-Sem
10.	Heap Sort - Insertion, Deletion – Analysis	Analyse algorithm using Recurrence relation	Slides / Black Board	3102.2	Quiz 2 and Sessional-I and End-Sem
11.	Heap Sort- Priority Queue	Analyse algorithm using Recurrence relation	Slides / Black Board	3102.2	Quiz 2 and Sessional-I and End-Sem
12.	Heap - Insertion, Deletion – Analysis	Analyse algorithm using Recurrence relation	Slides / Black Board	3102.2	Quiz 2 and Sessional-I and End-Sem
13.	Strassen's Matrix Multiplication	Adaptation of different matrix multiplication strategies	Slides / Black Board	3102.2	Quiz 2 and Sessional-I and End-Sem
14.	Greedy Paradigm - Introduction, Coin Change Problem	Synthesize efficient greedy algorithms in common engineering design situations	Slides / Black Board	3102.4	Quiz 3 and Sessional-I and End-Sem

15.	Job Sequencing with deadline, Interval Scheduling Problem (Given as Assignment)	Synthesize efficient greedy algorithms in common engineering design situations	Slides / Black Board	3102.4	Quiz 3 and Sessional-I and End-Sem
16.	Knapsack-problem,	Synthesize efficient greedy algorithms in common engineering design situations	Slides / Black Board	3102.4	Quiz 3 and Sessional-I and End-Sem
17.	Optimal Merge tape, Huffman Encoding	Synthesize efficient greedy algorithms in common engineering design situations	Slides / Black Board	3102.4	Quiz 3 and Sessional-I and End-Sem
18.	Spanning Trees - MST	Synthesize efficient greedy algorithms in common engineering design situations	Slides / Black Board	3102.4	Quiz 3 and Sessional-I and End-Sem
19.	Prim's, Algorithm	Design and Analyze different path finding strategies	Slides / Black Board	3102.4	Quiz 3 and Sessional-2 and End-Sem
20.	Kruskal's Algorithm	Design and Analyze different path finding strategies	Slides / Black Board	3102.4	Quiz 3 and Sessional-2 and End-Sem
21.	Dijkstra's Algorithm-SSSP	Design and Analyze different path finding strategies	Slides / Black Board	3102.4	Quiz 3 and Sessional-2 and End-Sem
22.	Graph Search Algorithm - BFS/ DFS	Design and Analyze different path finding strategies	Slides / Black Board	3102.4	Quiz 4 and Sessional-2 and End-Sem
23.	Topological Sort,	Design and Analyze different path finding strategies	Slides / Black Board	3102.4	Quiz 4 and Sessional-2 and End-Sem

24.	Bellman Ford Algorithm	Design and Analyze different path finding strategies	Slides / Black Board	3102.4	Quiz 4 and Sessional-2 and End-Sem
25.	Connected Components, Bi-connected Components	Synthesize efficient greedy algorithms in common engineering design situations	Slides / Black Board	3102.4	Quiz 4 and Sessional-2 and End-Sem
26.	Introduction to Dynamic Programming-	Design and analysis of dynamic-programming algorithms	Slides / Black Board	3102.3	Quiz 5 and Sessional-2 and End-Sem
27.	Top Down Fibonacci, Binomial Coefficient	Design and analysis of dynamic-programming algorithms	Slides / Black Board	3102.3	Quiz 5 and Sessional-2 and End-Sem
28.	Bottom up Binomial Coefficient, Dynamic Knapsack,	Design and analysis of dynamic-programming algorithms	Slides / Black Board	3102.3	Quiz 5 and Sessional-2 and End-Sem
29.	Longest Integer Sequence, Longest Common Subsequence	Design and analysis of dynamic-programming algorithms	Slides / Black Board	3102.3	Quiz 5 and Sessional-2 and End-Sem
30.	Multi-Stage Graph	Design and analysis of dynamic-programming algorithms	Slides / Black Board	3102.3	Quiz 5 and Sessional-2 and End-Sem
31.	Floyd Warshal Algorithm – All pair of shortest path	Design and analysis of dynamic-programming algorithms	Slides / Black Board	3102.3	Quiz 5 and Sessional-2 and End-Sem
32.	Matrix Chain Multiplication	Design and analysis of dynamic-programming algorithms	Slides / Black Board	3102.3	Quiz 6 and Sessional-2 and End-Sem

33.	TSP- DP method	Design and analysis of dynamic-programming algorithms	Slides / Black Board	3102.3	Quiz 6 and Sessional-2 and End-Sem
34.	OBST-Optimal Binary Search Tree	Design and analysis of dynamic-programming algorithms	Slides / Black Board	3102.3	Quiz 6 and Sessional-2 and End-Sem
35.	Backtracking Intro – Problems	Design and analysis of dynamic-programming algorithms	Slides / Black Board	3102.3	Quiz 6 and Sessional-2 and End-Sem
36.	Graph Coloring, M-Graph Coloring	Synthesize new graph algorithms and algorithms that employ graph computations as key components,	Slides / Black Board	3102.5	Quiz 6 and Sessional-2 and End-Sem
37.	Sum of Subset Problem	Synthesize new graph algorithms and algorithms that employ graph computations as key components,	Slides / Black Board	3102.5	Quiz 6 and End-Sem
38.	N-Queen Problem	Synthesize new graph algorithms and algorithms that employ graph computations as key components,	Slides / Black Board	3102.5	Quiz 6 and End-Sem
39.	Sudoku Game - Design & Implementation (Given as an assignment)	Synthesize new graph algorithms and algorithms that employ graph computations as key components,	Slides / Black Board	3102.5	Quiz 6 and End-Sem

40.	Branch & Bound – Knapsack	Synthesize new graph algorithms and algorithms that	Slides / Black Board	3102.5	Quiz 6 and End-Sem
		employ graph computations as key components,			
41.	Branch & Bound - Job Assignment	Synthesize new graph algorithms and algorithms that employ graph computations as key components,	Slides / Black Board	3102.5	End-Sem
42.	15 Puzzle Problem (Given as an assignment)	Synthesize new graph algorithms and algorithms that employ graph computations as key components,	Slides / Black Board	3102.5	End-Sem
43.	Branch & Bound – TSP	Synthesize new graph algorithms and algorithms that employ graph computations as key components,	Slides / Black Board	3102.5	End-Sem
44.	String Matching – Meaning and Application	Synthesize new graph algorithms and algorithms that employ graph computations as key components,	Slides / Black Board	3102.5	End-Sem
45.	Naïve String Matching, Rabin Karp Algorithm	Synthesize new graph algorithms and algorithms that employ graph computations as key components,	Slides / Black Board	3102.5	End-Sem

46.	Knuth-Morris-Pratt (KMP) Algorithm	Synthesize new graph algorithms and algorithms that employ graph computations as key components,	Slides / Black Board	3102.5	End-Sem
47.	Randomization & Approximation Algorithm	Synthesize new graph algorithms and algorithms that employ graph computations as key components,	Slides / Black Board	3102.5	End-Sem
48.	Randomization & Approximation Algorithm	Synthesize new graph algorithms and algorithms that employ graph computations as key components,	Slides / Black Board	3102.5	End-Sem

I. 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
CC3102.1	Analyse the running times of algorithms using asymptotic analysis.		3		2								1		3	2
CC3102.2	Demonstrate and Design algorithms using divide and-conquer paradigm to solve business problems hence enhance skills.		2	2								2			2	2
CC3102.3	Illustrate the concept of greedy and dynamic programming approach to solve real life problems to enhance entrepreneurship capabilities.			2	1	1									2	3
CC3102.4	Demonstrate the concept of backtracking and branch & bound algorithms.			3	2					2					3	2
CC3102.5	Synthesize and analyse various advanced algorithms concept such as graphs, string matching, approximation algorithms and complexity classes to enhance employability.			2	2		1			1	2		1	1	3	2

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

J. Course Outcome Attainment Level Matrix:

CO	STATEMENT	ATTAINMENT OF PROGRAM OUTCOMES **THRESHOLD VALUE: 40%**												ATTAINMENT OF PROGRAM SPECIFIC OUTCOMES		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CC3102.1	Analyse the running times of algorithms using asymptotic analysis.															
CC3102.2	Demonstrate and Design algorithms using divide and-conquer paradigm to solve business problems hence enhance skills.															
CC3102.3	Illustrate the concept of greedy and dynamic programming approach to solve real life problems to enhance entrepreneurship capabilities.															
CC3102.4	Demonstrate the concept of backtracking and branch & bound algorithms.															
CC3102.5	Synthesize and analyse various advanced algorithms concept such as graphs, string matching, approximation algorithms and complexity classes to enhance employability.															

MANIPAL UNIVERSITY JAIPUR

School of Computer & Information Technology

Department of Computer and Communication Engineering
Course Hand-out

Foundation of Data Science | CC 3103 | 4 Credits | 3 1 0 4

Session: July 2021 – Dec., 2021 | Course Coordinator: Manoj Kumar Sharma | Class: 3rd Year / 5th Semester

Faculty: 1. Dr Manoj Kumar Sharma

A. Introduction: This is a core course which provides understanding of mathematical foundation of the data science and machine learning. In this course student will be able to understanding the use of mathematical foundations like linear algebra, probability and statistics and some basic machine learning algorithms.

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

[3103.1]. Describe with the illustration of mathematical concepts in the field of data science
[3103.2]. Discuss with illustration the techniques and methods related to the area of data science in variety of applications
[3103.3]. Understand and Apply logical thinking to understand and solve the problem in context
[3103.4]. Describe with examples, the basic machine learning algorithms with their applications.
[3103.5]. Recommend appropriate mathematical concept/ model to solve real world problems through machine learning and data science concepts which leads to 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
[PSO.1]. Imbibe the basic concepts and applications of mathematical concepts in data science and machine learning algorithms.

[PSO.2]. Investigate prominent areas in the field of Computer and Communication Engineering to provide feasible solutions.

[PSO.3]. Apply the contextual knowledge in problem solving through Machine learning and Data Science

D. Assessment Rubrics:

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

Basics of Data Science: Introduction, Typology of problems, Importance of linear algebra, statistics and optimization from a data science perspective, Structured thinking for solving data science problems;

Linear Algebra: Matrices and their properties (determinants, traces, rank, nullity, etc.), Eigenvalues and eigenvectors, Matrix factorizations, Inner products, Distance measures, Projections, Notion of hyper planes, half-planes;

Probability, Statistics and Random Processes: Probability theory and axioms, Random variables, Probability distributions and density functions (uni-variate and multivariate), Expectations and moments, Covariance and correlation, Statistics and sampling distributions, Hypothesis testing of means, proportions, variances and correlations, Confidence (statistical) intervals, Correlation functions, White-noise process;

Optimization: Unconstrained optimization, Necessary and sufficiency conditions for optima, Gradient descent methods, Constrained optimization, KKT conditions, Introduction to non-gradient techniques, Introduction to least squares optimization, Optimization view of machine learning;

Introduction to Data Science Methods: Linear regression as an exemplar function approximation problem, Linear classification problems.

F. Text Books : NA

G. REFERENCE BOOKS

R1. *G. Strang, Introduction to linear algebra, Wellesley, (5e), MA: Wellesley-Cambridge Press, 2016.*

R2. *J. S. Bendat, A. G. Piersol, Random data: analysis and measurement procedures, (4e), John Wiley & Sons. 2010.*

R3. *D. C. Montgomery, G. C. Runger, Applied statistics and probability for engineers, (5e), John Wiley & Sons, 2011. 4. C. O'Neil, R. Schutt, Doing data science: Straight talk from the frontline, O'Reilly Media, Inc., 2016.*

H. Lecture Plan:

Lect. No	Topics	Session Objective	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1	Basics of Data Science, Introduction	To acquaint and clear teachers expectations and understand student expectations	Lecture	NA	NA
2-3	Typology of problems, Importance of linear algebra, statistics and optimization from a data science perspective	Explain mathematical foundations and their importance in Data Science	Lecture	3103.1 3103.5	Class Quiz/ Sessional Exam / End Term Exam
5-6	Structured thinking for solving data science problems	Explain how to solve data science problems	Lecture	3103.1	Sessional Exam/ End Term Exam
7-8	Matrices and their properties (determinants, traces, rank, nullity, etc.)	Explain the application of matrices and determinants in data science	Lecture/Flipped Classroom	3103.1	Class Quiz Sessional Exam/ End Term Exam
9-10	Eigenvalues and eigenvectors, Matrix factorizations, Inner products	Explain concept of Eigenvalue/ Eigenvectors in data science	Lecture	3103.1	Class Quiz Sessional Exam/ End Term Exam
11-12	Distance measures	Explain different distance measuring matrices	Lecture	3103.1	Sessional Exam/ End Term Exam
13-14	Linear Algebra - Projections, Notion of hyper planes, half-planes	Explain use of Linear algebra in data science problems	Lecture	3103.1 3103.5	Home Assignment Class Quiz Sessional Exam/ End Term Exam
15-16	Probability theory and axioms, Random variables	Explain use of probability theory and axiom and random variables in data science	Lecture/Flipped Classroom	3103.1 3103.5	Home Assignment Sessional Exam/ End Term Exam
17	Probability distributions and density functions (uni-variate and multivariate)	Explain use of probability distribution and density function in data science	Lecture	3103.2 3103.5	Sessional Exam/ End Term Exam
18-19	Expectations and moments, Covariance and correlation	Explain variance, covariance and correlation of parameters in data science algorithms	Lecture	3103.2 3103.5	Home Assignment Sessional Exam/ End Term Exam
20-21	Statistics and sampling distributions	Explain sample distribution in machine learning	Lecture	3103.2	Sessional Exam/ End Term Exam
22-23	Hypothesis testing of means	Explain how to perform hypothesis testing with different methods	Lecture/Flipped Classroom	3103.2	Sessional Exam/ End Term Exam
24-25	Proportions, variances and correlations, Confidence (statistical) intervals, Correlation functions, White-noise process	Explain variances, correlation, confidence and while noise process in data science	Lecture	3103.2 3103.5	Class Quiz Sessional Exam/ End Term Exam
26	Unconstrained optimization, Necessary and sufficiency conditions for optima	Explain optimization and its applications in data science	Lecture	3103.2	Sessional Exam/ End Term Exam
27	Gradient descent methods	Explain gradient decent methods with examples	Lecture	3103.3 3103.5	Sessional Exam/ End Term Exam
28-29	Constrained optimization, KKT conditions	Explain constrained optimization and KKT conditions	Lecture/Flipped Classroom	3103.3	Class Quiz Sessional Exam/ End Term Exam

30-31	Introduction to non-gradient techniques	Explain non-gradient techniques	Lecture	3103.3	Class Quiz Sessional Exam/ End Term Exam
32	Introduction to least squares optimization	Explain least square optimization	Lecture	3103.3	Sessional Exam/ End Term Exam
33	Optimization view of machine learning	Explain the optimization of machine learning	Lecture/Flipped Classroom	3103.3	Class Quiz Sessional Exam/ End Term Exam
34-36	Linear regression as an exemplar function approximation problem	Explain linear regression with appropriate examples	Lecture	3103.3	Class Quiz Sessional Exam/ End Term Exam
37-41	Linear classification problems	Explain classification in linear manner	Lecture	3103.4 3103.5	Sessional Exam/ End Term Exam

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

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CC 3103.1	Describe with the illustration of mathematical concepts in the field of data science	**2**	**1**	**1**											**1**	
CC 3103.2	Discuss with illustration the techniques and methods related to the area of data science in variety of applications	**2**	**1**	**1**			**2**	**2**							**1**	
CC 3103.3	Understand and Apply logical thinking to understand and solve the problem in context	**2**	**2**	**2**											**1**	
CC 3103.4	Describe with examples, the basic machine learning algorithms with their applications	**2**	**2**												**1**	
CC 3103.5	Recommend appropriate mathematical concept/ model to solve real world problems through machine learning and data science concepts which leads to employability.	**3**	**2**	**2**			**1**	**2**		**1**					**1**	

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

J. Course Outcome Attainment Level Matrix:

CO	STATEMENT	ATTAINMENT OF PROGRAM OUTCOMES **THRESHOLD VALUE: 40%**											ATTAINMENT OF PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CC 3103.1	Describe with the illustration of mathematical concepts in the field of data science															
CC 3103.2	Discuss with illustration the techniques and methods related to the area of data science in variety of applications															
CC 3103.3	Understand and Apply logical thinking to understand and solve the problem in context															
CC 3103.4	Describe with examples, the basic machine learning algorithms with their applications															
CC 3103.5	Recommend appropriate mathematical concept/ model to solve real world problems through machine learning and data science concepts which leads to employability.															

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Department of Computer and Communication Engineering
Course Hand-out

Cryptography and Security | CC3104 | 4 Credits | 3 1 0 4

Session: Aug'21 – Dec'21 | Course Coordinator/Faculty: Dr Vaishali | Class: 3rd Year / 5th Semester

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

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

[3104.1]. Explain the basic concept of Cryptography & Security with importance on mathematical background of number theory with its usage in the field of computing.
[3104.2]. Identify the usage of tools in understanding and performing the security attacks.
[3104.3]. Examine and acquire appropriate skills to solve real time problems in real world.
[3104.4]. Analyze the performance and applicability of learned cryptographic algorithms.
[3104.5]. Identify the research trends and propose their own design for different security issues to have safer environment for computation in order to acquire more employability options.

C. Program Outcomes and Program Specific Outcomes

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

[PSO.2]. Investigate prominent areas in the field of Computer and Communication Engineering to provide feasible solutions.

[PSO.3]. Apply the contextual knowledge in the field of Computing and Communication to assess social, health, safety, and security issues relevant to the professional engineering practice.

D. Assessment Rubrics:

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

F. Text Books

T1. W. Stallings, "Cryptography and Network Security, Principles and Practices", 6th Edition, Pearson Education, 2013.

T2. B. A. Forouzan, "Cryptography and Network Security", 3rd Edition, McGraw Hill, 2015.

G. REFERENCE BOOKS

R1. Pieprzyk, T. Hardjono, J. Seberry, "Fundamentals of Computer Security", springer- Verlag Berlin Heidelberg, 2013.

R2. C. P. Pfleeger, "Security in Computing", 4th Edition, Prentice Hall, 2014.

H. Lecture Plan:

Lect. No	**Topics**	**Session Objective**	**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
2-5	Introduction to Security & Cryptography: Need for Computer, Security, Basic concepts, Security Attributes, security attacks, Security services and mechanisms.	Identifying the Security attribute and its importance	Lecture	3104.1	Class Quiz/ Sessional Exam / End Term Exam
6-12	Cryptography: Introduction, Symmetric ciphers, Symmetric Key, cryptography, Different types of Encryption	Identify different classical encryption technique with their drawbacks	Lecture	3104.1 3104.2	Class Quiz/ Sessional Exam/ End Term Exam
13-20	Block Cipher: S-DES, DES, its rounds, strength of DES, triple DES; Modes: Electronic codebook mode, cipher block chaining mode, cipher feedback mode, output feedback mode, counter mode; Finite fields	Working and basics of modern encryption techniques and modes of Encryption	Lecture	3104.3 3104.4	Class Quiz/ Home Assignment Sessional Exam/ End Term Exam
21-25	Block Cipher AES: AES structure, AES transformation functions, AES key expansions, AES implementation;	Advance encryption scheme and its working and applications	Lecture	3104.3 3104.4 3104.5 3104.1	Class Quiz Sessional Exam/ End Term Exam
26-30	Pseudorandom Number Generation: Principles of pseudorandom number generation, pseudorandom number generators, pseudorandom number generation using block ciphers and stream cipher	Importance of Pseudo Random Numbers and its application	Lecture	3104.5 3104.1	Home Assignment Sessional Exam/ End Term Exam
31-37	Basics of Number theory, Public-key cryptography, RSA, its implementation, El Gamal cryptographic system, Elliptic curve arithmetic, Elliptic curve cryptography	Working of modern Cryptographic algorithms	Lecture	3104.3 3104.4 3104.5	Class Quiz Sessional Exam/ End Term Exam
38-41	Key Management, Diffee-Hellman key exchange, Certification Authority, Digital Certificate.	Key exchange relevance and its application	Lecture	3104.3 3104.4	Home Assignment/ Class Quiz/ Sessional Exam/ End Term Exam
42-45	Basics of Hash, MAC, working of it, Digital signature and authentication protocols	Working of Hash, Mac	Lecture	3104.3 3104.1	Class Quiz/ Sessional Exam/ End Term Exam
46-48	Security Attacks :Different types of attack and its existing Solutions	Possible attacks and its solution	Lecture	3104.2 3104.5 3104.1	Home Assignment/ Class Quiz/ Sessional Exam/ End Term Exam

49-50	Operating Systems. Security capabilities of different platforms, Identification and authentication. Passwords, choosing, managing, spoofing attacks. User accounts, file permissions, backups, Access Control and Firewalls.	Operating system attacks	Self-Study	3104.1 3104.2 3104.4 3104.5	Class Quiz/ Sessional Exam/ End Term Exam

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

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CC 3104.1	Explain the basic concept of Cryptography & Security with importance on mathematical background of number theory with its usage in the field of computing	**2**						**1**			**1**		**2**	**2**	**1**	**1**
CC 3104.2	Identify the usage of tools in performing and understanding the security attacks	**1**	**2**		**1**	**3**								**1**	**1**	**1**
CC 3104.3	Examine and acquire appropriate skills to solve real time problems in real world.		**2**					**2**		**1**		**1**		**2**	**2**	
CC 3104.4	Analyze the performance and applicability of learned cryptographic algorithms.		**1**	**2**	**3**								**1**	**2**	**2**	**2**
CC 3104.5	Identify the research trends and to propose their own design for different security issues to have safer environment for computation in order to acquire more employability options.		**1**	**1**	**1**		**2**	**2**				**1**			**2**	**2**

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

J. Course Outcome Attainment Level Matrix:

CO	STATEMENT	ATTAINMENT OF PROGRAM OUTCOMES **THRESHOLD VALUE: 40%**												ATTAINMENT OF PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CC 3104.1	Explain the basic concept of Cryptography & Security with importance on mathematical background of number theory with its usage in the field of computing															
CC 3104.2	Identify the usage of tools in performing and understanding the security attacks															
CC 3104.3	Examine and acquire appropriate skills to solve real time problems in real world.															
CC 3104.4	Analyze the performance and applicability of learned cryptographic algorithms.															
CC 3104.5	Identify the research trends and to propose their own design for different security issues to have safer environment for computation in order to acquire more employability options.															

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

MANIPAL UNIVERSITY
JAIPUR

SCHOOL OF COMPUTING & INFORMATION TECHNOLOGY

DEPARTMENT OF COMPUTER & COMMUNICATION ENGG.

COURSE HAND-OUT

WEB PROGRAMMING: CC3140: (DE) || 3 Credits||3 0 0 3

Session: JULY 21 – DEC 21 | Faculty Name: Dr V S Dhaka

A. Introduction: Details about overall course. The main objective of this course is to familiarize students with the basics of Web, Web clients and servers with working of HTTP. It also gives the insight of developing static and dynamic Web pages to serve as front-end to client/server applications, and effective server side programming while introducing event -driven system programming. The course also covers basics of XML and recent trends in the area of web technology. The course also covers application areas of Introduction of web technology in Electronic Commerce**.**

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

[CC3140.1]: Recognize fundamentals and working principles of web technology and web programming.

[CC3140.2]: Design and implement client-side web programming using HTML, Java Script, CSS, JSON, Angular JS and Node JS.

[CC3140.3]: Implement server-side programming using PHP and JSP and Database interactions.

[CC3140.4]: Web-based applications development and deployment on the webserver and debugging.

[CC3140.5]: Developing skills for designing websites leads to entrepreneurship opportunities

C. Program Outcomes and Program Specific Outcomes

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

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

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

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

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

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

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

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

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

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

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

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

Program Specific Outcomes (PSOs)

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

[PSO.1] Imbibe the basic concepts and applications of computer-based Communication or networking, information sharing, signal processing, web-based systems, smart devices, and communication technology.

[PSO.2] Investigate prominent areas in the field of Computer and Communication Engineering to provide feasible solutions.

[PSO.3] Apply the contextual knowledge in the field of Computing and Communication to assess social, health, safety, and security issues relevant to the professional engineering practice.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	**Sessional Exam I** **Sessional Exam II**	**20** **20**
		20
	MOOC :2/Quizzes **Project: 1**	MOOC: 2*7=14 Project : 1* 6=6
End Term Exam (Summative)	**End Term Exam**	**40**
	Total	**100**
(Formative)	**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: overview of internet and "the web", web system architecture; HTTP: basics of HTTP request and response, HTTP methods, headers, content transport (push and pull), drawbacks HTTP1.0, introduction to HTTP1.1, HTTPS, SSL;

Client side programming: introduction to HTML, using XHTML – basic syntax and semantics, fundamental elements, URLs – inter-page and intra-page linking, lists, tables, frames and forms, html document object model (DOM), deficiencies of HTML, introduction to HTML5, styling with CSS4, CSS5;

JavaScript: fundamental, document object model, event handling, pattern matching and form validation with regular expressions, internal & external JavaScript, working with class, objects, constructors and inheritance, JSON;

Server side programming: three tier model, PHP –basics, form validation, sessions and session tracking techniques, ASP; XML: syntax and semantics, document structure, DTDs;

Angular JS: overview, MVC architecture, directives, controllers, modules; **Node JS**: modules, NPM modules, create, edit and publish NPM modules

F. Reference(s):

R1. D. Herron, Node.js Web Development: Server-side development with Node 10 made easy, (4e), Packet Publishing, 2018.

R2. S. Seshadri, Angular: Up and Running- Learning Angular, Step by Step, (1e), Shroff/O'Reilly, 2018.

R3. DT. E. Services, HTML 5 Black Book, (2e), Dreamtech Press, 2016.

R4. J. Sklar, Web Design Principles, (5e), Cengage, 2015.

R5. P. J. Deitel, H. M. Deitel, Internet and World Wide Web How to program, (5e), Pearson, 2011.

R7. R. Moseley, M. T. Savaliya, Developing Web Applications, (1e), John Wiley & Sons, 2007.

R8. J. C. Jackson, Web Technologies: A Computer Science Perspective, Pearson Education, 2007.

H. Lecture Plan:

Lecture No	**Topics**	**Session Outcome**	**Mode of Delivery**	**Corresponding CO**	**Mode of Assessing the Outcome**
1	Overview of Internet and the sub network	Introduction of Internet	Lecture	1551.1	Class Quiz and Mid Term-1
2	Web System Architecture	Physical structure of Web system	Lecture	1551.1	Class Quiz and Mid Term-1
3,4	Web Clients and Web Servers	To store, process and deliver web pages to the users.	Lecture	1551.1	Class Quiz and Mid Term-1
5,6	Application Servers	Understanding the application servers	Lecture	1551.1	Class Quiz and Mid Term-1
7,8,9	HTTP– Basics of HTTP Request and Response, HTTP Methods, headers, content transport (PUSH and PULL), Drawbacks HTTP1.0	Introduction of HTTP with Drawbacks	Lecture	1551.1	Class Quiz and Mid Term-1
10	Introduction to HTTP1.1, HTTPS, SSL	Explanation and analysis of HTTP and SSL	Lecture	1551.1	Class Quiz Mid Term I End Term
11	Discussion of Project and Assignment	Case study on the project	Group Discussion	1551.4/5	Continuous Evaluation
12,13	Generation of Dynamic Web pages, Extension Mechanisms	Basics of Web development.	Lecture	1551.2	Class Quiz Mid Term 1 End term
14,15	Web application Design Life-cycle, Web Markup Languages	Website enhancement methods.	Lecture	1551.2	Home Assignment Class Quiz Mid Term 1 End Term
16	Project Study presentation by students	Project Discussion	Flip Class	1551.4/5	Continuous Evaluation
17,18	Intro to HTML and Deficiencies of HTML	Static approach of development	Lecture	1551.2	Class Quiz Mid Term 1 End Term

19	XHTML– Basic syntax and semantics, fundamental elements,	Introduction of XHTML	Lecture	1551.2	Class Quiz Mid Term I End Term
20	URLs – Inter-page and Intra-page Linking, Lists, Tables, Frames and Forms	Designing of frames, lists, tables.	Lecture	1551.2	Class Quiz Mid Term I End Term
21,22	HTML Document Object Model (DOM), Styling with CSS	Introduction of Web development	Lecture	1551. 2	Class Quiz Mid-Term II and End Term
23,24	Introduction to HTML5,CSS4 and CSS5	Basic introduction of web design and development	Lecture	1551.2/4	Class Quiz Mid-Term II and End Term
25,26	Client side dynamic programming with JavaScript- Basics	Advance web designing and development	Lecture	1551.2/4	Class Quiz Mid-Term II and End Term
27,28	Primitives, Loops, Decision Statements, Screen Output and Keyboard Input .	Understanding of loops and decision statement.	Lecture	1551.2/4	Class Quiz Mid-Term II and End Term
29,30	Arrays and Functions, Event Handling, Pattern Matching and Form Validation with Regular Expressions	Verification and validation of web development.	Lecture	1551.2/4	Class Quiz Mid-Term II and End Term
31	Midterm Project Presentation by the students and discussion	Project Discussion	Flip Class	1551.4/5	Continuous Evaluation
32	JSON	Introduction to JavaScript Object Notation	Lecture	1551.2/4	Class Quiz Mid-Term II and End Term
33	Three Tier Model	Analysis of Tier system	Lecture	1551.2/4	Class Quiz Mid-Term II and End Term

34	PHP –Basics, Form Validation	Dynamic programing –Through PHP	Lecture	1551.3/4	Class Quiz Mid-Term II and End Term
35,36	Sessions and Session Tracking techniques	Useful Methodology of PHP	Lecture	1551.3/4	Class Quiz Mid-Term II and End Term
37,38	ASP, JSP	Dynamic programing through ASP	Lecture	1551.3/4	Class Quiz Mid-Term II and End Term
39-40	XML – Syntax and Semantics	Introduction of XML	Lecture	1551.3/4	Class Quiz and End term
41	Document Structure, DTDs, Need for Namespaces	Explanation of Domain name server	Lecture	1551.4/5	Class Quiz and End term
42	Angular JS	overview, MVC architecture, directives	Lecture	1551.4/5	Class, MOOC and End term
43	Angular JS	controllers, modules	Lecture	1551.4/5	Class, MOOC and End term
44	Node JS	modules, NPM modules,	Lecture	1551.4/5	Class, MOOC and End term
45	Node JS	create, edit and publish NPM modules	Lecture	1551.4/5	Class, MOOC and End term
44	End Term Project Evaluation presentation	Project Evaluation	Flip Class	1551.4/5	Continuous 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
[CC3140.1]	Recognize fundamentals and working principles of web technology and web programming.	2				3		2	2			3		2	2	3
[CC3140.2]	Design and implement client-side web programming using HTML, Java Script, CSS, JSON, Angular JS and Node JS.			3	3	1							3		2	2
[CC13140.3]	Implement server-side programming using PHP and JSP and Database interactions.		2	3	2	1	1			2	2			1	1	2
[CC31540.4]	Web based applications development and deployment on web server and debugging.					3			1	1				1		3
[CC3140.5]	Developing skills for designing websites leads to entrepreneurship opportunities.			3	2						1	3	1	1	2	3

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

DEPARTMENT OF COMPUTER AND COMMUNICATION ENGINEERING

Course Hand-out

Soft Computing | CC 3141 | 3 Credits | 3 0 0 3

Session: Aug 21-Nov 21 | Faculty: Mr. Nitesh Pradhan | Class: BTech CCE V SEM | Sec: A|B

A. Introduction: This course is offered by Computer and Communication Engineering, targeting students who wish to pursue development and research in industries or higher studies in field of Computer Science, Information Technology and Communication Engineering. This course will form the concept of soft computing hence this course is introduced at this level to make the students understand concept of neural networks, fuzzy logic and genetic algorithm and use the type depending upon the application.

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

[CC 3141.1]	Learn about soft computing techniques and their applications.
[CC 3141.2]	Implement various supervised learning algorithms with their application.
[CC 3141.3]	Implement various unsupervised learning algorithms with their application.
[CC 3141.4]	Describe and Implement fuzzy systems for some real world problems.
[CC 3141.5]	Understand the genetic algorithm concepts and their applications.
[CC 3141.6]	Identify and select a suitable Soft Computing technology to solve the problem.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

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

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

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

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

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

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[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] Imbibe the basic concepts and applications of computer-based Communication or networking, information sharing, signal processing, web-based systems, smart devices, and communication technology.

[PSO.2] Investigate prominent areas in the field of Computer and Communication Engineering to provide feasible solutions.

[PSO.3] Apply the contextual knowledge in the field of Computing and Communication to assess social, health, safety, and security issues relevant to the professional engineering practice**.**

Assessment Plan:

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

D. SYLLABUS

Introduction: Soft computing and its applications; **Neural networks:** Architectures, Transfer Functions; Learning models: supervised, unsupervised, reinforcement learning; Types of neural network: perceptron, backpropagation, multi-layer perceptron, radial basis function, recurrent neural network, self-organizing maps, Boltzmann machine; **Fuzzy logic and fuzzy systems**: introduction and applications, fuzzy versus crisp set, basic operations on fuzzy sets, relations, fuzzy rule based models, fuzzy classification, fuzzy arithmetic, fuzzy numbers, linguistic variables, arithmetic operations on intervals and numbers, lattice of fuzzy numbers,

fuzzy equations, properties of membership functions, fuzzification and defuzzification, automated methods for fuzzy systems; **Genetic algorithms**: overview, applications, operators, fitness function, classifier systems, convergence; Hybrid soft computing approaches.

E. REFERENCE BOOKS

1. S.N. Sivanandam, S.N. Deepa, Principles of Soft Computing, (3e), Wiley, 2018.
2. T. J. Ross, Fuzzy Logic with Engineering Applications, (2e), Wiley, 2016.
3. S. J. Russel, P. Norvig, Artificial Intelligence, (3e), Pearson, 2015.
4. J. –S Jang, R, C. – T Sun, E. Mizutani, Neuro-fuzzy and Soft Computing, Pearson, 2015.

F. Lecture Plan:

Class Number	Topics	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1	Introduction and Course Hand-out briefing	Lecture	NA	NA
2	Overview of Soft Computing and its applications	Lecture	CO 1	Mid Term I, Quiz & End Term
3-4	McCulloch-Pitts Model with examples	Lecture	CO 1	Mid Term I, Quiz & End Term
5	Introduction to neural Network	Lecture	CO 2	Mid Term I, Quiz & End Term
6-7	Perceptron Network with examples	Lecture	CO 2	Mid Term I, Quiz & End Term
8-10	Adaptive Linear Neuron with examples	Lecture	CO 2	Mid Term I, Quiz & End
11-13	Back Propagation Network with examples	Lecture	CO 1 & CO 2	Mid Term II, Quiz & End Term
14-16	Radial Basis Function Network with examples	Lecture	CO 2	Mid Term I, Quiz & End
17-19	Kohonen Self-Organizing Feature Map	Lecture	CO 3	Mid Term II, Quiz & End Term

20-22	Learning Vector Quantization with examples	Lecture	CO 2 & CO 3	Mid Term II, Quiz & End Term
23-25	Counter propagation Network with examples	Lecture	CO 2 & CO 3	Mid Term II, Quiz & End Term
26-27	Fuzzy logic and fuzzy systems: introduction and applications, fuzzy versus crisp set.	Lecture	CO 4	Mid Term II, Quiz & End Term
28-30	Basic operations on fuzzy sets, relations, fuzzy rule based models, fuzzy classification.	Lecture	CO 4	Mid Term II, Quiz & End
31-33	Fuzzification and defuzzification, automated methods for fuzzy systems	Lecture	CO 4 & CO 6	Mid Term II, Quiz & End Term
34	Overview and applications of Genetic Algorithm	Lecture	CO 5	
35-37	Fitness function, classifier systems	Lecture	CO 5	
38-40	Hybrid soft computing approaches	Lecture	CO 5 & CO 6	

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

CO	STATEMENT	Correlation with Program Outcomes(POs)												Correlation with Program Specific Outcomes (**PSOs**)		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
[CC 3141.1]	Learn about soft computing techniques and their applications.	**2**	**2**			**1**	**-**	**-**	**-**				**1**	**1**	**-**	**-**
[CC 3141.2]	Implement various supervised learning algorithms with their application.	**2**	**2**		**3**	**1**	**1**	**-**	**-**					**2**	**-**	**-**
[CC 3141.3]	Implement various unsupervised learning algorithms with their application.	**2**	**1**	**3**		**1**	**1**								**2**	
[CC 3141.4]	Describe and Implement fuzzy systems for some real world problems.	**1**			**3**	**2**	**2**						**2**	**1**		
[CC 3141.5]	Understand the genetic algorithm concepts and their applications.	**2**					**1**					**2**	**1**	**2**		
[CC 3141.6]	Identify and select a suitable Soft Computing technology to solve the problem.	**1**			**3**							**2**	**2**		**2**	

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

MANIPAL UNIVERSITY
JAIPUR

SCHOOL OF COMPUTING & INFORMATION TECHNOLOGY

DEPARTMENT OF COMPUTER AND COMMUNICATION ENGINEERING
COURSE HAND-OUT

Software Engineering Lab| CC 3130| 1 Credit | 0 0 2 1

Session: Jan '21 – May '21
Faculty: **Dr. Dinesh Kumar Saini** and **Ms. Somya Goyal**

|Class: B.Tech. IIIrd Year V Semester

A. Introduction:

The software Engineering lab will facilitate the students to develop a preliminary yet practical understanding of software development process and tools

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

[CC3130.1]: To be able to understand different software methodologies.
[CC3130.2]: Understanding of Requirement analysis and SRS.
[CC3130.3]: To be able to understand the concepts of UML diagrams.
[CC3130.4]: Design of test cases based on requirement and design.

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 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 CSE program, the student:

[PSO.1] **Analysis** to design, develop and implement efficient software for a given real life problem.

[PSO.2] **Develop** through practice apply knowledge of AI, Machine Learning and Data Mining in analyzing big data for extracting useful information from it and for performing predictive analysis.

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

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D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Continuous evaluation (20 for Performance, 10 Lab file, 20 Viva, 20 Mini 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

CC3130: SOFTWARE ENGINEERING LAB [0 0 2 1]

Development of software requirements specification (SRS); Use of appropriate CASE tools and other tools such as configuration management tools, program analysis tools in the software life cycle; Flow of events and System modelling (DFD and ER); Use Case diagrams; Object-oriented design using UML; Class diagram; Object diagram; State transition diagram, State chart diagram; activity diagram; Sequence diagram; Collaboration diagrams; Component diagram; Deployment diagram; Designing test cases for white box and black box testing strategies; Introduction to DevOps; Mini project.

Guidelines for Mini Project-

1. Students must make groups of minimum 02 and maximum 04 members.
2. The group must freeze their project title in the beginning of the course.
3. All the students must perform all the lab experiments / activities for their selected project title only throughout the course.

Suggested Titles-

a. Student Result Management System

b. Library management system

c. Inventory control system

d. Accounting system

e. Fast food billing system

f. Bank loan system

g. Blood bank system

h. Railway reservation system

i. Automatic teller machine

j. Video library management system

k. Hotel management system

l. Hostel management system

m. E-ticking

n. Share online trading

o. Hostel management system

p. Resource management system

q. Court case management system

F. REFERENCES

1. R. S. Pressman, Software Engineering: A Practitioners Approach, (7e), McGraw Hill, 2016.
2. I. Sommerville, Software Engineering, (10e), Pearson, 2016.
3. R. Mall, Fundamental of Software Engineering, (5e), PHI, 2018.
4. P. Jalote, Software Engineering a Precise Approach, (1e), Wiley India, 2010.
5. L. Bass, DevOps: A Software Architect's Perspective, Pearson Education, 2016.

G . Lab Plan

Lab No.	**Topics**	**Session Outcome**	**Mode of Delivery**	**Corresponding CO**	**Mode of Assessing the Outcome**
1	Write the complete problem statement.	Understand the Problem Definition	Lecture Demonstration at system	CC 3130.1	Continuous Evaluation End Term Examination
2	Write the software requirement specification document	Understand and demonstrate the SRS writing from Problem Definition	Lecture Demonstration at system	CC 3130.1 CC 3130.2	Continuous Evaluation End Term Examination
3	Draw the entity relationship diagram	Understand and demonstrate the E-R diagram	Lecture Demonstration at system	CC 3130.2	Continuous Evaluation End Term Examination
4	Draw the data flow diagrams at level 0 and level 1	Understand and demonstrate the DFD	Lecture Demonstration at system	CC 3130.2	Continuous Evaluation End Term Examination
5	Draw use case diagram	Understand and demonstrate the use case diagram	Lecture Demonstration at system	CC 3130.3	Continuous Evaluation End Term Examination
6	Draw activity diagram of all use cases.	Understand and demonstrate the activity diagram	Lecture Demonstration at system	CC 3130.3	Continuous Evaluation End Term Examination
7	Draw state chart diagram of all use cases	Understand and demonstrate the state chart diagram	Lecture Demonstration at system	CC 3130.3	Continuous Evaluation End Term Examination
8	Draw sequence diagram of all use cases	Understand and demonstrate the sequence diagram	Lecture Demonstration at system	CC 3130.3	Continuous Evaluation End Term Examination
9	Draw collaboration diagram of all use cases	Understand and demonstrate the collaboration diagram	Lecture Demonstration at system	CC 3130.3	Continuous Evaluation End Term Examination
10.	Assign objects in sequence diagram to classes and make class diagram.	Understand and demonstrate the class diagram	Lecture Demonstration at system	CC 3130.3	Continuous Evaluation End Term Examination

11.	Estimate test coverage metrics and structural complexity	Understand and compute structural complexity	Lecture Demonstration at system	CC 3130.4	Continuous Evaluation End Term Examination
12.	Design the test suite	Understand and demonstrate the test suite design	Lecture Demonstration at system	CC 3130.4	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
[CC3130.1]:	To be able to understand different software methodologies.	1	1	2	2	1	1		1	1		1				1
[CC3130.2]:	Understanding of Requirement analysis and SRS.	1	1	1												1
[CC3130.3]:	To be able to understand the concepts of UML diagrams.	1	1	1												1
[CC3130.4]:	Design of test cases based on requirement and design.	1		1					1	1	1	1				1

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Department of Computer and Communication Engineering
Course Hand-out

Design and Analysis of Algorithms Lab | CC 3131 | 1 Credits | 0 0 2 1
Session: Aug'21 – Dec'21 | Course Coordinator: Dr Geeta Rani | Class: 3nd Year / 5th Semester
Faculty: 1. Dr. Geeta Rani, 2. Dr. Suman Bhakar

A. Introduction: This course is offered by Computer and Communication engineering, targeting students who wish to learn new technologies, idea and research in industries or higher studies in field of Computer and Communication Engineering. This course is designed to develop analytical skills to enable students design algorithms for various applications, and to analyze the algorithms. The mathematical analysis of algorithms is also discussed.

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

[CC3131.1] Explain basic concepts of various Algorithm and Complexity.
[CC3131.2] Select and/or apply appropriate algorithm to solve problems and assess the trade-offs involved in the design choices also calculate the running time complexity.
[**CC3131.3]** Describe and analyze various Notations, Recurrences and DAC approach, also used in sorting algorithms like merge sort, heap sort and quick sort etc and analyses of different cases.
[CC3131.4] Describe how Greedy, Dynamic and Graph based techniques used and identify their classifications and operations using various approaches.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

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

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

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

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

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

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

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

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

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

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

[PSO1]. Imbibe the basic concepts and applications of computer-based Communication or networking, information sharing, signal processing, web-based systems, smart devices, and communication technology.

[PSO2]. Investigate prominent areas in the field of Computer and Communication Engineering to provide feasible solutions.

[PSO3]. Apply the contextual knowledge in the field of Computing and Communication to assess social, health, safety, and security issues relevant to the professional engineering practice.

D. Assessment Rubrics:

Criteria	Description	Date	Maximum Marks
Internal Assessment (Summative)	Internal (Continuous Evaluation)		60
End Term Exam (Summative)	End Term Exam	As per Academic Calendar	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.
Make-up Policy: As per University Norms **Chamber Consultation:** online as per Instructor **Notice:** Via email/ Teams/WhatsApp (Use University Microsoft Account) **Consultancy** **Hours:** To be Announced later	

E. Syllabus:

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

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

F. Text Books

T1. E. Horowitz, S. Sahni and S. Rajasekaran, *"Computer Algorithms"*, 2nd Edition, University Press, 2007.

T2. T. H. Cormen, C. E. Leiserson, R.L.Rivest, and C. Stein, *"Introduction to Algorithms*", 3rd Edition, MIT press, 2009.

G. Reference Books

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

H. Lab Plan:

Lec. No.	TOPICS	Session Outcomes	Mode of Delivery	Corresponding CO	Mode of Assessing CO
1.	**Searching**	Programs based on Iterative Binary Search Programs based on Recursive Binary Search	Slides / Black Board	3131.1	Internal Evaluation Home Assignments External Evaluation
2.	**Sorting**	Programs to implement Insertion Sort Programs to implement Selection Sort Programs to implement Merge Sort Programs to implement Quick Sort	Slides / Black Board	3131.1	Internal Evaluation Home Assignments External Evaluation
3.	**Heap**	Programs to implement sorting a given list of elements in ascending order using the following sorting methods. HeapSort – MAX Heap and MIN Heap Programs based on Priority Queue	Slides / Black Board	3131.1	Internal Evaluation Home Assignments External Evaluation
4.	**Greedy method**	Programs to implement the single source shortest path problem using greedy method. (Dijkstra's).	Slides / Black Board	3131.1	Internal Evaluation

		Programs to implement knapsack problem using greedy method.			Home Assignments External Evaluation
5.	**Spanning Trees**	Programs to implement following algorithms: a. Prim's b. Kruskal's	Slides / Black Board	3131.1	Internal Evaluation Home Assignments External Evaluation
6.	**Graph**	Programs to implement following algorithms: a. Breadth first search b. Depth first search	Slides / Black Board	3131.2	Internal Evaluation Home Assignments External Evaluation
7,8	**Dynamic Programming**	Write a program to implement following algorithms: a. Fibonacci series dynamic programming using top-down approach. b. Fibonacci series dynamic programming using bottom-up approach.	Slides / Black Board	3131.2	Internal Evaluation Home Assignments External Evaluation
		Write a program to implement longest integer sequence LIS.			
		Write a program to implement longest common subsequence LCS.			
		Write a program to implement Binomial Coefficient using Dynamic Programming.			

		Write a program for solving travelling sales person problem using dynamic programming.			
9.	**Backtracking**	Consider the problem of eight queens on a chess board. Two queens are said to attack each other if they are on the same row, column or diagonal. Write a program that implements back tracking algorithm to solve the problem i.e., place eight non-attacking queens on the board.	Slides / Black Board	3131.2	Internal Evaluation Home Assignments External Evaluation
10.	**Randomization**	Write a program to implement Randomized Quick sort.	Slides / Black Board	3131.2	Internal Evaluation Home Assignments External Evaluation
		Write a program to implement Graph Coloring Problem.			

I. 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
CC3131.1	Explain basic concepts of various Algorithm and Complexity.		3		2								1		3	2
CC3131.2	Select and/or apply appropriate algorithm to solve problems and assess the trade-offs involved in the design choices also calculate the running time complexity.		2	2								2			2	2
CC3131.3	Describe and analyze various Notations, Recurrences and DAC approach, also used in sorting algorithms like merge sort, heap sort and quick sort etc and analyses of different cases.			2	1	1									2	3
CC3131.4	Describe how Greedy, Dynamic and Graph based techniques used and identify their classifications and operations using various approaches.			3	2					2					3	2

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

2-

J. Course Outcome Attainment Level Matrix:

CO	STATEMENT	ATTAINMENT OF PROGRAM OUTCOMES **THRESHOLD VALUE: 40%**												ATTAINMENT OF PROGRAM SPECIFIC OUTCOMES		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CC3131.1	Explain basic concepts of various Algorithm and Complexity.															
CC3131.2	Select and/or apply appropriate algorithm to solve problems and assess the trade-offs involved in the design choices also calculate the running time complexity.															
CC3131.3	Describe and analyze various Notations, Recurrences and DAC approach, also used in sorting algorithms like merge sort, heap sort and quick sort etc and analyses of different cases.															
CC3131.4	Describe how Greedy, Dynamic and Graph based techniques used and identify their classifications and operations using various approaches.															

MANIPAL UNIVERSITY JAIPUR
School of Computing & Information Technology
Department of Computer and Communication Engineering
Course Handout
[Organization and Management | BB0026 | 3 Credits |
Session: Jan-May 2022 | Faculty: Dr. Priyanka Sharma | Class: B Tech VI Semester|

A. Course Introduction: Today's world consists of many local, national, multinational and global organizations. Success of all business depends on their effective and efficient management. Therefore, management plays a most powerful and crucial role in the success and survival of the whole world. The significance of the course enlightens the dynamic life-giving element in every business. Consequently, it will emerge as a great resource as well an important 'discipline of learning' in the modern business world. The objective is to provide an understanding of basic concepts, principles and practices of organization and management. The aim is to inculcate the ability to apply multifunctional approach to organizational objectives. This course will enable students understand the basic concept of organization and management and various functions of it.

B. Course Outcomes: On completion of the course the students shall be able to:

[BB1540.1]. Understand theory and practice of organization and management.
[BB1540.2]. Build a comprehensive knowledge about marketing and personnel management
[BB1540.3]. Develop the skills of leadership and motivation.
[BB1540.4]. Illustrate the concept of entrepreneurship for developing skill for employability.
[BB1540.5]. Develop the knowledge of management information system (MIS).

C. Program Outcomes and Program Specific Outcomes

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

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

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

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

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

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

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

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

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

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

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

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

Program Specific Outcome

[PSO.1] Imbibe the basic concepts and applications of computer-based Communication or networking, information sharing, signal processing, web-based systems, smart devices, and communication technology.

[PSO.2] Investigate prominent areas in the field of Computer and Communication Engineering to provide feasible solutions.

[PSO.3] Apply the contextual knowledge in the field of Computing and Communication to assess social, health,
safety, and security issues relevant to the professional engineering practice.

D. Assessment Plan

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

E. Syllabus

Unit 1: Meaning and definition of an organization, Necessity of Organization, Principles of Organization, Formal and Informal Organizations. Management: Functions of Management, Levels of Management, Managerial Skills, Importance of Management, Models of Management, Scientific Management, Forms of Ownership, Organizational Structures, Purchasing and Marketing Management, Functions of Purchasing Department, Methods of Purchasing, Marketing, Functions of Marketing, Advertising.

Unit 2: Introduction, Functions of Personal Management, Development of Personal Policy, Manpower Planning, Recruitment and Selection of manpower.

Unit 3: Motivation – Introduction, Human needs, Maslow's Hierarchy of needs, Types of Motivation, Techniques of Motivation, Motivation Theories, McGregor's Theory, and Herzberg's Hygiene Maintenance Theory. Leadership - Introduction Qualities of a good Leader, Leadership Styles, Leadership Approach, Leadership Theories.

Unit 4: Entrepreneurship – Introduction, Entrepreneurship Development, Entrepreneurial Characteristics, Need for Promotion of Entrepreneurship, Steps for establishing small scale unit.

Unit 5: Data and Information; Need, function and Importance of MIS; Evolution of MIS; Organizational Structure and MIS, Computers and MIS, Classification of Information Systems, Information Support for functional areas of management.

F. Text Books

T1. Koontz, Harold, Cyril O'Donnell, and Heinz Weihrich: Essentials of Management, Tata McGraw-Hill, New Delhi

T2. Robbins, Stephen P, and Mary Coulter: Management, Pearsonhyq jnnb, New Delhi

T3. E. S. Buffa and R. K. Sarin "Modern Production / Operations Management", 8th Edition, Wiley, 1987

G. Reference Books

R1. H. J. Arnold and D. C. Feldman "Organizational Behavior", McGraw – Hill

R2. Aswathappa K: Human Resource and Personnnel Management, Tata McGraw Hill

R3. William Wether& Keith Davis, Human Resource and Personnel Management, McGraw Hill

H. Lecture Plan

Lecture No.	PARTICULARS	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1.	Meaning and definition of an organization, Necessity of Organization	Understands the importance and concepts of organization management.	Lecture PPT , Discussion	BB1540.1	Class Quiz Mid Term I End Term
2.	Principles of Organization, Formal and Informal Organizations	Learn and understand the process and principles as well learn types of organizations	Lecture PPT, Discussion	BB1540.1	Class Quiz Mid Term I End Term
3.	Management Function: Planning & Organizing	Learn the principles of management and administration as well how they are applicable in a business Organization	Lecture PPT, Discussion	BB1540.1	Class Quiz Mid Term I End Term
4.	Management Function: Leading & Controlling	Understand the basic process of various management functions and how they are applicable in the organization	Lecture PPT, Discussion	BB1540.1	Class Quiz Mid Term I End Term
5.	Managerial Skills, Importance of Management,	Understanding of different managerial skills	Lecture PPT, Discussion	BB1540.1	Class Quiz Mid Term I End Term
6.	Activity	Understanding of previous lectures	Class activity	BB1540.1	Quiz/ Case study
7.	Models of Management: Scientific and Administrative management	Students will gain the knowledge of different Scientific and Administrative management	Lecture , Discussion	BB1540.1	Class Quiz Mid Term I End Term
8.	Models of Management: Behavioral approach	Understand the approach of behavioral management	Lecture , Discussion	BB1540.1	Class Quiz Mid Term I End Term

9.	Activity	Understanding of previous lectures	Class activity	BB1540.1	Class Quiz/ case study
10.	Forms of Ownership and Organization Structures	Understanding of Ownership and Organization Structures	Lecture, Discussion	BB1540.2	Class Quiz Mid Term I End Term
11.	Activity	Understanding of previous lectures	Class activity	BB1540.2	Class Quiz/ case study
12.	Purchasing Function and Marketing Function	Understanding of purchasing function and marketing function	Lecture PPT ,Discussio n	BB1540.2	Class Quiz Mid Term I End Term
13.	Advertising and Changing Dynamics of Advertising	Students will gain knowledge of advertising and how advertising is changing with market	Lecture PPT, Discussion	BB1540.2	Class Quiz Mid Term I End Term
14.	Activity	Understanding of previous lectures	Class activity	BB1540.2	Class Quiz/ case study
15.	Introduction, Functions of Personnel Management, Development of Personnel Policy	Understanding of human resource function and policies of personnel management	Lecture PPT, Discussion	BB1540.2	Class Quiz Mid Term II End Term
16.	Manpower Planning	Students will gain the knowledge of manpower planning	Lecture, Discussion	BB1540.2	Class Quiz Mid Term II End Term
17.	Recruitment of Manpower	Students will gain the knowledge of various steps and process of recruitment in human resource	Lecture PPT, Discussion :	BB1540.2	Class Quiz Mid Term II End Term

18.	Selection of Manpower	Students will gain the knowledge of various steps and process of selection in human resource	Lecture PPT, Discussion	BB1540.2	Mid Term II End Term
19.	Activity	Understanding of previous lectures	Class activity	BB1540.2	Class Quiz/ case study
20.	Introduction to Motivation, Human needs, Maslow's Hierarchy of needs	Understand the meaning of the motivation, human needs and the Maslow's theory of motivation Students will learn various types of motivation.	Recap of previous lecture, Lecture PPT, Discussion	BB1540.3	Class Quiz Mid Term II End Term
21.	Types and techniques of Motivation	Understand different techniques of motivation and their uses.	Lecture PPT, Discussion	BB1540.3	Class Quiz Mid Term II End Term
22.	McGregor's Theory, Herzberg's Hygiene Maintenance Theory	Students will learn the popular theories of motivation.	Lecture PPT, Discussion	BB1540.3	Class Quiz Mid Term II End Term
23.	Activity	Understanding of previous lectures	Class activity	BB1540.3	Class Quiz/ case study
24.	Leadership - Introduction Qualities of a good Leader, Leadership Styles	Students will learn different approaches of leadership.	Lecture PPT, Discussion	BB1540.3	Class Quiz Mid Term II End Term
25.	Leadership Theories	Understand different theories of leadership	Lecture PPT, Discussion	BB1540.3	Class Quiz Mid Term II End Term
26.	Leadership Theories	Understand different theories of leadership	Class Activity, PPT	BB1540.3	Class Quiz Mid Term II End Term

27.	Activity	Understanding of previous lectures	Class activity	BB1540.3	Class Quiz/ case study
28.	Entrepreneurship – Introduction, Entrepreneurship Development	Students will learn about entrepreneurship and its development.	Lecture PPT, Discussion	BB1540.4	Class Quiz Mid Term II End Term
29.	Entrepreneurial Characteristics, Need for Promotion of Entrepreneurship	Understand the characteristics and need for promoting entrepreneurship unit.	Lecture, Discussion	BB1540.4	Class Quiz Mid Term II End Term
30.	Steps for establishing small scale unit	Analyze the various steps involved in establishing small scale.	Lecture PPT, Discussion	BB1540.4	Class Quiz Mid Term II End Term
31.	Activity	Understanding of previous lectures.	Class activity	BB1540.4	Class Quiz/ case study
32.	Data and Information; Need and Importance of MIS	Understand the difference between data and information and the importance of managerial information system in an organization.	Lecture, Discussion	BB1540.5	Class Quiz End Term
33.	Functions of MIS and Evolution of MIS	Understand different phases related to evolution of MIS.	Lecture PPT, Discussion	BB1540.5	Class Quiz End Term
34.	Activity	Understanding of previous lectures	Class activity	BB1540.5	Class Quiz/ case study
35.	Organizational Structure and MIS	Understand the use of managerial information system in organizational structure. Student will learn about management information system.	Lecture PPT, Discussion	BB1540.5	Class Quiz End Term

36.	Activity	Analyze the close ended case study related to the management.	Case study	BB1540.5	Case study analysis
37.	Computers and MIS	Understand the basic requirement of management and computers in business	Lecture PPT, Discussion	BB1540.5	Class Quiz End Term
38.	Classification of Information Systems and Information Support for functional areas of management	Learn the importance of Control and it is the fourth and final principle element of the managerial process.	Lecture PPT, Discussion	BB1540.5	Class Quiz End Term
39.	Classification of Information Systems and Information Support for functional areas of management	Lear the controlling that intends to ensure that everything occurs in conformity with the plans	Lecture PPT, Discussion	BB1540.5	Class Quiz End Term

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

		CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
CO	**STATEMENT**	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO8	PO9	P10	P11	P12	PSO 1	PSO 2	PSO 3
BB 1540.1	Understand theory and practice of organization and management	2												2		2
BB 1540.2	Build a comprehensive knowledge about marketing and personnel management		1	2											1	
BB1540.3	Develop the skills of leadership and motivation.		2	2		2								2		
BB1504.4	Illustrate the concept of entrepreneurship.	2			1		1							1		
BB1504.5	Develop the knowledge of management information system.							1								2

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and IT

Department of Computer and Communication Engineering
Course Hand-out

AI and Machine Learning | CC 3201 | 4 Credits | 3 1 0 4

Session: Jan'22 – May'22 | Course Coordinator: Dr. Sunil Kumar | Class: 3rd Year / 6th Semester

Faculty: 1. Dr Gulrej Ahmed, 2. Dr. Manoj Kumar Sharma

A. Introduction: This is a core course which introduces, concepts of AI and Machine Learning algorithms. Important AI concepts like heuristic search, knowledge representation and planning are covered. Students will learn to design and use rule-based systems to solve the AI problems. The second half of the course familiarize the students to popular machine learning algorithms and their evaluation. Students will gain proper knowledge of traditional AI techniques and modern machine learning methods. They will be able to choose proper technique to solve modern day problems.

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

[CC3202.1] Understand the underlying concepts and challenges of AI and Machine Learning.
[CC3202.2] Apply AI techniques/Machine Learning Algorithms to different problems.
[CC3202.3] Analyse the regression / classification ML models using performance metrics.
[CC3202.4] Evaluate ML models for real world applications to enhance employability prospects.

C. Program Outcomes and Program Specific Outcomes

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

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

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

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

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

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

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

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

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

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

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

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

Program Specific Outcomes (PSOs)

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

[PSO.1] Imbibe the basic concepts and applications of computer-based Communication or networking, information sharing, signal processing, web-based systems, smart devices, and communication technology.

[PSO.2] Investigate prominent areas in the field of Computer and Communication Engineering to provide feasible solutions.

[PSO.3] Apply the contextual knowledge in the field of Computing and Communication to assess social, health, safety, and security issues relevant to the professional engineering practice.

D. Assessment Rubrics:

Criteria	Description	Maximum Marks
Internal Assessment (Formative)	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	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	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	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

Artificial intelligence concepts: state space representation and search; Heuristic search techniques: hill climbing, best first search, A*, AO*, constraint satisfaction; Knowledge representation and reasoning; Formal logic and unification algorithms; Planning algorithms, goal stack planning, nonlinear planning using constraint posting, hierarchical planning; Case based reasoning; Optimization algorithms, genetic algorithm, ant colony optimization, particle swarm optimization, simulated annealing; Supervised machine learning algorithms: classification algorithms – KNN, decision tree, naïve bayes, support vector machine, regression, random forests; Un-supervised machine learning algorithms: principal component analysis, k-means; Machine learning performance evaluation metrics: classification accuracy, logarithmic loss, confusion matrix, area under curve, F1 score, mean absolute error, mean squared error.

References:

S. Russell, P. Norvig, Artificial Intelligence: A Modern Approach, (3e), Pearson Education, 2015.

T. M. Mitchell, Machine Learning, (1e), McGraw Hill, 1997.

D. Simon, Evolutionary optimization algorithms, (1e), Wiley, 2013.

D. Khemani, A First Course in Artificial Intelligence, (1e), McGraw Hill, 2015.

O. Richard, E. D. Peter, D. Hart, G. Stork, Pattern Classification, (2e), John Wiley, 2002.

C. Bishop, Pattern Recognition and Machine Learning, (1e), Springer, 2006.

F. Lecture Plan:

Lect. No	Topics	Session Objective	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1	Introduction to the subject, course plan, course outcomes and assessment plan.	To acquaint and clear teacher's expectations and understand student expectations	Lecture	NA	NA
2	Artificial intelligence concepts: state space representation and search	To introduce concepts of AI and its use in problem solving	Lecture	CC3201.1	Class Quiz/ Sessional Exam / End Term Exam
3	Heuristic search techniques: hill climbing	To introduce concept of heuristic search and understand hill climbing algorithm. Apply hill climbing to a search problem.	Lecture	CC3201.2	Sessional Exam/ End Term Exam
4-5	Best first search, A*	Understand Best First Search/ A* algorithm and apply them to search problem.	Lecture	CC3201.2	Class Quiz Sessional Exam/ End Term Exam
6	AO*	To understand AND/OR graph and apply AO* to AND/OR graph.	Lecture	CC3201.2	Class Quiz Sessional Exam/ End Term Exam
7	Constraint satisfaction	Understand the concept of constrained satisfaction using Crypto-arithmetic problem.	Lecture	CC3201.2	Sessional Exam/ End Term Exam
8	Knowledge representation and reasoning	Understand the importance of knowledge representation and challenges.	Lecture	CC3201.1	Home Assignment Class Quiz Sessional Exam/ End Term Exam
9-13	Formal logic and unification algorithms	To understand Concepts of FOPL, Normal forms, WFF, and using unification for reasoning.	Lecture	CC3201.2	Home Assignment Sessional Exam/ End Term Exam
14	Planning algorithms, goal stack planning	Understand the importance of Planning and use of goal stack planning	Lecture	CC3201.2	Sessional Exam/ End Term Exam
15	Nonlinear planning using constraint posting, hierarchical planning	Understand the types of planning and their use.	Lecture	CC3201.1	Home Assignment Sessional Exam/ End Term Exam
16	Case based reasoning	Understand Learning and case-based reasoning.	Lecture	CC3201.1	Sessional Exam/ End Term Exam
17-18	Optimization algorithms, genetic algorithm	Introduce the concept of optimization as problem solving technique. Introduction of genetic algorithms as optimizers.	Lecture	CC3201.1	Sessional Exam/ End Term Exam

19	Ant colony optimization	Understand the concept and application of Ant colony optimization.	Lecture	CC3201.1	Sessional Exam/ End Term Exam
20	Particle swarm optimization	Understand the concept and application of Particle swarm optimization.	Lecture	CC3201.1	Sessional Exam/ End Term Exam
21	Simulated annealing	Understand the concept and use of Simulated annealing.	Lecture	CC3201.1	Class Quiz Sessional Exam/ End Term Exam
22	Supervised machine learning algorithms	Understand the concept of learning from data. Labelled and unlabelled data.	Lecture	CC3201.2	Class Quiz Sessional Exam/ End Term Exam
23-24	Regression	Understand and apply Linear regression to predict.	Lecture	CC3201.2	Class Quiz Sessional Exam/ End Term Exam
25	Classification algorithms – KNN	Apply KNN for classification	Lecture	CC3201.2	Sessional Exam/ End Term Exam
26	Decision tree	Apply Decision Tree for classification	Lecture	CC3201.2	Class Quiz Sessional Exam/ End Term Exam
27	Naïve bayes	Apply Naïve bayes for classification	Lecture	CC3201.2	Class Quiz Sessional Exam/ End Term Exam
28	Support vector machine	Apply Support vector machine for classification	Lecture	CC3201.2	Sessional Exam/ End Term Exam
29	Random forests	Understand the concept of Random Forests and its possible use.	Lecture	CC3201.1	Class Quiz Sessional Exam/ End Term Exam
30-31	Introduction to Neural Networks	Concept of back propagation and typical neural network architecture	Lecture	CC3201.1	Class Quiz Sessional Exam/ End Term Exam
32-33	Un-supervised machine learning algorithms: principal component analysis	Principal Component Analysis and its use as unsupervised learner	Lecture	CC3201.2	Class Quiz Sessional Exam/ End Term Exam
34	K-means Clustering	**Clustering using K-Means**	Lecture	CC3201.2	Class Quiz Sessional Exam/ End Term Exam
35-40	Machine learning performance evaluation metrics: classification accuracy, logarithmic loss, confusion matrix, area under curve, F1 score, mean absolute error, mean squared error.	Use the evaluation metrics to analyze the performance of different models and compare performance.	Lecture	CC3201.3	Class Quiz Sessional Exam/ End Term Exam
41-45	Case studies of real-world problems using different ML models	Check the performance of different models on real world applications e.g., Spam filtering, Sentiment analysis etc.	Lecture/ Assignment	CC3201.4	Class Quiz/ Assignment/ End Term Exam

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

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CC3201.1	Understand the underlying concepts and challenges of AI and Machine Learning	3	0	0	0	1	1	1	1	1	2	0	1	3	0	0
CC3201.2	Apply AI techniques/Machine Learning Algorithms to different problems.	3	2	1	1	0	0	0	1	1	2	0	0	3	0	0
CC3201.3	Analyse the regression / classification ML models using performance metrics.	1	1	1	1	0	0	0	1	1	2	0	0	2	2	0
CC3201.4	Evaluate ML models for real world applications to enhance employability prospects.	3	2	1	1	1	1	0	1	1	2	0	1	1	3	1

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and IT

Department of Computer and Communication Engineering
Course Hand-out

Wireless Communications | CC 3202 | 4 Credits | 3 1 0 4

Session: Jan'22 – May'22 | Course Coordinator: Dr Gulrej Ahmed | Class: 3rd Year / 6th Semester

Faculty: 1. Dr Amita Nandal

A. Introduction: The objective of this course is to introduce the concepts of wireless communication using cellular environment. The course is designed to impart in-depth understanding of technologies & contribution of wireless communication to overall scientific growth. The main objective of the course to provide the knowledge of the different types of wireless communication systems, requirements for the wireless services & cellular radio fundamental concepts, the analog/digital modulation & different types of signal processing techniques like equalization, diversity used in wireless communication, advanced transceiver schemes; Cellular Code Division Multiple Access systems, Orthogonal Frequency Division Multiplexing, 3rd , 4th & 5th Generation wireless networks & standards..

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

[CC3202.1] Understand the underlying concepts and challenges of technical challenges in wireless communication systems and various types of wireless services.
[CC3202.2] Formulate the radio propagation models & path loss models of radio propagation.
[CC3202.3] Formulate mathematical relationships for frequency reuse, handoff, Co-channel interferenceand capacity of cellular systems.
[CC3202.4] Analyse modulation/demodulation, Diversity, Equalization & signal-processing techniques in wireless communicationsystems.
[CC3202.5] Understand the underlying concepts of cellular communications: 1G, 2G, 3G / LTE, 4G / LTE-A & 5G.

C. Program Outcomes and Program Specific Outcomes

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

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

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

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

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

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

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

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

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

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

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

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

Program Specific Outcomes (PSOs)

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

[PSO.1] Imbibe the basic concepts and applications of computer-based Communication or networking, information sharing, signal processing, web-based systems, smart devices, and communication technology.

[PSO.2] Investigate prominent areas in the field of Computer and Communication Engineering to provide feasible solutions.

[PSO.3] Apply the contextual knowledge in the field of Computing and Communication to assess social, health, safety, and security issues relevant to the professional engineering practice.

D. Assessment Rubrics:

Criteria	Description	Maximum Marks
Internal Assessment (Formative)	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	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	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	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 Wireless Communications, Types of Wireless Services, Requirements for the Wireless services, Multipath propagation, Parameters of mobile multipath channels, Spectrum Limitations, Principles of Cellular networks, Multiple Access Schemes, Path Loss models, Signal Fading. Wireless Transceivers, Structure of a wireless communication link, Modulation and demodulation Schemes, Signal Processing in Wireless Systems, Principle of Diversity, EqualizersLinear and Decision Feedback equalizers, Review of Channel coding and Speech coding techniques. Cellular Communications: 1G, 2G, 3G / LTE, 4G / LTE-A, 5G; New air interface and radio access virtualization.

References:

T. S. Rappaport, Wireless Communications - Principle and Practice, (2e), Prentice Hall of India, 2012.

A. F. Molisch, Wireless Communications, (2e), Wiley, 2011.

D. P. Agrawal, .A. Zeng, Introduction to Wireless and Mobile Systems, (3e), Thomson Press , 2012.

F. Lecture Plan:

Class Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1-5	Introduction to Wireless Communications, Types of Wireless Services, Requirements for the Wireless services, Multipath propagation	To find solutions for the technical challenges in wireless communication systems and various types of wireless services.	Lecture Interaction	[CC3202.1]	1st Sessional Exam, Quiz-1 End Term Exam
6-12	Parameters of mobile multipath channels, Spectrum Limitations, Principles of Cellular networks, Multiple Access Schemes, Path Loss models, Signal Fading.	To acquaint with the fundamentals of cellular systems and wireless fading	Lecture Interaction	[CC3202.2]	1st Sessional Exam, Quiz-1 End Term Exam
13-20	Wireless Propagation Models: Propagation Mechanisms (Qualitative treatment), Propagation effects with mobile radio, Channel Classification, Link calculations, Narrowband and Wideband models	To formulate mathematical models for radio propagation environment	Lecture Interaction	[CC3202.2], [CC3202.3]	2nd Sessional, Quiz-2 End Term Exam
21-25	Modulation and demodulation Schemes	To analyse modulation/demodulation & signal- processing techniques in wireless communication systems.	Lecture Interaction	[CC3202.4]	2nd Sessional, Quiz-3, End Term Exam
26-30	Wireless Transceivers, Structure of a wireless communication link	To Analyze Wireless Transceivers, Structure of a wireless communication link	Lecture Interaction	[CC3202.4], [CC3202.5]	2nd Sessional, Quiz-3, End Term Exam
31-37	Signal Processing in Wireless Systems, Principle of Diversity, Equalizers Linear and Decision Feedback equalizers, Review of Channel coding and Speech coding techniques.	To acquaint with signal processing principles, Diversity & Equalizers in wireless communication systems	Lecture Interaction	[CC3202.4], [CC3202.5]	2nd Sessional, Quiz-4, Assignment, End Term Exam
38-45	Cellular Communications: 1G, 2G, 3G / LTE, 4G / LTE-A, 5G; New air interface and radio access virtualization.	To acquaint with 1G, 2G, 3G / LTE, 4G / LTE-A, 5G; New air interface systems	Lecture Interaction	[CC3202.4], [CC3202.5]	Assignment, Quiz-5, End Term Exam

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

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CC3202.1	Understand the underlying concepts and challenges of technical challenges in wireless communication systems and various types of wireless services.	3	2										2	3		
CC3202.2	Formulate the radio propagation models & path loss models of radio propagation.	3	2		2									3		
CC3202.3	Formulate mathematical relationships for frequency reuse, handoff, Co-channel interference and capacity of cellular systems.	3	2		2									3		
CC3202.4	Analyse modulation/demodulation, Diversity, Equalization & signal-processing techniques in wireless communication systems.	3	2		2								2	3	2	
CC3202.5	Understand the underlying concepts of cellular communications: 1G, 2G, 3G / LTE, 4G / LTE-A & 5G.	3	3	2	2	2							3	3	2	2

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

H. 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
CC3202.1	Understand the underlying concepts and challenges of technical challenges in wireless communication systems and various types of wireless services.															
CC3202.2	Formulate the radio propagation models & path loss models of radio propagation.															
CC3202.3	Formulate mathematical relationships for frequency reuse, handoff, Co-channel interference and capacity of cellular systems.															
CC3202.4	Analyse modulation/demodulation, Diversity, Equalization & signal-processing techniques in wireless communication systems.															
CC3202.5	Understand the underlying concepts of cellular communications: 1G, 2G, 3G / LTE, 4G / LTE-A & 5G.															

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

DEPARTMENT OF COMPUTER AND COMMUNICATION ENGG.

Course Hand-out

AUTOMATA THEORY AND COMPILER DESIGN | CC3203 | 3 Credits | 3 0 0 3

Session: Jan - May 2022 | Faculty: Dr. Lal Pratap Verma| Class: B. Tech VI SEM

A. INTRODUCTION

This course is offered by Department of Computer and Communication Engineering as a core course. The objective of this course is to make students familiar with core concepts of Automata Theory and Compilers which will enable students to focus on abstract models of computation. The word automaton itself, closely related to the word "automation", denotes automatic processes carrying out the production of specific processes. Through automata, computer scientists can understand how machines compute functions and solve problems. This course exposes students to the computability theory, as well as to the complexity theory. The objective is to make students familiar with various phases of compilation process of any source code. Students will learn about lexical analysis and different types of parsing techniques. The goal is to allow them to understand in detail about compilers and it's working.

B. COURSE OUTCOMES

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

[CC 3203.1] Interpret, analyse, and develop abstract models (such as finite automata, pushdown automata, and Turing machines) based on any problem that can be specified using formal language.

[CC 3203.2] Apply the characteristics of different types of formal languages, grammars, and abstract models to prove their properties.

[CC 3203.3] Determine the type of computational problems and examine the decidability of them by constructing Turing machines.

[CC 3203.4] Identify the basic concepts, structure, and importance of compilers.

[CC 3203.5] Critically analyse the performances of each parser and determine the compilation process.

C. PROGRAM OUTCOMES (B.Tech) AND PROGRAM SPECIFIC OUTCOMES (B.Tech in CCE)

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

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

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

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

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

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

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

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

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

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

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

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

[**PSO.1**] Imbibe the basic concepts and applications of computer-based Communication or networking, information sharing, signal processing, web-based systems, smart devices, and communication technology.

[PSO.2] Investigate prominent areas in the field of Computer and Communication Engineering to provide feasible solutions.

[PSO.3] Apply the contextual knowledge in the field of Computing and Communication to assess social, health, safety, and security issues relevant to the professional engineering practice.

D. ASSESSMENT PLAN

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Mid Term Examination-1(Closed Book)	20
	Mid Term Examination-11 (Closed Book)	20
	In class Quizzes (Accumulated and averaged)	10
	Assignments, Activity feedbacks	10
End Term Exam (Summative)	End Term Exam (Closed Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who miss a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that particular day of absence will be marked blank, so that the student is not accounted for absence. These assignments are limited to a maximum of 5 throughout the entire semester.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work at home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

Introduction to abstract models of computers: Chomsky hierarchy; regular languages: deterministic finite automata (DFA) and nondeterministic finite automata (NFA), their equivalence, minimizing FA, regular expressions, identifying non-regular languages; Context-Free languages (CFLs): Context-Free grammars, push down automata (PDA), nondeterministic PDA and CFLs, deterministic PDA and CFLs; Introduction to Turing machine; Introduction to compiler design: lexical analysis, recognition of tokens, lexeme and patterns; Syntax analysis: LL(1) parsing, SLR parsers, LR parsers, LALR parsers, parser generators (Flex and Bison), parsing and ambiguity; Runtime environments.

F. REFERENCE BOOKS

1. P. Linz, An Introduction to Formal Languages and Automata, (6e), Jones & Bartlett Learning, 2016
2. J.E. Hopcroft, R. Motwani, J.D. Ullman, Introduction to Automata Theory, Languages and Computation, (3e), Pearson Education, 2013.
3. M. Sipser, Introduction to the Theory of Computation, (3e), Cengage Learning, 2012
4. J. Martin, Introduction to Languages and the Theory of Computation, (4e), McGraw Hill, 2010.
5. A.V. Aho, M.S. Lam, R. Sethi, J.D. Ullman, Compiler Design: Principles, Techniques and Tools, (2e), Prentice Hall of India, 2006.

G. LECTURE PLAN

Class Number	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1.	Introduction to the subject, course plan, course outcomes and assessment plan.	To acquaint and clear teacher's expectations and understand student expectations	Lecture	NA	NA
2	Mathematical Preliminaries and Notation	Understand basics of set theory, groups, relations, functions.	Lecture	3203.1	In Class Quiz, MTE-1, ETE
3	Three Basic Concepts (Languages, Grammars and Automata)	Understand basics of Automata Theory i.e., languages, grammars etc.	Lecture	3203.1	In Class Quiz, MTE-1, ETE
4	Introduction to abstract models of computers and their applications	Understanding the applications of Automata	Lecture	3203.1	In Class Quiz, MTE-1, ETE
5	Chomsky hierarchy	Understanding the basics of formal languages using Chomsky hierarchy	Lecture	3203.1	In Class Quiz, MTE-1, ETE
6	Deterministic Finite Automata/ Accepters (DFA)	Introduction to DFA and its designing	Lecture, Practice questions	3203.1	In Class Quiz, Assignment, MTE-1, ETE
7	Nondeterministic Finite Accepters (NFA)	Construction of NFA using different approaches for different type of problems	Lecture, Practice questions	3203.1	In Class Quiz, Assignment, MTE-1, ETE
8	Equivalence of DFA and NFA	Understanding the basic difference between DFA and NFA and realising the importance of NFA	Lecture, Practice questions	3203.1	In Class Quiz, Assignment, MTE-1, ETE
9	Minimizing Finite Automata	Understanding the algorithm for minimizing the DFA	Lecture, Practice questions	3203.1	In Class Quiz, MTE-1, ETE
10	Regular Expressions and Finite Automata	Construct regular expressions	Lecture, Practice questions	3203.1	In Class Quiz, MTE-1, ETE
11	Regular Grammar	Construct regular grammar	Lecture, Practice questions	3203.2	In Class Quiz, MTE-1, ETE

12	Properties of Regular Languages	Study the properties of regular languages	Lecture, Practice questions	3203.2	In Class Quiz, Assignment, MTE-1, ETE
13	Pumping Lemma for Regular Languages and identifying Non-Regular Languages	Compare and identify the non-regular languages	Flipped Classroom	3203.2	In Class Quiz, Assignment, MTE-1, ETE
Mid Term Examination -1					
14-15	Context Free Languages	Study the properties of context free languages	Lecture, Practice questions	3203.2	In Class Quiz, MTE-2, ETE
16	Leftmost/ Rightmost Derivations and derivation trees	Deriving a string from CFL using either leftmost or rightmost derivations	Lecture, Practice questions	3203.2	In Class Quiz, MTE-2, ETE
17	Context Free Grammars	Understanding the concept of CGF, designing of CFG for CFL	Lecture, Practice questions	3203.2	In Class Quiz, Assignment, MTE-2, ETE
18	Simplification of Context Free Grammars and Normal Forms	Simplify a given CFG using three transformation method	Lecture, Practice questions	3203.2	In Class Quiz, Assignment, MTE-2, ETE
19	Chomsky Normal Form (CNF)	Normalize a CFG into CNF	Flipper Classroom	3203.2	In Class Quiz, MTE-2, ETE
20	Greibach Normal Form (GNF)	Normalize a CFG into GNF	Lecture, Practice questions	3203.2	In Class Quiz, MTE-2, ETE
21	Pushdown Automata (PDA) and Context–Free Languages	Construction of PDA using different approaches for different type of problems	Lecture	3203.1	In Class Quiz, Assignment, MTE-2, ETE
22	Deterministic Pushdown Automata, Non-deterministic Pushdown Automata	Understanding acceptability of PDAs and categorizing the PDAs into DPDA and NPDA	Lecture, Practise questions	3203.1	In Class Quiz, Assignment, MTE-2, ETE
23	Turing Machine and Recursive/ Recursive Enumerable Languages	Understanding principles of Turing machines, halting problems and the languages of Turing machine	Lecture, Practise questions	3203.1 3203.3	In Class Quiz, Assignment, MTE-2, ETE
Mid Term Examination – 2					
24	Introduction to compiler design: analysis of the source program, phases of a compiler, Structure of a Compiler	Identification of needs and structure of compiler design	Lecture, Activity	3203.4	In Class Quiz, ETE
25-27	Lexical analysis: The Role of the Lexical Analyzer, Input Buffering, Specification of Tokens, Recognition of Tokens	Outline the role and working of lexical analysis	Lecture, Activity	3203.4	In Class Quiz, ETE
28	Syntax analysis: parsing and ambiguity	Identifying the roles of syntax analysis in Compiler Design and determine whether a grammar is ambiguous or not	Lecture, Practice questions	3203.5	In Class Quiz, Assignment, ETE
29	Top-Down Parsing and its types	Understanding about working of Top-Down parsers	Lecture, Activity	3203.5	In Class Quiz, Assignment, ETE

30	FIRST and FOLLOW, Construction of LL(1) parsing table	Computation of FIRST and FOLLOW, Construction of LL(1) parsing table	Lecture, Activity	3203.5	In Class Quiz, ETE
31	LL(l) parser	Understanding the working of LL(l) parser	Lecture, Activity	3203.5	In Class Quiz, Assignment, ETE
32	Bottom-up parsing and its type – and Overview,	Understanding about working of Bottom-up parsers	Lecture, Activity	3203.5	In Class Quiz, ETE
33-35	LR(k) parsers: LR(0) item-set construction, LR(0) parsing technique, SLR parsing technique, LR(1) item-set construction, CLR and LALR	Understanding about working of Bottom-up parsers	Lecture, Activity	3203.5	In Class Quiz, Assignment, ETE
36	Parser generators (Flex and Bison)	Understanding the working of parser generators	Lecture, Activity	3203.5	In Class Quiz, ETE
37	Runtime environments	Understanding the storage allocation of run time environments of compilers	Lecture, Activity	3203.5	In Class Quiz, ETE
End Term Examination					

H. COURSE ARTICULATION MATRIX

CO	STATEMENT	Correlation with Program Outcomes **(POs)**												Correlation with Program Specific Outcomes (**PSOs**)		
		PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
[CC3203.1]	Interpret, analyse, and develop abstract models (such as finite automata, pushdown automata, and Turing machines) based on any problem that can be specified using formal language.	**3**	**2**	**2**	**2**								**2**		**2**	
[CC3203.2]	Apply the characteristics of different types of formal languages, grammars, and abstract models to prove their properties.	**1**	**2**	**2**									**1**		**1**	
[CC3203.3]	Determine the type of computational problems and examine the decidability of them by constructing Turing machines.	**2**	**3**	**3**	**2**								**1**		**1**	**1**
[CC3203.4]	Identify the basic concepts, structure, and importance of compilers.	**2**	**2**	**3**	**2**								**2**	**1**	**1**	
[CC3203.5]	Critically analyse the performances of each parser and determine the compilation process.	**1**	**2**	**2**	**1**	**1**							**1**		**1**	

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

DEPARTMENT OF COMPUTER AND COMMUNICATION ENGINEERING

Course Hand-out

Advanced Internet Technology | CC 3240| 3 Credits | 3 0 0 3

Session: Jan 22-May 22 | Faculty: Dr. Punit Gupta | Class: 3rd Year/6th Semester

A. Introduction: This course is offered by the Department of Computer and Communication Engineering as the main objective of this course is to familiarize students with the basics of Web, Web clients and servers with working of HTTP. It also gives the insight of developing static and dynamic Web pages to serve as front-end to client/server applications, and effective server side programming while introducing event-driven system programming. The course also covers basics of XML, Ajax, JavaScript, and recent trends in the area of web technology.

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

[3240.1] Identify and describe various basic concepts of Advanced Internet technology.

[3240.2] Design client /server program.

[3240.3] Identify and perform various kinds of data validation to foster the processing

[3240.4] Design and execute the web based solutions pertaining to any real life need.

[3240.5] Relate working of web in real world with recent trends.

[3240.5] Design and execute advanced web development techniques.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

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

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

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

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

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

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

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

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

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

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

[PSO.1]. Imbibe the basic concepts and applications of computer-based Communication or networking, information sharing, signal processing, web-based systems, smart devices, and communication technology.

[PSO.2]. Investigate prominent areas in the field of Computer and Communication Engineering to provide feasible solutions.

[PSO.3]. Apply the contextual knowledge in the field of Computing and Communication to assess social, health, safety, and security issues relevant to the professional engineering practice.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	15
	Sessional Exam II (Closed Book)	15
	In class Quizzes and/or Assignments , Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Open Handwritten Notes)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work at home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

Introduction: Need for web, Basic concepts, web design fundamentals, website Strategy and planning, web testing tools, web server structure, maintenance, Criteria for navigation of web pages, development and development of the web pages, AJAX, Web sockets, WebRTC;

Client side technologies: Client Side Architecture, Browsers (IE, Mozilla, Firefox), Browser Extensions – Mime Types, Plugins, Controls, add-ons, XHTML, CSS, JavaScript, Generation and Handling of Dynamic Web pages, Action script, Silver light, HTML5 and CSS3, Ajax, Session Tracking Techniques on Client-side, Security issues, Rich Internet Applications;

XML: Xml basics, document object model, DTD and schemas, xml namespaces, xml for representation and for display – path and XSLT, xml DOM, XML manipulation, XML Ajax, xml DTD XSD schema XSD, complex XSD data;

Web/Application/Database Servers: Structure, Architecture of web servers with working (IIS , Apache) , Installation and configuration of Web Servers, Security Aspects, Deployment of Web Pages, Maintenance and monitoring of Web pages;

Case study: IIS / Apache / Tomcat / MSSQL/Apache/ LAMP/ WAMP/ MySQL Servers. App development issues, challenges, solutions, simulators, Tools for designing web applications;

Advanced topics: E-Commerce Basics, Models and Architecture; m-Commerce: WAP and Mobile Agents, Search Engines and Search Engine Optimization, Introduction to Web Services.

F. REFERENCE BOOKS

1. Jackson, Jeffrey C. "Web Technologies: a computer science perspective", Pearson Prentice Hall, 2006.
2. R. Kamal, "Web Technology", 2nd Edition, McGraw-Hill, 2001.

G. Lecture Plan:

Class Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1	Introduction and Course Hand-out briefing	To acquaint and clear teachers expectations and understand student expectations	Lecture	NA	NA
2,3	Introduction of Web Development process: Need for web, Basic concepts, web design fundamentals, website Strategy and planning,	Inderstanding web development principal and basics	Lecture	3240.1	Class Quiz Mid Term I
4,5	Client side programming - Web application Design Lifecycle, Web page design and production, Web Markup Languages – What is markup, why markup,	describe and identify various web development platforms and programming languages	Lecture	3240.1	Class Quiz Mid Term I
6,7	Intro to HTML and Deficiencies of HTML, Using XHTML – Basic syntax and semantics, fundamental elements, URLs –Interpage and Intrapage	learn and design html pages	Lecture	3240.1	Class Quiz Mid Term I
8	Linking, Lists, Tables, Frames and Forms.,	learn html table and form tags	Lecture	3240.2	Class Quiz Mid Term I End Term
9,10,11	HTML Document Object Model (DOM), Styling with CSS, Introduction to HTML5 and CSS3,	Learn CSS for designing web pages	Lecture	3240.2	Class Quiz Mid Term I End Term
12,13	AJAX: Introduction, Ajax XMLHttp, AJAX request,	Learn dynamic web page design concepts.	Lecture	3240.2	Class Quiz Mid Term I

14,15	Client side dynamic programming with JavaScript – Basics, Primitives, Loops, ,	Understanding scripting language.	Lecture	3240.2	Class Quiz	Mid Term I	End Term
16,17	Decision making and event handling	Understanding scripting language for event handling.	Lecture	3240.2	Class Quiz	Mid Term I	
18,19	Screen Output and Keyboard Input, Arrays and Functions, Event Handling, Pattern Matching	Understanding scripting language and its various functionality	Lecture	3240.2	Class Quiz	Mid Term II	End Term
20	Java Script and event handling	Understanding scripting language for event handling.	Lecture	3240.2	Class Quiz	Mid Term II	
21	Form Validation with Regular Expressions, ajax with java script	learn and design form validation in javascript	Lecture	3240.3	Class Quiz	Mid Term II	
22	Server side programming - Three Tier Model, PHP – Basics, Form Validation,	Understanding scripting language for server side scripting	Lecture	3240.3	Class Quiz	Mid Term II	
23,24	PHP database connection validation	Learning php and data base	Lecture	3240.3	Class Quiz	Mid Term II	
25,26	Transactions in php	Understanding transaction in PHP	Lecture	3240.4	Class Quiz	Mid Term II	
27-28	looping & event handling	Design and execute the concept of looping	Lecture	3240.4	Class Quiz	Mid Term II	
29-30	Emailing Form Data Addressing the Stateless Nature of HTTP -Sessions and Session Tracking techniques	understanding session management using php	Lecture	3240.4	Class Quiz	Mid Term II	End Term
31-32	XML – Syntax and Semantics, Document Structure,	learn and design XML messages	Lecture	3240.4	Class Quiz	Mid Term II	
33	DTDs, Need for Namespaces, XML Schemas,	learn and design DTD for XML	Lecture	3240.4	Class Quiz		End Term
34-35	Navigating XML documents with XPath, Displaying XML documents with CSS and XSLT.	learn and design N documents XPath XML	Lecture	3240.5	Class Quiz		End Term

36-37	Jquery: Introduction	learn and design Jquery for dynamic cntent	Lecture	3240.5	Class Quiz	End Term
38	Jquery and its functioning	describe and identify jquery components	Lecture	3240.5	Class Quiz	End Term
39-40	Angular JSP, NodeJS, JSON	learn and design NodeJS	Lecture	3240.5	Class Quiz	End Term
41-42	Bootstrap	learn and design Bootstrap	Lecture	3240.5	Class Quiz	End Term

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

CO	STATEMENT	Correlation with Program Outcomes **(POs)**												Correlation with Program Specific Outcomes (**PSOs**)		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
[CC3240.1]	To identify and describe various basic concepts of Advanced Internet technology.	**1**												**1**		
[CC3240.2]	To practice client /server programming	**2**	**2**	**2**	**1**										**1**	
[CC3240.3]	To identify and perform various kinds of data validation to foster the processing		**1**												**2**	
[CC3240.4]	To design and execute the web based solutions pertaining to any real life need.			**2**	**1**							**1**	**2**		**2**	**2**
[CC3240.5]	To identify working of web in real world and recent trends.	**1**			**1**	**1**							**2**	**2**		**1**
[CC3240.6]	To design and execute advanced web development techniques.	**2**	**2**	**2**	**1**	**3**							**1**	**3**	**2**	**3**

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

I. 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
[CC3240.1]	To identify and describe various basic concepts of Advanced Internet technology.															
[CC3240.2]	To practice client /server programming															
[CC3240.3]	To identify and perform various kinds of data validation to foster the processing															
[CC3240.4]	To design and execute the web based solutions pertaining to any real life need.															
[CC3240.5]	To identify working of web in real world and recent trends.															
[CC3240.6]	To design and execute advanced web development techniques.															

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and IT

Department of Computer and Communication Engineering
Course Hand-out

Computer Vision | CC 3241 | 3 Credits | 3 0 0 3

Session: Jan'22 – May'22 | Course Coordinator: Dr. Manoj Kumar Sharma | Class: 3rd Year / 6th Semester

Faculty: 1. Dr Manoj Kumar Sharma, 2. Mr. Vinod Kumar

A. Introduction: This is a programme elective course which introduces, concepts of computer vision. Important concepts of computer vision are image formation, filtering, segmentation and classifiers. Students will understand the concept of image formation and filtering techniques applied over image. In the next half of the course student will be understanding and applying different image segmentation techniques and image classification algorithms. Students will gain proper knowledge of image formation to image classification processes and their applications. They will be able to customize the filtering, segmentation, classification techniques to solve modern day problems.

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

[CC3241.1] Understand the underlying concepts and challenges of Computer Vision.
[CC3241.2] Apply image filtering techniques in image formation.
[CC3241.3] Analyse different image segmentation and image classification techniques.
[CC3241.4] Evaluate different segmentation and classification models for real world applications to enhance employability prospects.

C. Program Outcomes and Program Specific Outcomes

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

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

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

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

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

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

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

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

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

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

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

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

Program Specific Outcomes (PSOs)

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

[PSO.1] Imbibe the basic concepts and applications of computer-based Communication or networking, information sharing, signal processing, web-based systems, smart devices, and communication technology.

[PSO.2] Investigate prominent areas in the field of Computer and Communication Engineering to provide feasible solutions.

[PSO.3] Apply the contextual knowledge in the field of Computing and Communication to assess social, health, safety, and security issues relevant to the professional engineering practice.

D. Assessment Rubrics:

Criteria	Description	Maximum Marks
Internal Assessment (Formative)	Sessional Exam I (Closed Book)	20
	Sessional Exam II (Closed Book)	20
	In class Quizzes and Assignments , Activity feedbacks (Accumulated and Averaged)	20
End Term Exam (Summative)	End Term Exam (Closed Book)	40
	Total	100
Attendance	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	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	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

Image formation and image models: cameras, geometric camera models, geometric camera calibration, radiometry measuring light, sources, and shading; Color early vision - single image: linear filters, edge detection; Texture early vision - multiple images: the geometry of multiple views, stereopsis, affine structure from motion, projective structure from motion; Mid-level vision: segmentation by clustering, segmentation by fitting a model, segmentation and fitting using probabilistic methods, racking with linear; Dynamic models high-level vision: geometric methods: smooth surfaces and their outlines, aspect graphs, range data; High-level vision: probabilistic and Inferential methods, finding templates using classifiers, recognition by relations between templates, geometric templates from spatial relations.

References:

R1. D. A. Forsyth and J. Ponce, Computer Vision: A Modern Approach, Pearson Education, 2008.

R2. R. Hartley and A. Zisserman, Multiple View Geometry in Computer Vision, (2e), Cambridge University Press, 2004.

R3. R. Szeliski, Computer Vision: Algorithms and Applications, Springer, 2011.

R4. J. Leskovec, A. Rajaraman, J.D. Ullman, Mining of massive dataset, (2e), Cambridge University Press, 2014.

F. Lecture Plan:

Lect. No	Topics	Session Objective	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1	Introduction to the subject, course plan, course outcomes and assessment plan.	To acquaint and clear teacher's expectations and understand student expectations	Lecture	NA	NA
2	Image formation and image models	To understand image formation	Lecture	CC3241.1	Class Quiz/ Sessional Exam / End Term Exam
3-4	Cameras, geometric camera models	Understand camera module and its geometric	Lecture	CC3241.2	Sessional Exam/ End Term Exam
5	Geometric camera calibration	Understand camera geometry and its calibration	Lecture	CC3241.2	Class Quiz Sessional Exam/ End Term Exam
6-8	Radiometry measuring light, sources, and shading	Understand radiometry measurement	Lecture	CC3241.2	Class Quiz Sessional Exam/ End Term Exam
9-11	Color early vision - single image: linear filters, edge detection;	Understand and apply filtering and edge detection process over image	Lecture	CC3241.2	Sessional Exam/ End Term Exam
12-14	Texture early vision - multiple images: the geometry of multiple views, stereopsis	Understand and apply texture vision on multiple images	Lecture	CC3241.1	Home Assignment Class Quiz Sessional Exam/ End Term Exam
15-17	Affine structure from motion, projective structure from motion	Apply and customize different image structures in texture vision	Lecture	CC3241.2	Home Assignment Sessional Exam/ End Term Exam
18-20	Mid-level vision: segmentation by clustering	Understand and apply image segmentation	Lecture	CC3241.2	Sessional Exam/ End Term Exam
21	Segmentation by fitting a model	Understand and apply image segmentation	Lecture	CC3241.1	Home Assignment Sessional Exam/ End Term Exam
22-24	Segmentation and fitting using probabilistic methods, racking with linear	Understand and apply image segmentation	Lecture	CC3241.1	Sessional Exam/ End Term Exam
25	Dynamic models high-level vision: geometric methods	Apply different geometric methods in high level vision	Lecture	CC3241.1	Sessional Exam/ End Term Exam
26-28	Smooth surfaces and their outlines, aspect graphs, range data	Apply different geometric methods in high level vision	Lecture	CC3241.1	Sessional Exam/ End Term Exam
29-31	High-level vision: probabilistic and Inferential methods	Apply different geometric methods in high level vision	Lecture	CC3241.1	Sessional Exam/ End Term Exam
32-33	Finding templates using classifiers	Understand and customize image classifiers	Lecture	CC3241.1	Class Quiz Sessional Exam/ End Term Exam
34-35	Recognition by relations between templates	Understand and customize image classifiers	Lecture	CC3241.2	Class Quiz Sessional Exam/ End Term Exam
36-38	Geometric templates from spatial relations	Understand and customize image classifiers and their spatial relationships	Lecture	CC3241.2	Class Quiz Sessional Exam/ End Term Exam

G. 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
CC3241.1	Understand the underlying concepts and challenges of Computer Vision.	1	3	0	2	1	1	1	1	1	2	0	1	1	0	2
CC3241.2	Apply image filtering techniques in image formation.	2	2	3	1	1	1	0	1	1	2	0	1	1	1	2
CC3241.3	Analyse different image segmentation and image classification techniques.	3	2	3	1	3	1	0	1	1	2	1	2	2	2	0
CC3241.4	Evaluate different segmentation and classification models for real world applications to enhance employability prospects.	3	2	3	1	3	1	0	1	1	2	1	2	1	3	1

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and IT

DEPARTMENT OF COMPUTER AND COMMUNICATION ENGINEERING

Course Hand-out

Artificial Intelligence and Machine Learning Lab | CC3230 | 0 0 2 1

Session: Jan 22- May 22 | Faculty: Dr Sunil Kumar| Class: B Tech CCE VI SEM

A. Introduction: This course is designed to study and design the algorithms that allow computers to automatically learn from data or past experience, how to improve their performance at some tasks (object classification etc). Students will also learn the fundamental methodology for how to design and analyse machine learning systems.

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

[CC3230.1]: Demonstrate AI/ML algorithm implementation using Jupyter Notebook.

[CC3230.2]: Analyse the ML models using performance metrics.

[CC3230.3]: Analyse the performance of ML models w.r.t change in parameters /hyperparameters.

[CC3230.4]: Compare performance of some ML models for real world applications.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

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

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

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

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

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

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

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

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

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

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

Program Specific Outcomes (PSOs)

[PSO.1] Imbibe the basic concepts and applications of computer-based Communication or networking, information sharing, signal processing, web-based systems, smart devices, and communication technology.

[PSO.2] Investigate prominent areas in the field of Computer and Communication Engineering to provide feasible solutions.

[PSO.3] Apply the contextual knowledge in the field of Computing and Communication to assess social, health, safety, and security issues relevant to the professional engineering practice.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Formative)	Fortnightly evaluation (Record + execution + viva)	40
	Mini project	30
End Term Exam (Summative)	End Term Exam	30
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

E. SYLLABUS

Implementation of supervised learning Algorithms: Support vector machine, Naïve bayes, linear regression, decision tree, KNN algorithm; Implementation of neural network with basic concepts, with perceptron and with back propagation network; Implementation of unsupervised learning Algorithms: K-mean algorithm; Implementation of deep neural network: Deep Convolutional Neural Network.

F. REFERENCE BOOKS

1. Andres C. Muller, Sarah Guido: Introduction to Machine Learning with Python. O'REILLY, 2016.
2. Aurelien Geron: Hands On Machine Learning with Scikit-Learn & TensorFlow. O'REILLY, 2017.

G. Lab Plan:

	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1-2	Introduction to Python	How to declare Keywords, Variables, Datatypes, Statements, and Comments. How to implement I/O and imports How to use Functions How to implement Flow controls How to implement List and directories	Learn by doing	NA	Internal Evaluation
3	Write a program to implement hill climbing search algorithm	Implementation will be specific for Travelling salesman problem.	Learn by doing	CC3230.1	Internal Evaluation Project End Sem Exam
4	Write a program to implement A* search algorithm	Implementation may be done to solve any real-life problem such as 8-puzzle problem	Learn by doing	CC3230.1	Internal Evaluation Project End Sem Exam
5	Write a program to solve some real-world problem using constraint satisfaction	To solve some algebraic relations using constraint satisfaction	Learn by doing	CC3230.1	Internal Evaluation Project End Sem Exam
6-7	Write a program to Implement Simple Linear and Logistic Regression.	How to estimate linear regression coefficients from data. How to make predictions using linear regression for new data. How to make predictions for multivariate linear regression. How to implement linear regression with stochastic gradient descent to make predictions on new data.	Learn by doing	CC3230.3	Internal Evaluation Project End Sem Exam
8	Write a program to implement the Bayes Classifier and SVM Classifier.	How to use Bayes and SVM classifier .	Learn by doing	CC3230.2	Internal Evaluation Project End Sem Exam
9	Write a program to implement Decision Tree Algorithm	How to calculate and evaluate candidate split points in a data. How to arrange splits into a decision tree structure. How to apply the classification and regression tree algorithm to a real problem.	Learn by doing	CC3230.2	Internal Evaluation Project End Sem Exam

10	Write a program to implement k-Nearest Neighbours	The implementation will be specific for classification problems and will be demonstrated using the Iris flowers classification problem.	Learn by doing	CC3230.3	Internal Evaluation Project End Sem Exam
11.	Write a program to implement k-means algorithm	Implement unsupervised learning	Learn by doing	CC3230.3	Internal Evaluation Project End Sem Exam
12.	Write a Program to implement Principal Component Analysis for dimensionality reduction	Implementation of PCA using digit dataset	Learn by doing	CC3230.3	
13.	Write programs to Implement the Perceptron Algorithm Write a program to implement the Backpropagation Algorithm.	How to implement Neural Networks	Learn by doing	CC3230.3	Internal Evaluation Project End Sem Exam
14.	Mini Project		Learn by doing	CC3230.4	
End Term Exam					

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

CO	STATEMENT	Correlation with Program Outcomes **(POs)**												Correlation with Program Specific Outcomes (**PSOs**)		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
[CC3230.1]	Demonstrate AI/ML algorithm implementation using Jupyter Notebook	1	1	0	1	1	0	0	2	1	2	0	1	3	2	0
[CC3230.2]	Analyse the ML models using performance metrics	1	1	0	1	3	0	0	2	1	2	0	1	1	1	0
[CC3230.3]	Analyse the performance of ML models w.r.t change in parameters /hyperparametrs	1	1	0	1	3	0	0	2	1	2	0	1	1	1	0
[CC3230.4]	Compare performance of some ML models for real world applications	3	3	1	3	3	1	0	3	3	2	0	1	2	1	1

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

List of Experiments:

S.No.	Topics
1	Introduction to Python
2	Write a program to implement hill climbing search algorithm
3	Write a program to implement A* search algorithm
4	Write a program to solve some real-world problem using constraint satisfaction
5	Write a program to Implement Simple Linear and Logistic Regression.
6	Write a program to implement the Bayes Classifier and SVM Classifier.
7	Write a program to implement Decision Tree Algorithm
8	Write a program to implement k-Nearest Neighbours
9	Write a program to implement k-means algorithm
10	Write a Program to implement Principal Component Analysis for dimensionality reduction
11	Write programs to Implement the Perceptron Algorithm. Write a program to implement the Backpropagation Algorithm.
12	Mini Project

Justification:

Blooms Taxonomy Action verbs and Cognitive levels→

Level	Skill Demonstrated	Question cues / Verbs for tests
1. Remember	• Ability to recall of information like facts, conventions, definitions, jargon, technical terms, classifications, categories, and criteria • ability to recall methodology and procedures, abstractions, principles, and theories in the field • knowledge of dates, events, places • mastery of subject matter	list, define, tell, describe, recite, recall, identify, show, label, tabulate, quote, name, who, when, where
2. Understand	• understanding information • grasp meaning • translate knowledge into new context • interpret facts, compare, contrast • order, group, infer causes • predict consequences	describe, explain, paraphrase, restate, associate, contrast, summarize, differentiate interpret, discuss
3. Apply	• use information • use methods, concepts, laws, theories in new situations • solve problems using required skills or knowledge • Demonstrating correct usage of a method or procedure	calculate, predict, apply, solve, illustrate, use, demonstrate, determine, model, experiment, show, examine, modify
4. Analyse	• break down a complex problem into parts • Identify the relationships and interaction between the different parts of a complex problem • identify the missing information, sometimes the redundant information and the contradictory information, if any	classify, outline, break down, categorize, analyze, diagram, illustrate, infer, select
5. Evaluate	• compare and discriminate between ideas • assess value of theories, presentations • make choices based on reasoned argument • verify value of evidence • recognize subjectivity • use of definite criteria for judgments	assess, decide, choose, rank, grade, test, measure, defend, recommend, convince, select, judge, support, conclude, argue, justify, compare, summarize, evaluate

6. Create	• use old ideas to create new ones • Combine parts to make (new) whole, • generalize from given facts • relate knowledge from several areas • predict, draw conclusions	design, formulate, build, invent, create, compose, generate, derive, modify, develop, integrate

CO Design→

CO Number	Cognitive Domain	Performance	Condition	Criteria
CC1702.1	**L3**	**Demonstrate ML algorithm implementation using Jupyter Notebook**	**Jupyter notebook/ Python**	**Errorfree implementation**
CC1702.2	**L4**	**Analyse the ML models using performance metrics**	**Regression/classification metrics**	**Minimum error/ High classification accuracy**
CC1702.3	**L4**	**Analyse the performance of ML models w.r.t change in parameters /hyperparametrs**	**parameter/ hyper-parameter tuning**	**Minimum error/ High classification accuracy**
CC1702.4	**L5**	**Compare performance of some ML models for real world applications**	**Industry relevant problem datasets**	**Comparative results**

CO-PO Mapping (Refer to the AICTE Competencies and indicator table for CSE/IT)→

PO/PSO	No. of Competencies	Number of Related Competencies			
		CO1	CO2	CO3	CO4
PO1	4	1	1	1	3
PO2	4	2	1	1	3
PO3	4	0	0	0	2
PO4	3	2	2	2	3
PO5	3	3	3	3	3
PO6	2	0	0	0	1
PO7	2	0	0	0	0
PO8	2	1	1	1	2

PO9	3	1	1	1	3
PO10	3	2	2	2	2
PO11	3	0	0	0	0
PO12	3	1	1	1	1
PSO1	2	2	1	1	2
PSO2	2	1	1	1	1
PSO3	2	0	0	0	1

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Department of Computer and Communication Engineering
Course Hand-out

Linux Shell Programming | CC3231| 1 Credits | 0 0 2 1

Session: Jan'22 – May'22 | Course Coordinator: Gaurav Prasad | Class: 3rd Year / 6th Semester

Faculty: Dr.Vijay kumar Sharma

A. Introduction: This course is offered by the Department of computer and communication engineering as lab for the students is to familiarize students with introduction to LINUX as a development platform. This course introduces the full range of LINUX user commands and utilities. It also discusses about the shell programming concept and deals with in detail about the shell programming in LINUX shell environment. Overall the course covers, through basic shell commands to shell programming.

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

[3231.1]. Identify the concept of LINUX as a development platform with importance on basic commands with its usage in the field of computing.
[3231.2]. Use tools and utilities in LINUX, performing and analysing the working and usage of these tools for real world applications.
[3231.3]. Identifying and applying appropriate technique to solve real time problems.
[3231.4]. Perform experiments to analyse the performance and applicability of learned utilities and shell programming.

C. Program Outcomes and Program Specific Outcomes

[PO.1]. **Engineering knowledge**: Apply the knowledge of mathematics, 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]. Imbibe the basic concepts and applications of computer-based Communication or networking, information sharing, signal processing, web-based systems, smart devices, and communication technology.

[PSO.2]. Investigate prominent areas in the field of Computer and Communication Engineering to provide feasible solutions**.**

[PSO.3]. Apply the contextual knowledge in the field of Computing and Communication to assess social, health, safety, and security issues relevant to the professional engineering practice

D. Assessment Rubrics:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	File/Record	30
	Viva/quiz	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.	

E. Syllabus

General LINUX Commands: Cal, date, echo, who, bc, script, passwd, who; File System & File Compression: file handling commands such as cat, cp, rm, mv, more, wc, cmp, diff, gzip, unzip, tar, zip, unzip, mkdir, rmdir, pwd, cd, File attribute: ownerships, permissions; The Process Basics, ps, Internal and external commands, Process states and zombies, nice, at, mesg, cron, time, top. VI Editor: The vi editor Basics, Input mode and The ex mode, Navigation, Editing text, I/O redirection, piping data. Regular Expressions: The period (.), dollar ($), caret(^), asterisk(*). cut, paste, sed, grep, sort, uniq. Shell and Shell programming: The Shell's interpretive cycle, Shell offering, Pattern Matching, Parameter substitution. Decisions: test: string, integer, file and logical operators, else, exit, elif and case. Loops: For, while until. Breaking out from loop, Executing loop in background. Reading and printing data: read, program to copy files, mycp, printf commands. Network Commands: Telnet, ipconfig, ping, netstat, firewalls, System configurations

F. Text Books

T1. *S. Das, "Unix Concepts and Applications", 4th Edition, McGraw Hill, 2006*

G. REFERENCE BOOKS

R1. P. Wood, S. G. Kochan, Shell Programming in Unix, Linux and OS X, (4e), AddisonWesley Professional, 2016.

R2. *W. R. Stevens, S. A. Rago, "Advanced Programming in the UNIX Environment", 3rd Edition, Addison-Wesley, 2013*

H. Lecture Plan:

LEC NO	TOPICS	Session Outcome Corresponding	Mode of Delivery	Corresponding CO	CO Mode of Assessing the Outcome
1	Basic Commands: cal, date, echo, who. Working with files: ls, cat, wc, cp, mv, rm. Working with Directories: pwd, cd, mkdir, rmdir.	Understand basic commands used for working in LINUX Environment	Lecture Demonstration at system	CC3231.1 CC3231.3	Viva File/Record Submission
	File Compression/Decompression: gzip, bzip2, zip, tar, gunzip, bunzip2, unzip	• Working of Compression & Un compression	Demonstration of Compression & compression Un	CC3231.2 CC3231.4	Viva File/Record Submission
2	File attributes: ownerships, permissions; The Process Basics, ps, Internal and external commands, Process states and zombies, nice, at, mesg, cron, time, top.	• To identify the processes running at foreground, background and to kill the process	Demonstration a explanation process nd ab ou t	CC3231.2 CC3231.3 CC3231.4	Viva End Term Examination File/Record Submission
3	Regular Expressions: The period(.), dollar($), caret(^), asterisk(*). cut, paste, sed, grep, sort, uniq.	• Identify the use of tools which is provided by Unix environment	Experimental demonstration a usage of the expression nd reg ular	CC3231.2 CC3231.4	Viva End Term Examination File/Record Submission
4	Passing Arguments: The $#, $*, program to look up, add, remove entries in phonebook	• Understand passing of arguments	demonstration and usage of the parameter passing	CC3231.2 CC3231.3	Viva End Term Examination File/Record Submission
5-7	Parameter substitution: ${parameter}, ${parameter:-value}, ${parameter:=value} and ${parameter:?value}. pattern matching constructs: ${variable%%pattern} ${variable#pattern} and ${variable##pattern}	• Use of passing arguments in the function	demonstration and usage of the parameter passing	CC3231.3 CC3231.4	Viva End Term Examination File/Record Submission
8	Decisions: test: string, integer, file and logical operators, else, exit, elif and case.	• Understand working of decision making and if else statement in LINUX shell programming Environment	Program execution of logical operators and usage of the parameter passing	CC3231.3 CC3231.4	Viva End Term Examination File/Record Submission

9	Loops: For, while until. Breaking out from loop, Executing loop in background, I/O redirection, piping data into and out of loop.	• Usage of loops in LINUX shell programming and also redirection	Program execution of loops operators and usage of the parameter passing	CC3231.3 CC3231.4	Viva End Term Examination File/Record Submission
10	Reading and printing data: read, program to copy files, mycp, printf commands.	•Working on copy files and reading, writing on to the files	Demonstration of working with files	CC3231.3 CC3231.4	Viva End Term Examination File/Record Submission
11-13	Network Commands: Telnet, ipconfig, ping, netstat, firewalls, System configurations. The vi editor Basics, Input mode and The ex mode, Navigation, Editing text;	• Understand basic commands related to networking in LINUX Environment	Demonstration and experiments of usage of network utility tools	CC3231.2 CC3231.3 CC3231.4	Viva End Term Examination File/Record Submission

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	P O 12	PSO 1	PSO 2	PSO 3
[CC3231.1]:	Identify the basic of LINUX as a development platform with importance on basic commands with its usage in the field of computing.	2		1		1			1	2	1	1	1	2		1
[CC3231.2]:	Use tools and utilities in LINUX, performing and analyzing the working and usage of these tools for real world applications.	2	1	1	1	3								1		
[CC3231.3]:	Identifying and applying appropriate technique to solve real time problems.		2	1	1	1								1	2	3
[CC3231.4]:	Perform experiments to analyse the performance and applicability of learned utilities and shell programming.		2	2	3						1			1	2	2

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

J. Course Outcome Attainment Level Matrix:

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
[CC3231.1]:	Identify the basic of LINUX as a development platform with importance on basic commands with its usage in the field of computing.															
[CC3231.2]:	Use tools and utilities in LINUX, performing and analyzing the working and usage of these tools for real world applications.															
[CC3231.3]:	Identifying and applying appropriate technique to solve real time problems.															
[CC3231.4]:	Perform experiments to analyse the performance and applicability of learned utilities and shell programming.															

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

DEPARTMENT OF COMPUTER AND COMMUNICATION ENGINEERING

Course Hand-out

Minor Project | CC 3270 | 3 Credits | 3 0 0 3

Session: Jan 22-May 22 | Faculty: Dr. Punit Gupta | Class: 3rd Year/6th Semester

A. Introduction: This course is offered by the Department of Computer and Communication Engineering as in this practical course, each group consisting of two/three members is expected to design and develop practical solutions to real life problems related to industry, institutions and computer science research. Software life cycle should be followed during the development. The theoretical knowledge, principles and practices gained from various subjects would be applied to develop effective solutions to various computing problems. The knowledge gained to work with various software tools, Designing tools, programming languages, operating systems, etc. would be utilized in various stages of project. Structured/ Object Oriented design techniques may be used for the project. Software Requirements Specification (SRS), Modeling Techniques, Design and Testing strategies would be part of document of the work. A committee consisting of minimum three faculty members shall perform internal assessment of the minor projects. A report on minor project would be submitted for evaluation, Project work would be presented and demonstrated before the panel of examiners.

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

[3270.1] Identify the basic of the concepts related to the selected topics of the project and also identify the open issues.

[3270.2] Identify the depth of the problem and to propose the solution.

[3270.3] Analyse the use of software tools, reporting and implementation.

[3270.4] Solve real time problem and contribute to open community with ethical values by understanding systematic study.

[3270.5] Plan the work in team with proper contribution from individual and managing lifelong learning.

[3270.6] Demonstrate software development skills and practices.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

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

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

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

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

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

[PO.8]. <u>Ethics:</u> 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]. <u>Individual and team work:</u> United we grow, divided we fall is a culture at MUJ. Thus an outgoing student should be able to function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

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

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

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

[PSO.1]. Imbibe the basic concepts and applications of computer-based Communication or networking, information sharing, signal processing, web-based systems, smart devices, and communication technology.

[PSO.2]. Investigate prominent areas in the field of Computer and Communication Engineering to provide feasible solutions.

[PSO.3]. Apply the contextual knowledge in the field of Computing and Communication to assess social, health, safety, and security issues relevant to the professional engineering practice.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	I progress Presentation	15
	II progress Presentation	15
	Guide Marks	30
	Project Diary	10
End Term Exam (Summative)	End Term Presentations	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.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work at home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. Lecture Plan:

S. No	Month	Phase	Outcome/Deliverable	Assessment

1	First	Problem Identification and Requirement Analysis	SRS cum Detail Design Document	Continuous Assessment-I
2	Second	Design and Implementation	Project Version 1.0	Continuous Assessment-II
3	Third	Testing and Debugging	Project final Version	Continuous Assessment-III
4	Fourth	Presentation and Report Writing	Report	Final Assessment

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

CO	STATEMENT	Correlation with Program Outcomes **(POs)**												Correlation with Program Specific Outcomes (**PSOs**)		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CC3270.1	Identify the basic of the concepts related to the selected topics of the project and also identify the open issues.	**2**	**2**		**2**									**2**	**2**	**1**
CC3270.2	To identify the depth of the problem and to propose the solution.		**1**	**1**	**1**											**1**
CC3270.3	Solve real time problem and contribute to open community with ethical values by understanding systematic study.	**1**	**1**	**1**	**1**	**3**									**1**	
CC3270.4	Design and execute the web based solutions pertaining to any real life need.				**1**	**1**		**1**								
CC3270.5	Work in team with proper contribution from individual and managing lifelong learning.					**1**	**1**		**1**	**1**	**1**	**1**	**1**			
CC3270.6	Learning software development skills and practices.	**1**	**2**	**3**											**1**	**1**

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

I. 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
CC3270.1	Identify the basic of the concepts related to the selected topics of the project and also identify the open issues.															
CC3270.2	To identify the depth of the problem and to propose the solution.															
CC3270.3	Solve real time problem and contribute to open community with ethical values by understanding systematic study.															
CC3270.4	Design and execute the web based solutions pertaining to any real life need.															
CC3270.5	Work in team with proper contribution from individual and managing lifelong learning.															
CC3270.6	Learning software development skills and practices.															

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

MANIPAL UNIVERSITY JAIPUR
SCHOOL OF COMPUTING & INFORMATION TECHNOLOGY

DEPARTMENT OF COMPUTER & COMMUNICATION ENGG.
Course Hand-out

Network Security| CC1701 | Credits 4 | 3 1 0 4)

Session: Aug 21 – Dec 21 | Faculty: Dr.Arjun Singh & Mr.Gaurav Prasad | Class: B.Tech CCE (VII Sem)

A. Introduction: This course is offered by Dept. of Computer and Communication Engineering as an department core subject for the students who wish to pursue research & development in Network Security or higher studies in the field of Information Security, Network Security and Cryptography. Course offers in depth knowledge of Network attacks, network Security applications, internet security, issues in network security and the techniques to mitigate these attacks. Students are expected to have background knowledge on cryptography for the better understanding of subject.

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

[CC1701.1] Identify factors driving the need for network security and categorize them into different types of attacks based on security attributes for the given application

[CC1701.2] Identify and Experiment different type of network security Applications and tools to defend the system from attacks for the given scenario with minimum usage of resources.

[CC1701.3] Analyse and deploy appropriate network security devices and techniques to defend against different attacks on the network to reduce the damage using the existing techniques.

[CC1702.4] Design security applications to prevent and mitigate attacks based on the given predefined scenario in optimized way.

C. Program Outcomes and Program Specific Outcomes

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

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

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

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

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

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

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

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

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

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

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

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

[PSO.1]. Imbibe the basic concepts and applications of computer-based Communication or networking, information sharing, signal processing, web-based systems, smart devices, and communication technology.

[PSO.2]. Investigate prominent areas in the field of Computer and Communication Engineering to provide feasible solutions**.**

[PSO.3]. Apply the contextual knowledge in the field of Computing and Communication to assess social, health, safety, and security issues relevant to the professional engineering practice

D. Assessment Plan:

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

E. Syllabus

Basics of Network Security: Attacks, services and mechanisms; **Network Security Applications:** Kerberos, IPSec, SSL, TLS and VPN; **Internet Security:** Digital Certificate, PKI, Secure Electronic Payment System and Protocols, iKP protocol; **Issues in Network Security and Tools:** Man in the middle attack, Replay, ARP poisoning, DNS poisoning, web based attacks ; **Firewalls and IDS:** Need of firewalls, firewall characteristics and access policy, type of firewall, firewall basing, firewall location

and configuration, Types of Intrusion detection System, working of IDS and policies; **Malware, Virus, Worm, Trojan Horse:** Introduction and working of malwares, Identifications and remedies.

F. Reference Books

T1: W. Stallings, *"Cryptography and Network Security Principles and Practice"*, 7th Edition, Pearson education, 2017

R1: Y. Qian, D. Tipper, P. Krishnamurthy, J. Joshi, *"Information Assurance Dependability & Security in Networked Systems"*, 1st Edition, Morgan Kaufmann, 2010.

G. Lecture Plan:

Lec No	**Topics**	**Session Outcome**	**Mode of Delivery**	**Corresponding CO**	**Mode of Assessing the Outcome**
1	Introduction and Course Hand-out briefing	To acquaint and clear teachers expectations and understand student expectations	Lecture	NA	NA
2,3	Network Attacks, services and mechanism	Recall the network attacks and preventive Mechanism	Lecture	1701.1	MID term 1
4,5,6	Network Security Applications: Kerberos	Understanding of the Kerberos as KDC and Authentication protocol	Lecture	1701.2	Mid term-1, End Term, Video & Presentation
7,8,9	IPsec, Modes of IPSec	Understanding of IPSec architecture, operational modes	Lecture	1701.2	Video & Presentation Mid term-1
10,11,12	IPSec Security Protocol, AH vs ESP, Services provided by ESP	Understanding of two security protocols (AH & ESP)	Lecture	1701.2	Mid term-1 End Term Video & Presentation
13	Security Association, Security association database	Recall IPSec Security association and database	Lecture	1701.2	Mid Term 1 End Term Video & Presentation
14,15,16	SSL introduction , SSL Architecture, Key exchange algorithm, Cryptographic parameter generation	Understand the need of security at TL layer, Structure of SSL	Lecture	1701.2	Mid Term 1 End term Video & Presentation
17	SSL Handshake protocol	Recall the handshake protocol functionality	Self-learning	1701.2	Video & Presentation End term
18,19,20	TLS version, cipher suite, generation of cryptographic secrets	Highlight the general structure of TLS and difference between SSL and TLS	Lecture and Activity (Think Pair Share)	1701.2	Mid Term 1 End Term Video & Presentation
21,22,23,24	Digital Certificate: Hash function, MD hash Family, whirlpool, SHA-512	Understand the process of creating Hash function, illustration of structure of whirlpool with example	Group Discussion	1701.2	Mid Term 1 End Term Video & Presentation
25,26,27	Digital Signature, differences between conventional signature and digital signature Refer the below link- https://www.coursera.org/lecture/iot-connectivity-security/digital-signatures-digital-certificates-wGVU2	Compare between conventional signature and digital signature, understand the process of digital signature	Flipped class	1701.2	Mid Term-1 End Term
28,29	Public key Infrastructure, PKI Tust model, Mesh Model, hijacking	Infer the concept of PKI and key distribution	Lecture	1701.2	Mid Term II End Term

30,31,32,33,34	Secure Electronic Transaction (SET), SET participants, SET Process, SET Internals, Payment Authorization, Payment Capture, SET model Note: Refer cryptography and Network Security, Atul Kahate, chapter-6	Describe the SET process and issues	Lecture	1701.2	Mid Term-11, End Term Video & Presentation
35,36,37	Issues in Network Security: Man in middle attack, Replay Attack (cryptography and Network Security, William stalling and handouts)	Describe the working of MIM attack in different environment.	Lecture, Activity	1701.3	Mid Term II End Term Video & Presentation
38,39,40,41	ARP Poisoning, web based attacks (cryptography and Network Security, Prakash C Gupta)	Simulation of ARP poisoning and web attacks	Lecture, Activity	1701.3	Mid Term II End Term Video & Presentation
41,42,43	Firewalls, type of firewalls, Firewall configurations, DMZ zones (cryptography and Network Security, Prakash C Gupta)	Describe working of firewall and its deployment process	Lecture, activity	1701.4	Mid Term II End Term Video & Presentation
44,46	Intrusion Detection System, Signature based vs Anomaly based IDs (cryptography and Network Security, Prakash C Gupta)	Infer the knowledge of IDS and working	Activity	1701.4	End Term
47,48,49,51	Introduction and working of malwares, warms, viruses , Identifications and remedies	Understanding the difference among various type of malicious code, and their neutralization process	Flipped Class	1701.4	End Term
52	Conclusion and Course Summarization	NA	NA		NA

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
CC 1701.1	Identify factors driving the need for network security and categorize them into different types of attacks based on security attributes for the given application.	3	1						1	1	1		1	1		3
CC1701.2	Identify and Experiment different type of network security Applications and tools to defend the system from attacks for the given scenario with minimum usage of resources.	1	1			3			1	1	1		1	1		3
CC1701.3	Analyse and deploy appropriate network security devices and techniques to defend against different attacks on the network to reduce the damage using the existing techniques.	1	2			1			1	1	1		1	1	1	3
CC1701.4	Design security applications to prevent and mitigate attacks based on the given predefined scenario in optimized way.	1	2	3					1	1	1		1	1	2	3

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

MANIPAL UNIVERSITY JAIPUR

School of Computing & Information Technology
Machine Learning | CC 1702 | 4 Credits | 3 1 0 4

Department of Computer & Communication Engineering
Course Hand-out
Session: Aug 21 – Nov 21 | Faculty: Sunil Kumar | Harish Sharma | Class: VII Sem

A. Introduction: This course is offered by Dept. of Computer & Communication Engineering as department core, targeting students who wish to pursue research & development in industries or higher studies in field of Artificial Intelligence, including supervised machine learning, unsupervised learning & reinforcement learning. It offers in-depth knowledge of Machine Learning concepts using supervised, unsupervised, and Reinforcement Learning. Concepts of Deep Learning, and Natural Language Processing are introduced. The course will enable students to choose and build a Machine Learning model and combine multiple models to solve any problem.

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

[CC1702.1] **Explain** the basic theory underlying machine learning algorithms.
[CC1702.2] **Apply** machine learning algorithm to data.
[CC1702.3] **Compare** various learning algorithms and models.
[CC1702.4] **Evaluate** machine learning algorithms for performance.
[CC1702.5] **Build** machine learning models for different applications to enhance employability prospects.

C. Program Outcomes and Program Specific Outcomes

[PO.1]. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
[PO.2]. Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
[PO.3]. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations
[PO.4]. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions
[PO.5]. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations
[PO.6]. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice
[PO.7]. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
[PO.8]. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices
[PO.9]. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
[PO.10]. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
[PO.11]. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
[PO.12]. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

Program Specific Outcomes (PSOs)

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

[PSO.1] Imbibe the basic concepts and applications of computer-based Communication or networking, information sharing, signal processing, web-based systems, smart devices, and communication technology.
[PSO.2] Investigate prominent areas in the field of Computer and Communication Engineering to provide feasible solutions.
[PSO.3] Apply the contextual knowledge in the field of Computing and Communication to assess social, health, safety, and security issues relevant to the professional engineering practice.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Formative)	Sessional Exam I	15
	Sessional Exam II	15
	Class Quizzes and Assignments and MOOC (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam	40
	Total	100
Attendance	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Make up Assignments (Formative)	Students who miss a class will have to report to the teacher about the absence. A makeup assignment on the topic taught on the day of absence will be given which has to be submitted within a week from the date of absence. No extensions will be given on this. The attendance for that 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: Introduction and applications of machine learning; **Supervised learning:** perceptron network, Adaptive linear neuron, multiple Adaptive linear neurons, Back propagation network, Generative learning algorithms. Gaussian discriminant analysis, Naive Bayes, Support vector machine, KNN algorithm, basic/variance trade off, linear regression and feature selection; **Neural network**: forward/backward network, Deep learning; **Unsupervised learning**: clustering, K-means algorithm, Kohonen self-organizing map, learning vector quantization, Counter propagation network; Introduction to Reinforcement learning, Optimization technique, Gradient descent method**, Introduction to natural language processing**, **Decision making and Expert system.**

F. References

1. M. Mohri, A. Rostamizadeh, A. Talwalker, “Foundations of Machine Learning”, MIT Press, Cambridge, MA, 2012.
2. T.M. Mitchell, “Machine learning”, 1 st Indian Edition, McGraw-Hill India, 2013.
3. T. Hastie, R. Tibshirani, J. Friedman, “The Elements of Statistical Learning”, 2nd Edition, Springer, 2009.
4. C.M. Bishop, “Pattern Recognition and Machine Learning”, 1st Edition, Springer Verlag, 2010.
5. S.N. Sivanandam, S.N. Deepa, “Principles of Soft Computing”, 2nd Edition, Wiley, 2011.

G. Lecture Plan:

	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1	Machine Learning – Introduction	Importance of Machine learning in the current scenario, convey teacher's expectations and understand student expectations	Lecture	CC1702.1	Class Quiz
2	Data, pre-processing, of Training & Testing Machine Learning Model	Data pre-processing, Training, and evaluating on a test dataset, cross validation, over fit and under fit, metrics	Lecture	CC1702.1	Home Assignment Class Quiz Mid Term I End Term
3-4	Linear Regression	To understand simple linear regression model and estimation of slope and intercept, gradient decent	Lecture	CC1702.1/2/4	Class Quiz Mid Term I End Term
5	Multivariate Regression	Multi variate regression	Lecture	CC1702.1	Class Quiz Mid Term I End Term
6	Logistic Regression	Regression, Estimating Probability, Decision Boundaries, SoftMax regression	Lecture	CC1702.2/3	Class Quiz Mid Term I End Term
7	Naïve Bayes Classifier	Learning Classifiers based on Bayes Rule, Discrete Inputs, Continuous Input, Conditional independence Multinomial Naive Bayes	Lecture	CC1702.2/4/5	Class Quiz Mid Term I End Term
8-9	Belief Network	Gaussian Bayes classifiers, Document classification Bayesian belief Network	Lecture	CC1702.1	Class Quiz Mid Term I End Term
10-11	Decision Tree	Training & visualizing, making prediction, CART training algorithm, Computational Complexity, Entropy, Regularization hyper parameter.	Lecture	CC1702.3/4/5	Class Quiz Mid Term I End Term
12-13	Ensemble Learning & Random Forest	Voting Classifiers Bagging Random Forest Boosting	Lecture	CC1702.1/2	Class Quiz Mid Term I End Term

14 -16	Support Vector Machine	Linear SVM Soft Margin Classifier Non-Linear SVM SVM Regression	Lecture	CC1702.1	Class Quiz Mid Term I End Term
17	Instance Based Learning	k-Nearest Neighbours KNN algorithm How do we choose the factor K	Lecture	CC1702.2/3/4	Class Quiz Mid Term I End term
18-19	Artificial Neural Network	Introduction, Neuron, Model, Perceptron	Lecture	CC1702.1/2	Class Quiz Mid Term II End Term
20-23	Multilayer Perceptron & Backpropagation.	Activation Function, Hidden Layers, Weights, Bias	Lecture	CC1702.1/2	Class Quiz Mid Term II End Term
24	Deep Learning	Concept of Deep Neural Networks, Requirements and challenges	Lecture	CC1702.1/2/5	Class Quiz Mid Term II End Term
25-27	Convolution Neural Network	Architecture, Convolution Layer Pooling Layer, CNN Architecture	Lecture	CC1702.1/2/5	Class Quiz Mid Term II End Term
28-30	Recurrent Neural Network	Recurrent Neurons Basic RNN, Deep RNN, LSTM, GRU	Lecture	CC1702.1/3	Class Quiz Mid Term II End Term
31-33	Natural Language Processing	Introduction and application of NLP Processing Raw text, learning to classify text	Lecture	CC1702.1/3	Class Quiz End Term
34-38	Unsupervised Learning	Concept of clustering with some example, K-means algorithm, Kohonen Self-Organizing Feature Map with their architecture and algorithm, Learning Vector Quantization (LVQ) architecture and algorithm, Counter Propagation Networks (CPN) with their training and testing algorithm	Lecture	CC1702.1/2/3	Class Quiz End Term
39	Reinforcement Learning	Learning Task, Markov Decision Process Learning to optimize rewards	Lecture	CC1702.1/3	Class Quiz End Term
40	Decision making and Expert Systems	Machine learning models vs expert systems	Lecture	CC1702.3	End Term

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

Course Out-Comes	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PSOs		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CC1702.1	**Explain** the basic theory underlying machine learning algorithms.	3					2							3		
CC1702.2	**Apply** machine learning algorithm to data.	3	2			2	3		2							2
CC1702.3	**Compare** various learning algorithms and models.		3	1	1										1	
CC1702.4	**Evaluate** machine learning algorithms for performance.	1	1	2	3								1		2	
CC1702.5	**Build** machine learning models for different applications to enhance employability prospects.	1	1	3	2			1		2				1		2

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

DEPARTMENT OF COMPUTER AND COMMUNICATION ENGINEERING

Course Hand-out

Principles of Web Services | CC 1753| 3 Credits | 3 0 0 3

Session: Aug 21-Nov 21 | Faculty: Dr. Punit Gupta | Class: VII SEM

A. Introduction: This course is offered by the Department of Computer and Communication Engineering as this course focuses on propagate communication between the client and server applications on the World Wide Web. Principles of Web Services allows student to learn popular service protocols like SOAP, WSDL, REST and other standard languages and architecture of web service deployment. Web services provide a common platform that allows multiple applications built on various programming languages to have the ability to communicate with each other

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

[CC 1753.1] To identify and describe various web services technologies like WSDL, UDDI, SOAP

[CC 1753.2] To practice xml technology and message passing

[CC 1753.3] To identify various web service models and messaging techniques

[CC 1753.4] To summarize SOA design implementation and managing SOA environment

[CC 1753.5] To evaluate and identify suitable service for a business model.

[CC 1753.6] To design and develop web service models using beans and spring framework

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

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

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

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

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

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

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

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

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

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

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

[PSO.1] Imbibe the basic concepts and applications of computer-based Communication or networking, information sharing, signal processing, web-based systems, smart devices, and communication technology.

[PSO.2] Investigate prominent areas in the field of Computer and Communication Engineering to provide feasible solutions.

[PSO.3] Apply the contextual knowledge in the field of Computing and Communication to assess social, health, safety, and security issues relevant to the professional engineering practice.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	15
	Sessional Exam II (Closed Book)	15
	In class Quizzes and/or Assignments , Activity feedbacks (Accumulated and Averaged)	30
End Term Exam (Summative)	End Term Exam (Open Handwritten Notes)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	
Homework/ Home Assignment/ Activity Assignment (Formative)	There are situations where a student may have to work at home, especially before a flipped classroom. Although these works are not graded with marks. However, a student is expected to participate and perform these assignments with full zeal since the activity/ flipped classroom participation by a student will be assessed and marks will be awarded.	

E. SYLLABUS

Evolution and Emergence of Web Services: Evolution of distributed computing, emergence of Web Services and Service Oriented Architecture (SOA). Introduction to Web Services – The definition of web services, basic operational model of web services, tools and technologies enabling web services, benefits and challenges of using web services;

Web Service Architecture: Web services Architecture and its characteristics, , web services communication, basic steps of implementing web services. Describing Web Services – WSDL introduction, non-functional service description, WSDL1.1 Vs. WSDL 2.0, WSDL document, WSDL elements, WSDL binding, WSDL tools, WSDL

port type, limitations of WSDL; Brief Over View of XML: XML technologies – XML, XML Document structure, XML namespaces, Defining structure in XML, documents, Reuse of XML schemes, Document navigation ,DTD, XSD, XSLT, X-Query-Path Web services technologies - Web services and SOA, WSDL, SOAP, UDDI Standards (WS-*) - Web services and Service- oriented enterprise (SOE), WS-Coordination and WS-Transaction, transformation WS-Security and the Web services security specifications, WS-Reliable Messaging, WSPolicy, WS-Attachments;

SOA Design implementation, Managing SOA Environment: service-oriented design process, design activities, determine services and tasks based on business process model, choosing appropriate standards, articulate architecture, mapping business processes to technology, designing service integration environment (e.g., ESB, registry), implementing SOA, security implementation, implementation of integration patterns, services enablement, quality assurance, impact of changes to services in the SOA lifecycle;

SOAP : Simple Object Access Protocol Inter-application communication and wire protocols, SOAP as a messaging protocol, Structure of a SOAP message, SOAP envelope, Encoding, Service Oriented Architectures, SOA revisited, Service roles in a SOA, Reliable messaging, The enterprise Service Bus, SOA Development Lifecycle, SOAP HTTP binding, SOAP communication model, Error handling in SOAP.

F. REFERENCE BOOKS

1. Coyle, Frank P., "XML, Web services, and the data revolution", 1st Edition, Addison-Wesley,2002..
2. S. Graham "Building web Services with Java", 2nd Edition, Pearson Education, 2004.
3. McGovern, "Java web Services Architecture", 1st Edition, Morgan Kaufmann , 2005.
4. Ethan Cerami, "Web Services Essentials: Distributed Application with XML – RPC, SOAP, UDDI & WSDL", O' Reilly, 2000.
5. Thomas Erl, "Service-Oriented Architecture: A Field Guide to Integrating XML and Web Services", Prentice Hall, 2004.

G. Lecture Plan:

Class Number	Topics	Session Outcome	Mode of Delivery	Corresponding Course Outcome	Mode of Assessing the Outcome
1	Introduction and Course Hand-out briefing	To acquaint and clear teachers expectations and understand student expectations	Lecture	NA	NA
2,3	Introduction to web services	understand web services	Lecture	CO 1	Class Quiz, Mid Term I
4,5	Type of Sevices & difference between distributed system and web services	describe and identify various web service models	Lecture	CO 1	Class Quiz, Mid Term I
6,7	Emergence of Web Services and Service Oriented Architecture (SOA) fundamentals.	understand web services models using SOA	Lecture	CO 1	Class Quiz, Mid Term I
8	QoS, Web service interportability, SLA.	describe and identify various web service performance parameters	Lecture	CO 2	Class Quiz, Mid Term I, End Term

9,10,11	Distributed computing Infrastructure and communication models.	distinguish between distributed model and web services.	Lecture	CO 2	Class Quiz	Mid Term I	End Term
12,13	Brief Over View of XML: XML technologies	learn and design XML messages	Lecture	CO 2	Class Quiz	Mid Term I	
14,15	XML DTD & XSD	design XML using XSD	Lecture	CO 2	Class Quiz	Mid Term I	End Term
16,17	SOAP Protocol, communication protocol.	learn SOAP messaging protocol for web services	Lecture	CO 2	Class Quiz	Mid Term I	
18,19	SOAP Message Structure, SOAP encoding	learn SOAP messaging protocol design and architecture	Lecture	CO 2	Class Quiz	Mid Term II	End Term
20	Describing web services	understand need of WSDL in web services	Lecture	CO 2	Class Quiz	Mid Term II	
21	WSDL services	learn WSDL protocol and its design	Lecture	CO 3	Class Quiz	Mid Term II	
22	WSDL binding.	understand WSDL binding with soap protocol	Lecture	CO 3	Class Quiz	Mid Term II	
23,24	Register and discovery services	learn various phases of deploying web services.	Lecture	CO 3	Class Quiz	Mid Term II	
25,26	WSDL to UDDI, maping & services.	learn UDDI protocol	Lecture	CO 4	Class Quiz	Mid Term II	
27-28	SOA, service composition	explain the complete layered architecture of web services.	Lecture	CO 4	Class Quiz	Mid Term II	
29-30	WS- BPEL process	learn and design business models in web services	Lecture	CO 4	Class Quiz	Mid Term II	End Term
31-32	Service Transactions, distributed transaction, nected transactions	design service transaction in SOAP	Lecture	CO 4	Class Quiz	Mid Term II	
33	SOAP Scurity policies	understand need of security in services	Lecture	CO 4	Class Quiz		End Term
34-35	xml secuity standards	understand ways to implement security in XML	Lecture	CO 5	Class Quiz		End Term
36-37	service policies	understand various service policies	Lecture	CO 5	Class Quiz		End Term

38	Service transactions	describe transactions in web services and rollback	Lecture	CO 5	Class Quiz End Term
39-40	EJB service architecture, Beans model	to design and deploy EJB based web services and its various model	Lecture	CO 6	Class Quiz End Term
41-42	REST protocol	Design and deploy RESTful services on HTTP	Lecture	CO 6	Class Quiz End Term

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

CO	STATEMENT	Correlation with Program Outcomes **(POs)**											Correlation with Program Specific Outcomes (**PSOs**)		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
[CC1753.1]	To identify and describe various web services technologies like WSDL, UDDI, SOAP	**2**		**2**	**2**								**2**	**1**		
[CC1753.2]	To practice xml technology and message passing	**2**			**3**								**2**		**1**	
[CC1753.3]	To identify various web service models and messaging techniques	**2**		**1**		**3**							**2**	**2**		
[CC1753.4]	To summarize SOA design implementation and managing SOA environment	**3**	**1**	**3**									**2**	**3**		
[CC1753.5]	To evaluate and identify suitable service for a business model.	**3**		**3**	**2**								**3**	**3**		**3**
[CC1753.6]	To design and develop web service models using beans and spring framework	**3**		**3**		**3**							**1**	**1**		**2**

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Department of Computer and Communication
Course Hand-out

Software Testing | CC 1754 | 3 Credits | 3 0 0 3

Session: Aug 21 to Nov 21| Faculty: Dr. Arjun Singh | Class: Departmental Elective Course

A. Introduction: This course presents the knowledge about Testing background such introduction of Bug, cause of Bug, how it effects on cost of project, role of STLC cycle realities of software testing. This subject also gives the knowledge software testing fundamentals, under the study of types of testing this subject enlighten the Configuration testing, Compatibility testing, Foreign language testing, Usability testing, Testing the documentation, testing for software security, Web site testing and more.

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

[1754.1]. Identify the various software testing issues and solutions in software unit test; integration, regression, and system testing.

[1754.2]. Examine the test project, design test cases and data, conduct testing operations, manage software problems and defects, generate a testing report.

[1754.3]. Illustrate advanced software testing topics, such as object-oriented software testing methods, and component-based software testing issues, challenges, and solutions

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

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

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

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

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

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

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

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

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

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

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

[PSO.1]. Imbibe the basic concepts and applications of computer-based Communication or networking, information sharing, signal processing, web-based systems, smart devices, and communication technology.

[PSO.2]. Investigate prominent areas in the field of Computer and Communication Engineering to provide feasible solutions**.**

[**PSO.3].** Apply the contextual knowledge in the field of Computing and Communication to assess social, health, safety, and security issues relevant to the professional engineering practice.

D. Assessment Plan:

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

E. SYLLABUS

Pre-requisite (Software Engineering)

Syllabus:

Software Metrics: Definition, categories of Metrics, Token Count, Data Structure Metrics, Informational Flow Metrics, Object Oriented Metrics, Project Metrics, Metrics Analysis; Case Study on Metrics ; **Software Reliability**: Basic concept, Failures and Faults, Reliability Models- Basic Execution Time Model, Logarithmic Poisson Execution Time Model, Calendar Time component, The Jelinski-Moranda Model. Reliability Metrics, Case Study on Reliability; **Software Testing**: Introduction to software Testing, Principle of Testing, Type of Testing, Verification, Validation Model, Test Oracle, Handling Defects, Defect Life Cycle, Testing Methods: Whilte Box (Structural) Testing, Black Box (Functional) Testing, Non-functional Testing, Testing in Object Oriented Systems, Test Management, Test Automation, Case Study on software testing.

F. Reference Books:

1. S. Desikan, G. Ramesh*, "Software Testing: Principles and Practices",* Pearson Education, 2006.
2. A. P. Mathur*, "Fundamentals of Software Testing",* Pearson Education, 2008.
3. K. K. Aggarwal, Y. Singh, "*Software Engineering*", Third Edition, New Age International Publication, 2008.
4. R. Mall,*" Fundamentals of Software Engineering"*, PHI, India 2004

G. Lecture Plan:

LEC NO	TOPICS	Session Outcomes	Mode of Delivery	Corresponding CO	Mode Of Assessing CO
1.	Basics of software testing: Introduction to software Testing, Testing and debugging,	Discuss the Basics of software testing	Lecture	CC 1754.1	Mid Term I, Quiz I
2.	Data Structure Metrics, Informational Flow Metrics	Discuss the various parameters of software	Lecture	CC 1754.1	Mid Term I, Quiz & End Term
3.	Verification, Validation and Testing,	To Learn about software validity	Lecture	CC 1754.1 and CC 1754.5	Mid Term I, Quiz & End Term
4.	Object Oriented Metrics	Discuss the types	Lecture	CC 1754.1	Mid Term I, Quiz & End Term
5.	Project Metrics	Discuss the defects	Lecture	CC 1754.1 and CC 1754.5	Mid Term I, Quiz & End Term
6.	Case Study on Metrics:	Demonstrate the testing techniques	Lecture	CC 1754.2	Mid Term I, Quiz & End Term
7.	Software Reliability: Basic concept, Failures and Faults, Reliability	Demonstrate the testing techniques	Lecture	CC 1754.2	Mid Term I, Quiz & End Term
8.	Models- Basic Execution Time Model	Demonstrate the testing techniques	Lecture	CC 1754.2	Mid Term I, Quiz & End Term
9.	Logarithmic Poisson Execution Time Model,	Demonstrate the testing techniques	Lecture	CC 1754.2	Mid Term I, Quiz & End Term
10.	Calendar Time component, The Jelinski-Moranda Model	Demonstrate the testing techniques	Lecture	CC 1754.2	Mid Term I, Quiz & End Term
11.	Reliability Metrics, Case Study on Reliability;	Discuss the graph metrics	Lecture	CC 1754.2	Mid Term I, Quiz & End Term
12.	Path testing,	Demonstrate the data flow graph and testing	Lecture	CC 1754.1	Mid Term I, Quiz & End Term
13.	Path testing,	Demonstrate the about functional testing	Lecture	CC 1754.3	Mid Term I, Quiz & End Term
14.	DD-Paths,	Demonstrate the boundary values	Lecture	CC 1754.1	Mid Term I, Quiz & End Term
15.	Cyclomatic Complexity,	Demonstrate the equivalence classes in software	Lecture	CC 1754.2	Mid Term I, Quiz & End Term

16.	Graph Metrics,	Demonstrate the n and identification of decision table	Lecture	CC 1754.2	Mid Term I, Quiz & End Term
17.	Cause Effect Graphing Technique	Demonstrate the graphing techniques	Lecture	CC 1754.2	Mid Term I, Quiz & End Term
18.	Ad hoc Testing;	Discuss and learn Ad hoc testing	Lecture	CC 1754.2	Mid Term I, Quiz & End Term
19.	Top down and Bottom up integration:	Demonstrate the about testing	Lecture	CC 1754.2 and CC 1754.3	Mid Term II, Quiz & End Term
20.	Bi-directional integration,	Demonstrate the bidirectional integration	Lecture	CC 1754.2	Mid Term II, Quiz & End Term
21.	System integration,	Demonstrate the system testing	Lecture	CC 1754.3	Mid Term II, Quiz & End Term
22.	Scenario Testing,	Demonstrate the scenario testing	Lecture	CC 1754.3	Mid Term II, Quiz & End Term
23.	Defect Bash,	Demonstrate the identify defect	Lecture	CC 1754.3	Mid Term II, Quiz & End Term
24.	Design/Archiecture verification,	Demonstrate the identify defect architecture	Lecture	CC 1754.3	Mid Term II, Quiz & End Term
25.	Deployment testing,	Demonstrate the testing techniques	Lecture	CC 1754.3 and CC 1754.2	Mid Term II, Quiz & End Term
26.	Beta testing,	Demonstrate the testing techniques	Lecture	CC 1754.3	Mid Term II, Quiz & End Term
27.	Scalability testing,	Demonstrate the testing techniques	Lecture	CC 1754.3	Mid Term II, Quiz & End Term
28.	Reliability testing,	Demonstrate the testing techniques	Lecture	CC 1754.1	Mid Term II, Quiz & End Term
29.	Stress testing;	Demonstrate the testing techniques	Lecture	CC 1754.3	Mid Term II, Quiz & End Term
30.	Acceptance testing;	Demonstrate the testing techniques	Lecture	CC 1754.3 and CC 1754.1	Mid Term II, Quiz & End Term
31.	Regression testing,	Demonstrate the testing techniques	Lecture	CC 1754.4 and CC 1754.3	Mid Term II, Quiz & End Term
32.	Test Planning,	Demonstrate the testing techniques	Lecture	CC 1754.4 and CC 1754.5	Mid Term II, Quiz & End Term
33.	Software Test Automation: Scope of automation,	Demonstrate the testing techniques	Lecture	CC 1754.4 and CC 1754.5	Mid Term II, Quiz & End Term
34.	Design & Architecture for automation,	Demonstrate the testing techniques	Lecture	CC 1754.4 and CC 1754.2	Mid Term II, Quiz & End Term
35.	Design & Architecture for automation,	Demonstrate the testing techniques	Lecture	CC 1754.2 and CC 1754.4	Mid Term II, Quiz & End Term

36.	Generic requirements for test tool framework,	Demonstrate the testing techniques	Lecture	IT 1754.4	Mid Term II, Quiz & End Term
37.	Test tool selection,	Demonstrate the testing techniques	Lecture	CC 1754.1 and CC 1754.2	Mid Term II, Quiz & End Term
38.	Testing in Object Oriented Systems,	Demonstrate the testing techniques	Lecture	CC 1754.5 and CC 1754.6	Mid Term II, Quiz & End Term
39.	Case Study on software testing;	Discuss case study	Lecture	CC 1754.5 and CC 1754.6	Quiz & End Term
40.	Advanced Topics on Testing:.	Discuss advanced topics	Lecture	CC 1754.1 and CC 1754.3	Quiz & End Term
41.	Functional and Non-Functional	Demonstrate the testing techniques	Lecture	CC 1754.4	Quiz & End Term
42.	Testing, Priotizing the Test cases,	Demonstrate the testing techniques	Lecture	CC 1754.4 and CC 1754.6	Quiz & End Term
43.	Testing Web Applications,	Demonstrate the testing techniques	Lecture	CC 1754.6	Quiz & End Term
44.	Testing Web Applications,	Demonstrate the testing techniques	Lecture	CC 1754.4 and CC 1754.	Quiz & End Term
45.	Testing Off-the-shelf component, ,	Demonstrate the testing techniques	Lecture	CC 1754.5	Quiz & End Term
46.	Testing security,	Demonstrate the testing techniques	Lecture	IT 1754.6	Quiz & End Term
47.	Testing Data warehouse	Discuss testing warehouses	Lecture	CC 1754.6	Quiz & End Term
48.	Revision Class-I	Discussion	Lecture	CC 1754.6	Quiz & End Term
49.	Revision Class-II	Discussion	Lecture	CC 1754.5 and CC 1754.6	Quiz & End Term

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

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
[CC 1754.1]	Demonstrate the various software testing issues and solutions in software unit test; integration, regression, and system testing.	2			2	3								1		
[CC 1754.2]	Examine the test project, design test cases and data, conduct testing operations, manage software problems and defects, generate a testing report.		2		3	2							1		1	1
[CC 1754.3]	Illustrate advanced software testing topics, such as object-oriented software testing methods, and component-based software testing issues, challenges, and solutions	2	3	2		1	1			1	1			1	1	

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and IT

Department of Computer and Communication Engineering
Course Hand-out

Wireless Sensors and Adhoc Networks | **CC1755** | 3 Credits | 3 0 0 3
Session: Aug 2021 – Dec 2021 | Faculty: Dr. Gulrej Ahmed Class: VII Semester (Department Elective)

A. Introduction: This course is offered by department of Computer and Communication Engineering for seventh semester students as department elective course. The core objective of this course is to make the students understand the concepts of Ad Hoc Networks as well as Wireless Sensor Networks (WSN), their characteristics, novel applications, and technical challenges. The prerequisites are to have basic understanding of infrastructure networks, basic protocols used on computer networking.

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

[1755.1]. Analyse the concept of wireless ad hoc networks and specialized ad hoc networks like sensor networks.
[1755.2]. Understand different categories of routing protocols in ad hoc networks and main design issues.
[1755.3]. Analyse design issues of Wireless sensor networks such as Energy consumption, Clustering of Sensors, QoS and applications.
[1755.4]. Describe the basic concepts of MAC layer, routing layer and high level application layer in WSN.
[1755.5]. Illustrate Security issues in wireless ad hoc networks, cooperation in MANETs, Intrusion detection systems.

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 processesthat 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 toolsincluding prediction and modeling to complex engineering activities with an understanding of the limitations

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

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

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

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

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

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

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

D. Program Specific Outcomes (PSOs)

[PSO.1] Imbibe the basic concepts and applications of computer-based Communication or networking, information sharing, signal processing, web-based systems, smart devices, and communication technology.

[PSO.2] Investigate prominent areas in the field of Computer and Communication Engineering to provide feasible solutions.

[PSO.3] Apply the contextual knowledge in the field of computing and communication to assess social, health, safety and cultural issues and endure the consequent responsibilities relevant to the professional engineering practice.

E. Assessment Plan:

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

F. SYLLABUS

Introduction to Ad Hoc Wireless Networks: Characteristics of Mobile Ad-hoc Networks (MANETs), Applications of MANETs, Challenges; **Routing in MANETs:** Topology-based versus Position-based approaches, Topology based routing protocols, Position based routing, Other Routing Protocols; **Data Transmission in MANETs, TCP over Ad Hoc Networks. Basics of Wireless Sensors and Applications:** Design issues, Energy consumption, Clustering of Sensors, Applications; **Data Retrieval in Sensor Networks:** Classification of WSNs, MAC layer, Routing layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs; **Security:** Security in Ad hoc Wireless Networks, Key Management, Secure Routing, Cooperation in MANETs, Intrusion Detection Systems; **Sensor Network Platforms and Tools:** Sensor Network Hardware, Sensor Network Programming Challenges, Node-Level Software Platforms.

G. TEXT BOOKS

T1. C.S.R. Murthy, B.S. Manoj, *"Adhoc Wireless Networks — Architectures and Protocols"*, 1st Edition, Pearson Education, 2006.

T2. C. M. Cordeiro, D. P. Aggarwal, *"Ad Hoc and Sensor Networks — Theory and Applications"*, 2nd Edition, World Scientific Publications, 2011

H. REFERENCE BOOKS

R1. F. Zhao,L. Guibas, "Wireless Sensor Networks: An Information Processing Approach", 1st Edition, Morgan Kauffman Publishers, 2004

R2. F. Hu,X. Cao, "Wireless Sensor Networks — Principles and Practice", An Auerbach Publications, CRC Press, Taylor & Francis Group, 2010.

R3. C.E. Perkins, "Ad hoc Networking", Addison-Wesley, 2008.

Lecture Plan:

Lecture No.	Major Topics	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode Of Assessing CO
1.	**Introduction to Ad Hoc Wireless Networks**	Introduction and Course Hand-out briefing	To acquaint and clear teachers expectations and understand student expectations	Lecture	**NA**	NA
2.		Introduction to basic of Ad Hoc Network	To acquaint infrasture-based and infrastructure-less network and fundamental concepts used in ad hoc networks	Lecture	**1755.1**	Mid Term I, Quiz & End Term
3.		Characteristics and Applications of MANETs	Describe the need of MANET, its characteristics and different applications of MANET and finding different scenarios of its applicability	Lecture	**1755.1**	Mid Term I, Quiz & End Term
4.		Challenges in Ad Hoc Networks	Identify different design issues of ad hoc networks in realistic environment	Lecture	**1755.1**	Mid Term I, Quiz & End Term
5.		Data Transmission in MANETs	Describe the process of data transmission in MANETs	Lecture	**1755.1**	Mid Term I, Quiz & End Term
6.	**Routing in MANETs**	Issues in Designing routing Protocols	Illustrate different design issues in routing of Ad hoc networks	Lecture	**1755.2**	Mid Term I, Quiz & End Term
7.		Classification of Routing Protocols	Describe various parameters for classification of routing protocols	Lecture	**1755.2**	Mid Term I, Quiz & End Term
8.		Distance vector and Link state routing protocols	Recall distance vector and link state routing protocols and their applications	Flipped Class	**1755.2**	Mid Term I, Quiz & End Term
9.		Destination Sequenced distance vector routing protocol	Describe Destination Sequenced distance vector routing protocol	Lecture	**1755.2**	Mid Term I, Quiz & End Term
10.		Destination Sequenced distance vector routing protocol	Describe working and applications of DSDV	Lecture	**1755.2**	Mid Term I, Quiz & End Term
11.		Wireless routing protocol, Cluster-head	Describe WRP and CGSR routing and applicability in real world	Lecture	**1755.2**	Mid Term I, Quiz & End Term

		gateway switch routing protocol				
12.		On demand routing protocols	Recall on-demand routing protocols and its advantages over table-driven routing protocols	Flipped Class	**1755.2**	Mid Term I, Quiz & End Term
13.		Dynamic source routing protocol	Describe DSR routing protocol and its working and advantages	Lecture	**1755.2**	Mid Term I, Quiz & End Term
14.		Ad hoc on demand distance vector routing protocol	Describe AODV routing protocol and its working and advantages	Lecture	**1755.2**	Mid Term I, Quiz & End Term
15.		Location-aided routing	Describe LAR routing protocol and its working and advantages	Lecture	**1755.2**	Mid Term I, Quiz & End Term
16.		Hybrid routing protocols, Zone routing protocol	Describe Hybrid routing protocol and its working and advantages. Illustrate the trade-off among all routing protocols in realistic environment	Lecture	**1755.2**	Mid Term I, Quiz & End Term
17.	**TCP over Ad Hoc Networks**	Transport layer Design issues for Ad Hoc Networks	Describe different design issues at transport layer in ad hoc networks	Lecture	**1755.4& 1755.6**	Mid Term I, Quiz & End Term
18.		Transport layer Goals for Ad Hoc Networks	Describe design goals of transport layer protocol for ad hoc wireless networks.	Lecture	**1755.4& 1755.6**	Mid Term I, Quiz & End Term
19.		TCP performance in Ad Hoc	Revisit to traditional TCP and recount the performance of traditional TCP protocols in wireless ad hoc networks	Lecture	**1755.4& 1755.6**	Mid Term I, Quiz & End Term
20.		Feedback based TCP	Describe Feedback based TCP	Lecture	**1755.4& 1755.6**	Mid Term II, Quiz & End Term
21.		TCP –BUS , Ad Hoc TCP	Describe TCP- BUS, Ad Hoc TCP and compare with traditional TCP	Lecture	**1755.4& 1755.6**	Mid Term II, Quiz & End Term
22.		Ad Hoc TCP , Split TCP	Describe Split TCP and compare with traditional TCP	Lecture	**1755.4& 1755.6**	Mid Term II, Quiz & End Term
23.		Comparative study of various protocols	Analyse various transport layer protocols in Ad hoc environment	Flipped Class	**1755.4& 1755.6**	Mid Term II, Quiz & End Term

24.		Other Transport layer Protocols	Trade-off study of various protocols at transport layer	Activity	**1755.4& 1755.6**	Mid Term II, Quiz & End Term
25.	**Security**	Issues and challenges in Security of Ad Hoc Networks	Describe the need of security in ad hoc networks due to its unique characteristics	Lecture	**1755.5**	Mid Term II, Quiz & End Term
26.		Security attacks	Describe issues and challenges in security provisioning in wireless ad hoc networks	Flipped Class	**1755.5**	Mid Term II, Quiz & End Term
27.		Key Management algorithms	Describe symmetric and Asymmetric kay algorithms	Lecture	**1755.5**	Mid Term II, Quiz & End Term
28.		Key Management approaches in Ad Hoc Networks	Describe various key management approaches used in Wireless Ad Hoc Networks	Lecture	**1755.5**	Mid Term II, Quiz & End Term
29.		Secure Routing	Describe the requirement of secure routing protocol for ad hoc network and elaborate security versions of studied routing protocols	Lecture	**1755.5**	Mid Term II, Quiz & End Term
30.		Cooperation in MANET	Describe the need of cooperation in security provisioning of mobile ad hoc networks	Lecture	**1755.5**	Mid Term II, Quiz & End Term
31.		Intrusion Detection System	Describe intrusion detection system for Ad hoc networks	Lecture	**1755.5**	Mid Term II, Quiz & End Term
32.	**Basics of Wireless Sensors and Applications**	Design issues, Clustering of Sensors	Describe different design issues and challenges of wireless sensor network	Lecture	**1755.3 & 1755.6**	Quiz & End Term
33.		Clustering of Sensors	Describe clustered architecture of wireless sensor network	Lecture	**1755.3 & 1755.6**	Quiz & End Term
34.		Energy consumption	Describe small minimum energy communication network	Lecture	**1755.3 & 1755.6**	Quiz & End Term
35.		Applications	Describe various applications of wireless sensor network	Lecture	**1755.3 & 1755.6**	Quiz & End Term
36.	**Data Retrieval in Sensor Networks**	Classification of WSNs	Classify Wireless Sensor Networks based on various parameters	Flipped Class	**1755.3 & 1755.6**	Quiz & End Term
37.		MAC layer, Routing layer	Describe MAC and routing layer design issues of Wireless Sensor Networks	Lecture	**1755.3 & 1755.6**	Quiz & End Term

38.		High-level application layer support	Describe application layer architecture of WSN	Lecture	**1755.3 & 1755.6**	Quiz & End Term
39.		Adapting to the inherent dynamic nature of WSNs	Identify the impact of different parameters on solutions designed for WSN	Lecture	**1755.3 & 1755.6**	Quiz & End Term
40.	**Sensor Network Platforms and Tools**	Sensor Network Hardware	Identify the hardware components required for WSN and their characteristics	Lecture	**1755.3 & 1755.6**	Quiz & End Term
41.		Sensor Network Programming Challenges, Node-Level Software Platforms.	Build solutions in WSN using node level software platforms	Lecture	**1755.3 & 1755.6**	Quiz & End Term

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
CC 1755.1	Analyse the concept of wireless ad hoc networks and specialized ad hoc networks like sensor networks.	2	1										1	2		
CC 1755.2	Understand different categories of routing protocols in ad hoc networks and main design issues	3	2										1		2	
CC 1755.3	Analyze design issues of Wireless sensor networks such as Energy consumption, Clustering of Sensors, QoS and applications.	2	2	1		3							1	1		1
CC 1755.4	Describe the basic concepts of MAC layer, routing layer and high level application layer in WSN.	3	2			3							2			1
CC 1755.5	Illustrate Security issues in wireless ad hoc networks, cooperation in MANETs, Intrusion detection systems.	3	2	1									2	1	1	1

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

J. Course Outcome Attainment Level Matrix:

CO	STATEMENT	ATTAINMENT OF PROGRAM OUTCOMES **THRESHOLD VALUE: 40%**											ATTAINMENT OF PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CC 1755.1	Analyse the concept of wireless ad hoc networks and specialized ad hoc networks like sensor networks.															
CC 1755.2	Understand different categories of routing protocols in ad hoc networks and main design issues															
CC 1755.3	Analyze design issues of Wireless sensor networks such as Energy consumption, Clustering of Sensors, QoS and applications.															
CC 1755.4	Describe the basic concepts of MAC layer, routing layer and high level application layer in WSN.															
CC 1755.5	Illustrate Security issues in wireless ad hoc networks, cooperation in MANETs, Intrusion detection systems.															

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

MANIPAL UNIVERSITY JAIPUR

School of COMPUTING & INFORMATION TECHNOLOGY

DEPARTMENT OF COMPUTER AND COMMUNICATION ENGG

Course Hand-out

HUMAN-COMPUTER INTERACTION| CC1756 | Credits [3 0 0 3]

Session: Aug-21 -Nov 21 | Faculty: Dr Saurabh Singh, Dr. Nirmal Gupta, Ms. Swati Shrivastav | Class VII SEM

A. **Introduction:** This course is offered by the Department of computer and communication engineering as a theory subject for students to get familiarize students with an introduction to human-computer interactions. HCI is an interdisciplinary field that assimilates theories and methodologies from computer science, design, cognitive psychology and many other areas. The overall goal is to make students learn user-centered design by learning the fundamentals of human-computer interactions.

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

[CC 1756.1] Define the design principle, standard and guidelines to create human-centered systems

[CC 1756.2] discuss and develop typical human-computer interaction (HCI) models and styles

[CC 1756.3] device and plan interface design through critical assessment and solutions.

[CC 1756.4] identify the current research and development in the field of HCI

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

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

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

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

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

[PO.7]. Environment and sustainability: The zero effect and zero defect is not just a slogan, it is to be practised in each action. Thus a B Tech CCE should understand the impact of the

professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

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

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

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

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

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

D. Program Specific Outcomes (PSOs)

[PSO.1] Imbibe the basic concepts and applications of computer-based Communication or networking, information sharing, signal processing, web-based systems, smart devices, and communication technology.

[PSO.2] Investigate prominent areas in the field of Computer and Communication Engineering to provide feasible solutions.

[PSO.3] Apply the contextual knowledge in the field of Computing and Communication to assess social, health, safety, and security issues relevant to the professional engineering practice.

E. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Closed Book)	15
	Sessional Exam II (Closed Book)	15
	In class Quizzes (Accumulated and Averaged)	20
	Assignments/video assignment	10
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.	

F. SYLLABUS

Introduction, Human Perception and Cognition, Designing an HCI System, Methodology for designing user-computer interfaces, Prototyping user interfaces, Guidelines for designing user interfaces, Implementing and Evaluating an HCI System; User experience levels, Styles, tasks, techniques, and devices, Testing and evaluation of interfaces, Hypothesis testing, Statistical analysis, models and theories, visual performance and graphics design, online documentation and help systems, HCI and the World Wide Web, Human Information Processing; Designing to fit human capabilities; Groupware, ubiquitous computing, collaborative systems, groupware, and coordination technology, Research Trends in HumanComputer Interaction; Voice, Gesture, Wearable and mobile, tactile and non-tactile interfaces, Concepts of Virtual and Augmented Reality, Models for Dynamic Learning in HCI; Bayesian Networks, Hidden Markov Model.

G. Reference Books

Text Book(s):

1. B. Shneiderman, C. Plaisant, "Designing the User Interface: Strategies for Effective Human-Computer Interaction", Addison-Wesley, 6th Edition, 2017.
2. J. Preece, H. Sharp, Y. Rogers, "Interaction Design: Beyond Human-Computer Interaction", John Wiley & Sons, 4th Edition, 2015.
3. T.M. Mitchell, "Machine learning", McGraw-Hill India, 2014.

Reference(s):

1. A. Dix, J. Finlay, G. Abowd,R. Beale, "Human Computer Interaction", Pearson Education, 3rd Edition, 2004.
2. J. M. Carroll, "HCI Models, Theories, and Frameworks: Toward a Multidisciplinary Science", Elsevier, 1st Edition, 2003.
3. R. Duda, P. Hart, D. Stork, "Pattern Classification", John Willey and Sons, 2nd Edition, 2001.

H. Lecture Plan

Class Number	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1.	**Introduction overall**	**Expecation and learning from the subject**	Lecture		
2.	Introduction	To understand human in terms of HCI	Lecture	1756.1	In Class Quiz Home Assignment Mid Term I End Term
3	Introduction	To understand Computers in terms of HCI	Lecture	1756.1	In Class Quiz Home Assignment Mid Term I End Term
4	Introduction	To understand interaction between Human and Computer	Lecture	1756.1	In Class Quiz Home Assignment Mid Term I End Term
5	Human Perception and Cognition	Study human perception and cognitive models and issues	Lecture	1756.1	In Class Quiz Home Assignment Mid Term I End Term
6-8	Designing an HCI System, Guidelines for designing user interfaces	Introduce with HCI designing principles and basics .	Lecture, Practice questions	1756.2	In Class Quiz Home Assignment Mid Term I End Term
9-10	Methodology for designing user-computer interface	User centered design and GUI	Lecture, Practice questions	1756.2	In Class Quiz Home Assignment Mid Term I End Term
11-12	Prototyping user interfaces	To understand need and usage of various type of prototypes available	Lecture,	1756.2	In Class Quiz Home

					Assignment Mid Term I End Term
13-14	Implementing and Evaluating an HCI System	Understanding different interactive models for s/w development and determine why, what, where and when evaluation. Types of evaluation etc	Lecture, Case study	1756.3	In Class Quiz Home Assignment Mid Term I End Term
		1st Sessional Exam			
15-16	Implementing and Evaluating an HCI System	Evaluation strategies and issues	Lecture,	1756.3	In Class Quiz Home Assignment Mid Term II End Term
17-18	User experience levels, Styles, tasks,	To understand user models and involvement in the interaction process and also to analyze styles available and task perform by user	Lecture, Flipped class room	1756.2	In Class Quiz Home Assignment Mid Term II End Term
19	techniques, and devices	To study and compare techniques and devices available for interactions	Lecture	1756.2	In Class Quiz Home Assignment Mid Term II End Term
20	Testing and evaluation of interfaces	To understand various testing technique and evaluation techniques	Lecture	1756.3	In Class Quiz Home Assignment Mid Term II End Term
21	Hypothesis testing	Forming hypothesis and comparing	Lecture	1756.3	In Class Quiz Home Assignment Mid Term II End Term
22	Statistical analysis	To learn and compute imperical method to evaluate interface designs	Lecture, Question	1756.3	In Class Quiz Home Assignment Mid Term II End Term
23	models and theories	To understand models and theories of interactions. Such as communication	Lecture	1756.2	In Class Quiz Home Assignment Mid Term II End Term
24	visual performance and graphics design	Evaluating and caompare visual interaction and design	Lecture	1756.2,1756.3	In Class Quiz Home Assignment Mid Term II End Term
25	online documentation and help systems	To understand the need and implementation od documentation and manual	Lecture	1756.2	In Class Quiz Home

		system for users			Assignment Mid Term II End Term
26	HCI and the World Wide Web	To discover and improve human effective interaction with www	Lecture	1756.2	In Class Quiz Home Assignment Mid Term II End Term
27	Human Information Processing	To understand the information retrieval and processing interaction	Lecture	1756.2	In Class Quiz Home Assignment Mid Term II End Term
28	Designing to fit human capabilities;	Associate synching of human cognition with computers	Lecture, Case studies	1756.2,1756.3	In Class Quiz Home Assignment Mid Term II End Term
29	Groupware, ubiquitous computing, collaborative systems, groupware, and coordination technology,	To understand the interaction designs and basics for groupware and any computing device	Lecture	1756.3	In Class Quiz Home Assignment Mid Term II End Term
2nd Sessional Exam					
30	Research Trends in HumanComputer Interaction;.	Analyze various research area and probable future of HCI	Lecture, Case studies	1756.4	In Class Quiz Home Assignment End Term
32	Voice, Gesture, Wearable and mobile, tactile and non-tactile interfaces,	Analyze HCI in various hand-held computing devices.	Lecture	1756.3,1756.4	In Class Quiz Home Assignment End Term
33	Concepts of Virtual and Augmented Reality,	Understanding the application of HCI in virtual and augmented reality. Analyze replacement of physical world by virtual world	Lecture	1756.3,1756.4	In Class Quiz Home Assignment End Term
34	Models for Dynamic Learning in HCI;	To understand feedback and learning inclusions with interaction	Lecture	1756.2	In Class Quiz Home Assignment End Term
35	Bayesian Networks,	To implement and understand directed acyclic graph to evaluate the dependencies	Lecture	1756.3,1756.4	In Class Quiz Home Assignment End Term
36	Hidden Markov Model	Usage and purpose of hidden Markov Model for HCI. And Understanding what is it.	Lecture, Practise questions	1756.3,1756.4	In Class Quiz Home Assignment End Term
END TERM EXAM					

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

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												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
[CC1756.1]:	**Define the design principle, standard and guidelines to create human-centered systems**	2		1							1		1	**1**	2	1
[CC1756.2]:	**discuss and develop typical human-computer interaction (HCI) models and styles**	3	2	1								3		2	1	1
[CC1756.3]:	**device and plan interface design through critical assessment and solutions.**	3	2	1	1					1		1		2	3	**3**
[CC1756.4]:	**identify the current research and development in the field of HCI**	1	2	2	1	1	1		1	2	1	1		3	2	2

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

MANIPAL UNIVERSITY JAIPUR

SCHOOL OF COMPUTING & INFORMATION TECHNOLOGY

DEPARTMENT OF COMPUTER & COMMUNICATION ENGG.
COURSE HAND-OUT

NETWORK SECURITY LAB || CC1730|| 1 Credits|| [0 0 2 1]
Session: JULY-NOV-2021 | Faculty NAME: Dr.Arjun Singh & Mr. Gaurav Prasad|| CORE

A. Introduction:

This course is meant to offer to computer & communication engineering undergraduate students in their seventh semester to have a broad overview of the field of security. Students will learn the basic concepts in security like security attacks, scanning, analysis and defence, networking and wireless security with cryptography. Students will also learn the fundamental methodology for how to design and analyse security critical systems.

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

[CC1730.1]:	Identify basic factors driving the need for network security and identify physical points of vulnerability in simple networks
[CC1730.2]:	Identify and perform experiments on different security related algorithms and techniques.
[CC1730.3]:	Use of software tools for performing scanning, vulnerability analysis, attack and to mitigate the attacks.
[CC1730.4]:	To identify the depth of the problem and to propose the solution.

C PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

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

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

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

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

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

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

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

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

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

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

Program Specific Outcomes (PSOs)

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

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

[PSO.2] Investigate problematic areas prevalent in the field of Computer and Communication Engineering to find acceptable solutions.

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

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

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Weekly evaluation (record+execution+viva)	30
	Project	40
End Term Exam (Summative)	End Term Exam	30
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

E. SYLLABUS

Implementation of Symmetric Key Algorithms: SDES, DES, AES; Implementation of Asymmetric Key Algorithms: RSA, Elgamal; Implementation of Key Management Algorithms: Diffie Helman, Certification Authority; Implementation of Security Protocols: Mutual Authentication, Digital Signature, Hash Functions, MAC; Open Source Security Tools: Wireshark, Ethercap, Penetration Testing tools; Mini project Implementation.

F TEXT BOOK

T1. W. Stallings, "Cryptography and Network Security Principles and Practice", 6th Edition, Pearson Education, 2014

G REFERENCE

R1. D. Hook, “Beginning Cryptography with Java”, 1st Edition, John Wiley & Sons, 2005.

H . Lecture Plan

Lec No	**Topics**	**Session Outcome**	**Mode of Delivery**	**Corresponding CO**	**Mode of Assessing the Outcome**
1	Introduction and Course Hand-out briefing	To acquaint and clear teachers expectations and understand student expectations	Lecture	NA	NA
2-3	Packet tracer	To identify different Protocols, Analyse packets flowing in real network and also to identify the structure, contents of packets, in the network.	Demonstration	CC1730.1 CC1730.2 CC1730.3	Internal Evaluation
2-6	Cryptographic Algorithms	To implement the Cryptographic Algorithms both Classical /Traditional & Modern	Lecture Demonstration	CC1730.1 CC1730.2 CC1730.3 CC1730.4	Internal Evaluation End Sem Exam
7-11	Security Tool	To install, analyse and perform different attacks using different tools available in Kali Linux	Lecture Demonstration	CC1730.1 CC1730.2 CC1730.3 CC1730.4	Internal Evaluation End Sem Exam
12-14	Firewall	Demonstrate the use of Firewall using iptables	Demonstration	CC1730.1 CC1730.2 CC1730.3 CC1730.4	Internal Evaluation End Sem Exam

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
[CC1730.1]:	Identify basic factors driving the need for network security and identify physical points of vulnerability in simple networks	1		1	1									2		1
[CC1730.2]:	Identify and perform experiments on different security related algorithms and techniques.	1	1	1	1	2									1	
[CC1730.3]:	Use of software tools for performing scanning, vulnerability analysis, attack and to mitigate the attacks.	1	1		1	2								1		1
[CC1730.4]:	To identify the depth of the problem and to propose the solution.	1	1	1	2	2								1	2	2

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

MANIPAL UNIVERSITY JAIPUR

School of Computing and IT

DEPARTMENT OF COMPUTER AND COMMUNICATION ENGINEERING

Course Hand-out

Machine Learning Lab | CC1731 | 1 Credits | 0 0 2 1

Session: Aug 20- Nov 21 | Faculty: Dr Sunil Kumar, Harish Sharma| Class: B Tech CCE VII SEM

A. Introduction: This course is designed to study and design the algorithms that allow computers to automatically learn from data or past experience, how to improve their performance at some tasks (object classification etc). Students will also learn the fundamental methodology for how to design and analyse machine learning systems.

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

[CC1731.1]: Identify the role of Machine Learning in problem solving.

[CC1731.2]: Apply algorithms and techniques focusing on strengths and weaknesses and appropriateness for learning problems.

[CC1731.3]: Make use of Software tools to design, implement, and evaluate Machine Learning algorithms.

[CC1731.4]: Evaluate the performance of machine learning algorithms to design the solution efficiently & effectively.

[CC1731.5]: Design the solution of the real world practical applications using Machine Learning for enhancing the employability prospects.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

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

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

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

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

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

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

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

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

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

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

Program Specific Outcomes (PSOs)

[PSO.1] Imbibe the basic concepts and applications of computer-based Communication or networking, information sharing, signal processing, web-based systems, smart devices, and communication technology.

[PSO.2] Investigate prominent areas in the field of Computer and Communication Engineering to provide feasible solutions.

[PSO.3] Apply the contextual knowledge in the field of Computing and Communication to assess social, health, safety, and security issues relevant to the professional engineering practice.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Formative)	Fortnightly evaluation (Record + execution + viva)	40
	Mini project	30
End Term Exam (Summative)	End Term Exam	30
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

E. SYLLABUS

Implementation of supervised learning Algorithms: Support vector machine, Naïve bayes, linear regression, decision tree, KNN algorithm; Implementation of neural network with basic concepts, with perceptron and with back propagation network; Implementation of unsupervised learning Algorithms: K-mean algorithm; Implementation of deep neural network: Deep Convolutional Neural Network.

F. REFERENCE BOOKS

1. Andres C. Muller, Sarah Guido: Introduction to Machine Learning with Python. O'REILLY, 2016.
2. Aurelien Geron: Hands On Machine Learning with Scikit-Learn & TensorFlow. O'REILLY, 2017.

G. Lab Plan:

	Topics	Session Outcome	Mode of Delivery	Corresponding CO	Mode of Assessing the Outcome
1	Write a program for data cleaning.	How to load a CSV file. How to convert strings from a file to floating point numbers. How to convert class values from a file to integers. How to normalize your data How to standardize your data When to normalize as opposed to standardize data.	Learn by doing	CC1731.1	Internal Evaluation
2-3	Write a program to Implement Machine Learning Algorithm Performance Metrics Write a program to Implement Simple Linear Regression.	How to implement classification accuracy. How to implement and interpret a confusion matrix. How to implement mean absolute error for regression. How to implement root mean squared error for regression. How to estimate statistical quantities from training data. How to estimate linear regression coefficients from data. How to make predictions using linear regression for new data.	Learn by doing	CC1731.2/3/4	Internal Evaluation
4-5	Write a program to implement the Logistic Regression Algorithm.	How to make predictions for multivariate linear regression. How to implement linear regression with stochastic gradient descent to make predictions on new data.	Learn by doing	CC1731.2/3/4	Internal Evaluation Project End Sem Exam
6-7	Write a program to implement the Bayes Classifier.	How to use Bayes Classifier.	Learn by doing	CC1731.2/3/4	Internal Evaluation Project End Sem Exam
8	Write a program to implement Decision Tree Algorithm	How to calculate and evaluate candidate split points in a data. How to arrange splits into a decision tree structure. How to apply the classification and regression tree algorithm to a real problem.	Learn by doing	CC1731.2/3/4	Internal Evaluation Project End Sem Exam
9	Write a program to implement	The implementation will be specific for	Learn by doing	CC1731.2/3/4	Internal

	k-Nearest Neighbors	classification problems and will be demonstrated using the Iris flowers classification problem.			Evaluation Project End Sem Exam
10	Write programs to Implement the Perceptron Algorithm Write a program to implement the Backpropagation Algorithm.	How to implement Neural Networks	Learn by doing	CC1731.2/3/4/5	Internal Evaluation Project End Sem Exam
11	Implement CNN for object classification	Implementing Deep learning	Learn by doing	CC1731.2/3/4/5	Internal Evaluation Project End Sem Exam
12	Write a program to implement k-means algorithm	Implement unsupervised learning	Learn by doing	CC1731.2/3/4/5	Internal Evaluation Project End Sem Exam
End Term Exam					

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

CO	STATEMENT	Correlation with Program Outcomes **(POs)**												Correlation with Program Specific Outcomes (**PSOs**)		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
[CC1731.1]	Identify the role of Machine Learning in problem solving.	2	2	1	2							1	1	3	1	
[CC1731.2]	Apply algorithms and techniques focusing on strengths and weaknesses and appropriateness for learning problems.		1	1	2	2	2		2							2
[CC1731.3]	Make use of Software tools to design, implement, and evaluate Machine Learning algorithms.			2	2	2									2	
[CC1731.4]	Evaluate the performance of machine learning algorithms to design the solution efficiently & effectively.		1	2	1		1	1				1				
[CC1731.5]	Design the solution of the real world practical applications using Machine Learning for enhancing the employability prospects.	2	2	3	2	2		1		2	1	2			2	2

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

MANIPAL UNIVERSITY
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School of Computing and Information Technology

DEPARTMENT OF COMPUTER AND COMMUNICATION ENGG.

Course Hand-out

Major Project | CC1881| 12 Credits | 0 0 24 24

Session: Jan - Jul 2022 | Faculty: Dr. Deepak Sinwar | Class: B. Tech VIII SEM | CORE

A. Introduction:

In this practical course, each student is expected to design and develop practical solutions to real-life problems related to industry, institutions, and computer science research. The project work can be carried out internally at Manipal University Jaipur under the supervision of an internal guide or externally (outside Manipal University Jaipur) under the supervision of an external guide. The software life cycle should be followed during the development. The theoretical knowledge, principles, and practices gained from various subjects would be applied to develop effective solutions to various computing problems. The knowledge gained to work with various software tools, designing tools, programming languages, operating systems, etc. would be utilized in various stages of the project. Structured/ Object Oriented design techniques may be used for the project. Software Requirements Specification (SRS), Modelling Techniques, and Design and Testing strategies would be part of the document of the work. A committee consisting of a minimum of three faculty members (including an internal guide) shall perform an assessment of the major project submitted by the student. A report on the major project would be submitted for evaluation. Project work would be presented and demonstrated before the panel of examiners.

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

[CC1881.1]:	Identify the basics of the concepts related to the selected topic of the project and identify the open issues.
[CC1881.2]:	Determine the depth of the problem and propose a solution.
[CC1881.3]:	Solve real-time problems and contribute to an open community with ethical values by undergoing systematic study and communicating the proposed solution.
[CC1881.4]:	Work in a team with proper contribution from individuals and build the project with lifelong learning.

C PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

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

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

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

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

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

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

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

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

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

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

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

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

Program Specific Outcomes (PSOs)

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

[PSO.1] Imbibe the basic concepts and applications of computer-based Communication or networking, information sharing, signal processing, web-based systems, smart devices, and communication technology.

[PSO.2] Investigate prominent areas in the field of Computer and Communication Engineering to provide feasible solutions.

[PSO.3] Apply the contextual knowledge in the field of Computing and Communication to assess social, health, safety, and security issues relevant to the professional engineering practice.

D. Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Synopsis	10
	Mid-Term Progress-I	20
	Mid-Term Progress-II (Faculty Visit, work done)	20
	Pre-submission report / Feedback from Industry (if the project is carried out in an industry)	20
End Term Exam (Summative)	End Term Exam	30
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

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
[CC1881.1]	Identify the basics of the concepts related to the selected topic of the project and identify the open issues.	2	2		2	2	2	1		1	1	2	2	2	3	1
[CC1881.2]	Determine the depth of the problem and propose a solution.	1	3	1	3	2	2			1		2	1	2	1	2
[CC1881.3]	Solve real-time problems and contribute to an open community with ethical values by undergoing systematic study and communicating the proposed solution.	1	2	3	2	3	3	1	3	1	2	2	3	1	2	2
[CC1881.4]	Work in a team with proper contribution from individuals and build the project with lifelong learning.			3	2	2	1		1	3	2	1	1			1

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