PROGRAM OUTCOMES,PROGRAM SPECIFIC OUTCOMES, COURSE OUTCOMES

Department: Computer Engineering & Information Technology

<table>
<tr><th colspan="3">Bachelor of Technology(CSE)</th></tr>
<tr><td>Programme Outcome</td><td colspan="2">PO-1: Strong foundation in core Computer Science and Engineering, both theoretical and applied concepts.
PO-2: Ability to apply knowledge of mathematics, science, and engineering to real-life problem solving.
PO-3: Ability to analyses, design, model, and develop complex software and information management systems.
PO-4: Ability to function effectively within teams.
PO-5: Understanding of professional ethical responsibility.
PO-6: Ability to communicate effectively, both in writing and oral.
PO-7: Understanding the impact of Computer Science and Engineering solutions in the societal and human context.
PO-8: Ability to engage in life-long learning.
PO-9: Knowledge of contemporary issues.
PO-10: The graduate will be able to use modern tools, software, equipments etc. to analyze and obtain solution to the problems.
PO-11: The graduates will be able to participate in competitive examinations for success.</td></tr>
<tr><td rowspan="3">Programme Specific Outcome</td><td colspan="2">Able to apply the knowledge gained during the course of the program from Mathematics, Basic Computing, Basic Sciences and Social Sciences in general and all Computer courses in particular to identify, formulate and solve real life problems faced in industries and/or during research work.</td></tr>
<tr><td colspan="2">Able to provide socially acceptable technical solutions to complex Computer engineering problems with the application of modern and appropriate techniques for sustainable development.</td></tr>
<tr><td colspan="2">Able to apply the knowledge of ethical and management principles required to work in a team as well as to lead a team.</td></tr>
<tr><td>Course Code</td><td>Course Name</td><td>Course Outcomes</td></tr>
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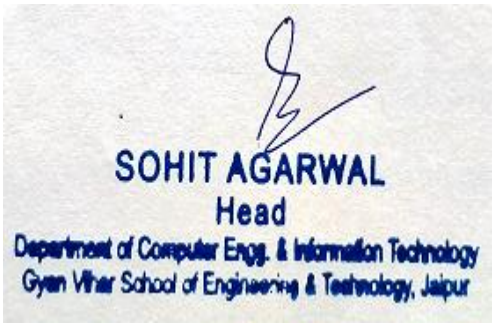
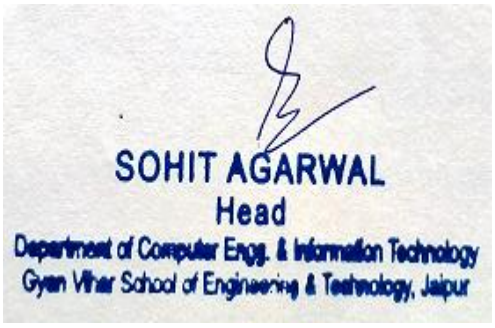
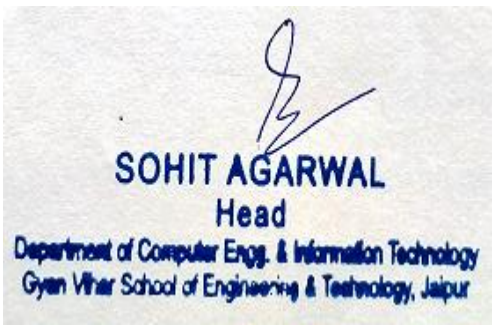
HS201	Economics and Social Sciences	• At the end of this course student can understand Behavioral and managerial theories of the firm, growth of the firm. • The students will be able to correlate industry with our economy, relation of technical knowledge with history and political science that how things are internally and externally correlated.
ES201	Employability Skill-II	• Communicate effectively. • Make effective presentations. • Critically think on a particular problem. • Solve problems. • Can prepare CV. • Work in Group & Teams. • Become an effective leader.



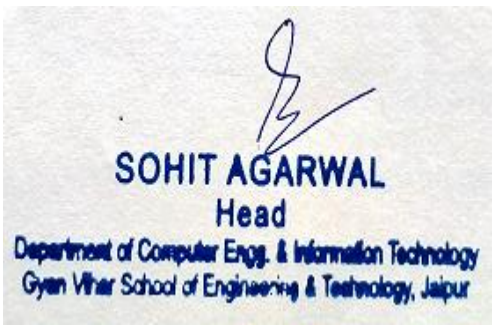
CP201	Data Structures and Algorithms	• Present arguments for the correctness or incorrectness of a given algorithm. • Reason about and evaluate the efficiency behaviour of a given algorithm. • Choose appropriate data structures and algorithms for a given problem. • Implement the chosen data structures and algorithms. • Recognize and analyze critical computational problems, generate alternative solutions to problems, and assess their relative merits. • Understand, analyze, and characterize those factors that influence algorithmic computational performance and memory consumption. • Design, implement, and document appropriate, effective, and efficient data structures & algorithms for a variety of real-world problems. • Understand detailed algorithm structures and their underlying strengths and weaknesses. • Perform detailed, code-level design and document the design in an understandable way.



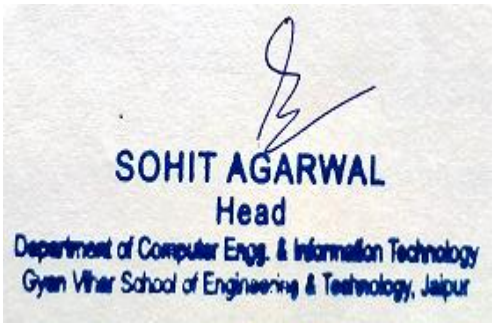
CP203	Principles of Programming Languages	• Ability to analyze the semantic differences of variables, data types, expressions, assignment statements, control structures, subprograms, data abstraction, concurrency, and exception handling in diverse programming language paradigms • Ability to identify and use methods for describing the syntax and semantics of a programming language. • Ability to understand the working of Compiler and Interpreter. • Ability to understand the working of linker and loader. • Ability to better understand Theoretical Computing.



EC223	Digital Logic Design	• Apply knowledge of number systems, codes and Boolean algebra to the analysis and design of digital logic circuits. • Identify and formulate arithmetic circuits to design digital logic to automate the computations required for implementing complex systems. • Use the sequential circuits such as flip flops, counters, registers etc., to design practical projects, necessary for engineering practice. • To design a practical digital system with the help of components such as RAM, ROM, PLA, PAL etc., to meet desired needs in realistic constraints. • To function on multi-disciplinary teams through digital circuit experiments and projects. • Design and analyse small combinational circuits and to use standard combinational functions/building blocks to build larger more complex circuits. • Design and analyse small sequential circuits and devices and to use standard sequential functions/building blocks to build larger more complex circuits.



CP202	Software Engineering	• An understanding of professional and ethical responsibility. • An ability to communicate effectively. • An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice. • The ability to analyze, design, verify, validate, implement, apply, and maintain software systems. • The ability to appropriately apply discrete mathematics, probability and statistics, and relevant topics in computer science and supporting disciplines to complex software systems. • Design applicable solutions in one or more application domains using software engineering approaches that integrate ethical, social, legal and economic concerns. • Deliver quality software products by possessing the leadership skills as an individual or contributing to the team development and demonstrating effective and modern working strategies by applying both communication and negotiation management skill. • Apply new software models, techniques and technologies to bring out innovative and novelistic solutions for the growth of the society in all aspects and evolving into their continuous professional development.



CP204	Discrete Mathematics	• Understand the structure and types of proofs in mathematics. • Define and relate basic notions in graph theory. • Apply algorithms and theorems from graph theory on solving problems. • Use mathematics literature from variety of sources and at least one text processor and LMS suitable for mathematics. • Structure and solve real work problems by tools from discrete mathematics and graph theory working in teams. • Understand proofs by induction thoroughly and be fluent in their construction; • Read and understand written descriptions of algorithms; • Develop and apply simple algorithms to solve problems or prove theorems; • Give the basic definitions of graph theory and a range of standard examples including, for example, complete graphs and bipartite graphs; • Characterise planar graphs and prove the five-colour theorem. • Apply the knowledge and skills obtained to investigate and solve a variety of discrete mathematical problems • Communicate both technical and non-technical information in a range of forms (written, oral, electronic, graphic,) and work as an effective team member. • Ability to learn theoretical computing.

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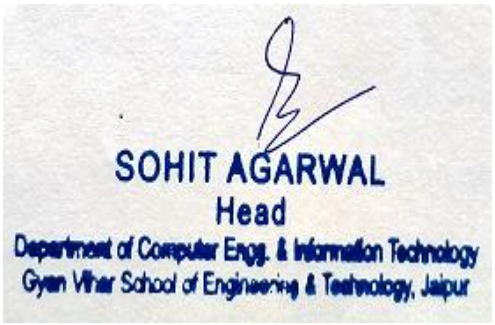
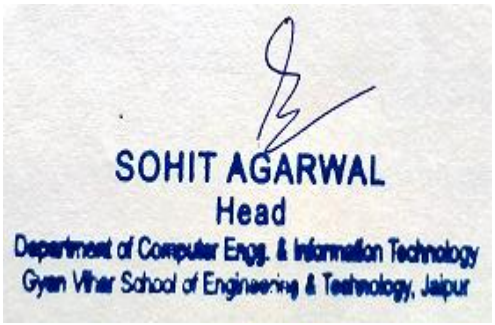
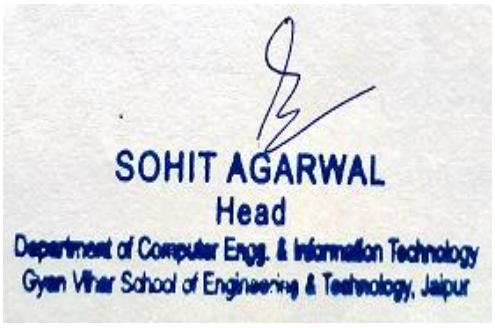
CP206	Core Java	• Ability to use the Java SDK environment to create, debug and run Java standalone and applet programs. • Ability to design and build robust and maintainable web applications by creating dynamic HTML. • Students will demonstrate their ability to work on larger, more complex projects by collaboratively designing and then individually implementing applications. • Ability to learn advance java programming. • Read and understand Java-based software code of medium-to-high complexity. • Use standard and third party Java's API's when writing applications. • Understand the basic principles of creating Java applications with graphical user interface (GUI). • Understand the basic approaches to the design of software applications. • Apply the above to design, implement, appropriately document and test a Java application of medium complexity, consisting of multiple classes.
CP301	Database Management System	• Ability to understand the role of a database management system in an organization. • Ability to manage database of an organization. • Ability to develop logical data models. • Ability to implement a relational database into a database management system. • Ability to write SQL queries to fetch data from database. • Ability to read data mining and data warehousing. • Ability to work successfully on a team by design and development of a database application system as part of a team.



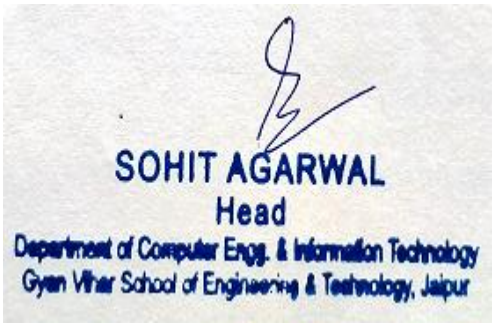
CP302	Computer Architectures	• Ability to understand the operation of electronic logic elements. • Ability to understand the organisation of a computer system in terms of its main components. • Ability to understand the various parts of a system memory hierarchy. • Ability to understand the operation of modern CPUs including pipelining, memory systems and busses. • Ability to understand the principles of operation of multiprocessor systems and parallel programming. • Ability to design and emulate a single cycle or pipelined CPU by given specifications using Hardware Description Language (HDL). • Ability to work in teams to design and implement CPUs. • Ability to write reports and make presentations of computer architecture projects.



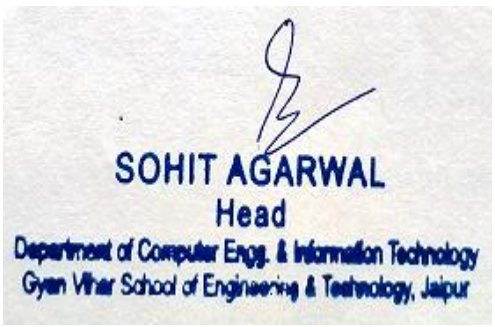
CP308	Design & Analysis of Algorithms	• Argue the correctness of algorithms using inductive proofs and invariants. • Analyze worst-case running times of algorithms using asymptotic analysis. • Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. • Synthesize divide-and-conquer algorithms. • Derive and solve recurrences describing the performance of divide-and-conquer algorithms. • Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize dynamic-programming algorithms, and analyse them.
CP304	Theory of Computation	• Understand basic properties of formal languages and formal grammars. • Understand basic properties of deterministic and nondeterministic finite automata. • Understand the relation between types of languages and types of finite automata. Understand the challenges for Theoretical Computer Science and its contribution to other sciences



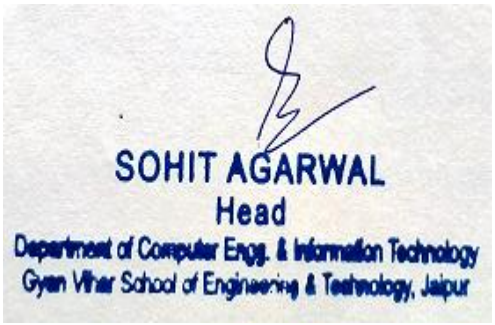
CP306	Computer Network	• Independently understand basic computer network technology. • Understand and explain Data Communications System and its components. • Knowledge of basic network theory and layered communication architectures. • Ability to solve problems in networking.
CP402	NETWORK SECURITY & CRYPTOGRAPHY FUNDAMENTALS(NSCF)	• Define the concepts and definition of the information systems. • Differentiate between several types of information system. • Identify the threats to information security. • Understand the difference between database and data warehouse. Differentiate between transaction processing system and functional area information system



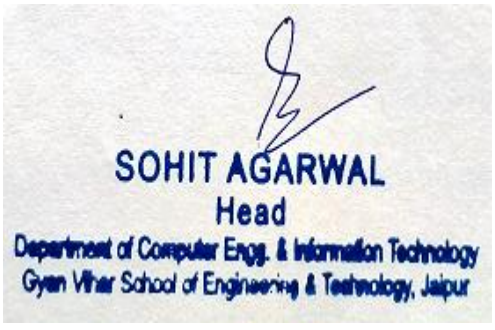
CP405	Operating Systems	• Master functions, structures and history of operating systems • Master understanding of design issues associated with operating systems • Master various process management concepts including scheduling, synchronization, and deadlocks • be familiar with multithreading • Master concepts of memory management including virtual memory • Master system resources sharing among the users • Master issues related to file system interface and implementation, disk management • Be familiar with protection and security mechanisms • Be familiar with various types of operating systems including Unix.



CP401	Asynchronous Transfer Mode	• Implementation of different routing mechanism. • Specifications and implementations of cell based structure. • Implement the concepts of QOS parameter and service categories. • Implement the various functions of ATM layers... • Implement the network based cell routing protocols. • Implement the OSI model in reference with ATM model. • Implement the concept of different switching architecture. • Implement the concept of input and output buffering.
CP409	Real Time Systems	• To present the mathematical model of the system. • To develop real-time algorithm for task scheduling. • To understand the working of real-time operating systems and real-time database. • To work on design and development of protocols related to real-time communication.

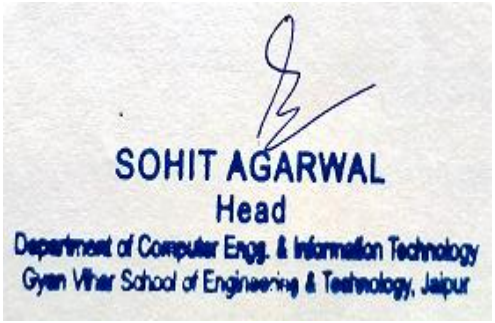


CP404	Advance Computer Architectures	• Will know about computer performance, instruction set architecture design and implementation. • Will know about microprocessor implementation alternatives (single- cycle, multiple-cycle, and pipelined implementations).
CP406	Compiler Construction	• Be familiar with compiler architecture. • Be familiar with register allocation. • Be exposed to compiler optimization
CP412	Cloud Computing	• Understanding the key dimensions of the challenge of Cloud Computing • Assessment of the economics, financial, and technological implications for selecting cloud computing for own organization. • Assessing the financial, technological, and organizational capacity of employer's for actively initiating and installing cloud-based applications. • Assessment of own organizations' needs for capacity building and training in cloud computing-related IT areas.

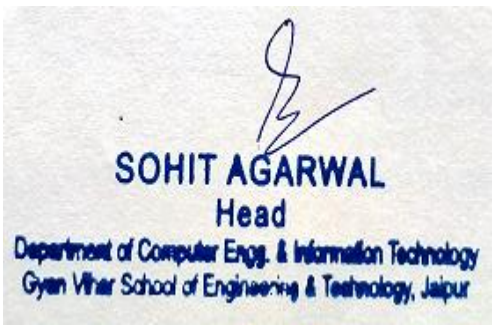


Department: Computer Engineering and Information Technology

Master in Technology (CSE)	
Programme Outcome	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences. **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. **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. **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. **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. **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. **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. **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.
Programme Specific Outcome	Able to apply the knowledge gained during the course of the program from Mathematics, Basic Computing, Basic Sciences and Social Sciences in general and all Computer courses in particular to identify, formulate and solve real life problems faced in industries and/or during research work.
	Able to provide socially acceptable technical solutions to complex Computer engineering problems with the application of modern and appropriate techniques for sustainable development.



	Able to apply the knowledge of ethical and management principles required to work in a team as well as to lead a team.	
Course Code	**Course Name**	**Course Outcomes**
CP502	Technical Writing	
CP503	Advance Data Base Management System	• Understand the difference between Data Warehousing and general databases • Familiar with multi-dimensional data cubes and related analysis • Describe and apply at least one of the algorithms used for Association rules in data mining • introduced to challenges in related advanced applications such as data mining for: Text, Time Series, Data Streams, or Multimedia applications



CP504	High Performance Scientific Computing	• Appreciate the building blocks of scientific and engineering software. • Demonstrate a basic knowledge of numerical computing using an appropriate programming language. • Be competent in experimental computing in a numerical context and of the optimization of algorithms on high performance architectures. • Be able to reason about the accuracy of mathematical and numerical models of real physical phenomena. • Have an awareness of the modern field of computational science and engineering and of the impact of high performance computing on science and industry. • Have an understanding of the various paradigms of high performance computing and their potential for performance and programmability. • Be capable of writing algorithms that yield good performance on high-performance architectures, and to be able to estimate and evaluate their performance. • Design a parallel solution to a scientific computing problem, including the selection, design and parallel implementation of appropriate numerical algorithms; • Better understand the state of the art and frontiers of high performance scientific computing through case studies drawn from physics (heat flow, Schrodinger Equation, gravitational wave), geophysics (3D wave-equation), astrophysics (N-body problem) and chemistry (molecular dynamics, two-electron integrals, 3D quadrature);

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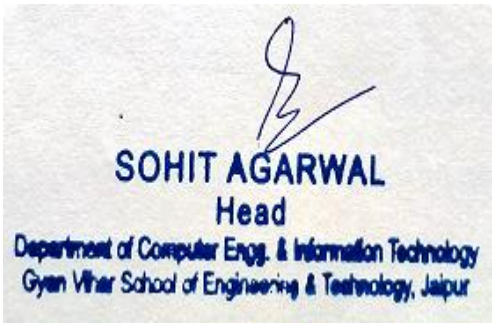
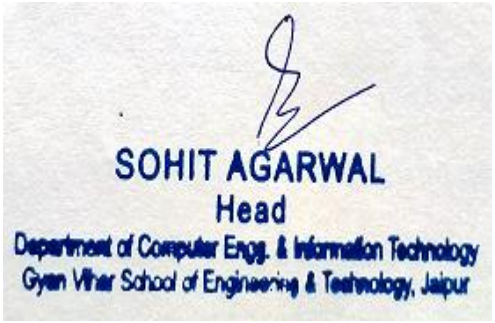
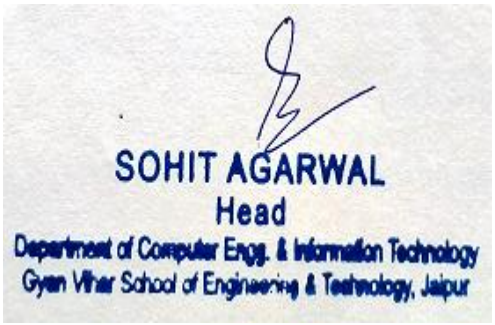
CP505	Distributed Operating System	• assess programming languages critically and in a scientific manner; • analyze the principles of an imperative, functional, object oriented or logic oriented programming language; and • use a formalism to describe a programming language.
CP511	High Performance Network	• To design High performance computer networks. • To design and implement CAC protocols in multimedia networks. • Design and implement network protocols in HPCN. • Analyse performance of network related issues using mathematical models. • Compare the various methods of providing connection-oriented services over an advanced network with reference to MPLS, VPN.



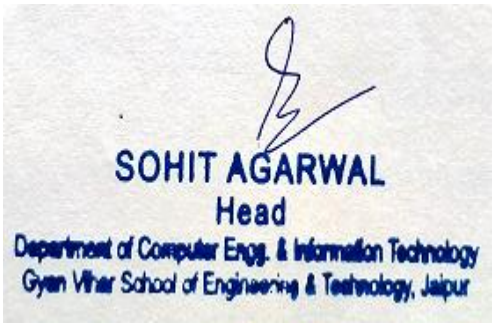
CP512	Digital Multimedia System	• Describe the basic issues and the scope (or principal applications) of image processing, and the roles of image processing and systems in a variety of applications; • Demonstrate a good understanding of the history and the current state-of-the-art image processing systems and applications which constantly push the boundaries and raise challenges in other fields of studies such as mathematics, physics, and computer systems engineering; • Identify areas of knowledge which are required, select an appropriate approach to a given image processing task, and critically evaluate and benchmark the performance of alternative techniques for a given problem by simulation using, e.g., Matlab; • Implement image processing tasks with a high level of proficiency via software and hardware systems; • Identify potential applications of image processing to advancement of knowledge in sciences and engineering with benefits in, e.g., policing, public safety and security, and social issues such as privacy; and • Demonstrate a high level of self-directed learning ability and good oral and written communication skills on technical topics of image processing and systems engineering.



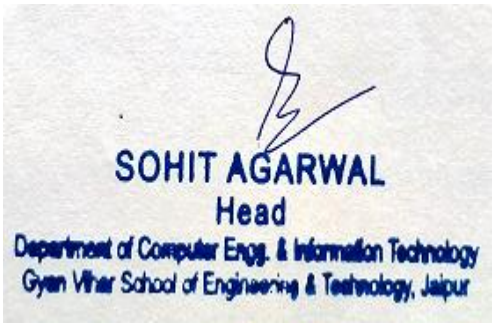
CP513	Object Oriented Software Engineering	• Develop an organized methodology for implementing larger scale software systems • Program effectively on a team • Think innovate • Independently teach yourself new software libraries, frameworks, and tools • Orally communicate your ideas, designs and implementations

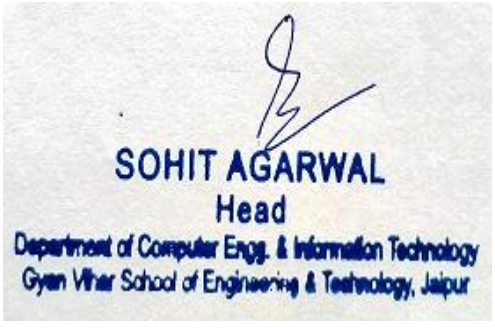


CP601	Software Project Management	• Manage the selection and initiation of individual projects and of portfolios of projects in the enterprise. • Conduct project planning activities that accurately forecast project costs, timelines, and quality. Implement processes for successful resource, communication, and risk and change management. • Demonstrate effective project execution and control techniques that result in successful projects. • Conduct project closure activities and obtain formal project acceptance. • Demonstrate a strong working knowledge of ethics and professional responsibility. • Demonstrate effective organizational leadership and change skills for managing projects, project teams, and stakeholders



CP602	Knowledge Management & Data Mining	• assess programming languages critically and in a scientific manner; • analyze the principles of an imperative, functional, object oriented or logic oriented programming language; and • use a formalism to describe a programming language.
CP603	E-Secure Transactions	▪ Ability to analyse the concept of E-Business models. • Ability to work in one or more significant application domains and to manage the development of E-Commerce application. • An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability. • An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

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GYAN VIHAR SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTER ENGINEERING & INFORMATION TECHNOLOGY

Teaching and Examination Scheme common for B.Tech. (Computer Science & Engineering 4 Year Course) with specialization in Artificial Intelligence & Machine Learning (powered by IBM)

Session 2021-2025

Year: II **Semester: III**

S. No.	Course Code	Course Name	Credits	Contact Hrs/Wk.			Exam Hrs.	Weightage (in%)	
				L	T	P		CIE	ESE
		University Core							
1	HS203	Economics and Social Sciences	3	3	0	0	3	40	60
2	EM201	Employability Skill-II	1	0	2	0		40	60
3	PC201	Proficiency in Co-Curricular Activities-III	2	-	-	-	-	100	-
		Program Core							
4	CP201	Data Structures and Algorithms	3	3	0	0	3	40	60
5	CP203	Principles of Programming Languages	3	3	-	0	3	40	60
6	CP 241	**Machine Learning**	3	3	-	0	3	40	60
7	CP251	Data Structures and Algorithms Lab	2	0	0	2+2	2	60	40
8	CP255	**Machine Learning Lab**	1	0	0	2	2	60	40
Students required to opt minimum one theory paper and one lab from Elective Courses									
		Program Elective							
9	EC223	Digital Logic Design	3	3	0	0	3	40	60
10	CA103	E-Commerce and Digital Marketing	3	3	0	0	3	40	60
11	EC255	Digital Logic Design Lab	1	0	0	2	2	60	40
12		APPS	3	3	0	0	3	40	60
13	EC201	Electronic Device Circuit	3	3	0	0	3	40	60
		University Elective							
14	BM 109	Principles of Management	3	3	0	0	3	40	60
15		Disaster Management	2	3	0	0	3	40	60

Year: II **Semester: IV**

Note:- Industrial training for 30 days after 4th Semester Exams is compulsory.

S. No.	Course Code	Course Name	Credits	Contact Hrs/Wk.			Exam Hrs.	Weightage (in%)	
				L	T	P		CIE	ESE
		University Core							
1	EM202	Employability Skill-III	1	0	2	0	-	40	60
2	PC202	Proficiency in Co-Curricular Activities-IV	2	0	0	0	-	100	-
		Program Core							
3	CP242	**Algorithm for Intelligent Systems and Robotics**	3	3	0	0	3	40	60
4	CP202	Software Engineering	3	3	0	0	3	40	60
5	CP204	Discrete Mathematics and Graph Theory	3	3	0	0	3	40	60
6	CP206	Core Java	3	3	0	0	3	40	60
7	CA111	Web Development and Database (PHP & My SQL)	3	3	0	0	3	40	60
8	CP254	Industrial oriented Core Java Project Lab	2	0	0	2+2	2	60	40
9	CP258	Design Practice with UML Lab	1	0	0	2	2	60	40
10	CP257	**Algorithm for Intelligent Systems and Robotics Lab**	1	0	0	2	2	60	40
Students required to opt minimum one theory paper and one lab from Elective Courses									
		Program Elective							
11	CP209	Business Economics	3	3	0	0	3	40	60
12	CP208	Open Source Technology	3	3	0	0	3	40	60
13	CP256	Open Source Technology Lab (UNIX/LINUX)	2	0	0	2+2	2	60	40

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Associate Dean Academics
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14	CA157	Web Development and Database Lab (PHP & My SQL)	1	0	0	2	2	40	60
15	CP258	Big data & Hadoop	3	3	0	0	3	40	60
16	EC242	Telecommunication Engineering & Fundamental	3	3	0	0	3	40	60
17	CA107	Introduction to Internet of Things(IoT)	3	3	0	0	3	40	60
		University Elective							
17	MA204	Statistical &Probability Theory	3	3	0	0	3	40	60
18		Innovation and Entrepreneurship	3						

Year: III **Semester: V**

S. No.	Course Code	Course Name	Credits	Contact Hrs/Wk.			Exam Hrs.	Weightage (in%)	
				L	T	P		CIE	ESE
		University Core							
1	EM301	Employability Skill-IV	1	0	2	0	-	40	60
2	PC301	Proficiency in Co-Curricular Activities-V	2	-	-	-	-	100	-
		Program Core							
3	CP301	Database Management System	3	3	0	-	3	40	60
4	CP302	Computer Architectures	3	3	0	0	3	40	60
5	CP341	**Computational Linguistics and Natural Language Processing**	3	3	0	0	3	40	60
6	CP352	Computer Architectures Lab	1	-	-	2	2	60	40
7	CP353	Database Management System Lab	2	-	-	2+2	2	60	40
8	CP355	**Computational Linguistics and Natural Language Processing Lab**	1	0	0	2	2	60	40
9	PT301	Practical Training Seminar Stage-I	1	-	-	2	2	60	40
Students required to opt minimum one theory paper and one lab from Elective Courses									
		Program Elective							
10	CP309	Logical & Functional Programming	3	3	0	0	3	40	60
11	CP317	Advanced Data Structures	3	3	0	0	3	40	60
12	CP357	Advanced Data Structures Lab	1	-	-	2	2	60	40
13	CP361	Global Engineering	3	3	0	0	3	40	60
14	CP362	Super Computer	3	3	0	0	3	40	60
15	EC309	Microprocessor & Interface	3	3	0	0	3	40	60
		University Elective							
16		Swatch Bharat Abhiyan	2	3	0	0	3	40	60

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DEPARTMENT OF COMPUTER ENGINEERING & INFORMATION TECHNOLOGY

Teaching and Examination Scheme common for B.Tech. (Computer Science & Engineering 4 Year Course) with specialization in Artificial Intelligence & Machine Learning (powered by IBM)

Session 2021-2025

Year: III ***Semester: VI***

Note:- Industrial training for 45days after 6th Semester Exams is compulsory.

S. No.	Course Code	Course Name	Credits	Contact Hrs/Wk.			Exam Hrs.	Weightage (in%)	
				L	T	P		CIE	ESE
		University Core							
1	EM302	Employability Skills-V	1	0	2	0	3	40	60
2	PC302	Proficiency in Co-Curricular Activities-VI	2	-	-	-	-	100	-
		Program Core							
3	CP308	Design & Analysis of Algorithms	4	3	1	-	3	40	60
4	CP304	Theory of Computation	4	3	1	-	3	40	60
5	CP306	Computer Network	3	3	-	-	3	40	60
6	CP342	**Application of machine learning in industries**	3	3	-	-	3	40	60
7	CP354	Computer Network Lab	1	-	-	2	2	60	40
8	CP359	**Application of machine learning in industries Lab**	1	-	-	2	2	60	40
Students required to opt minimum one theory paper and one lab from Elective Courses									
		Program Elective							
9	CP310	System Software Engineering	3	3	-	-	3	40	60
10	CP351	Computer Graphics Lab	2	-	-	2+2	2	60	40
11	CP356	System Software Engineering Lab	1	-	-	2	2	60	40
12	CP318	Computer Graphics & Multimedia Technology	3	3	-	-	3	40	60
13		Human – Computer Interfaces intelligence	3	3	-	-	3	40	60
14		Project Design Evaluation Management and Innovations	3	3	-	-	3	40	60
15	EC342	Wireless Communication Network	3	3	-	-	3	40	60
		University Elective							
16		Consumer Affairs	2						
17		Optical Fiber and Laser Instruments	3	3	-	-	3	40	60

Year: IV **Semester: VII**

S. No.	Course Code	Course Name	Credits	Contact Hrs/Wk.			Exam Hrs.	Weightage (in%)	
				L	T	P		CIE	ESE
		University Core							
1	EM401	Employability Skills-VI	1	0	2	0	3	40	60
2	PC401	Proficiency in Co-Curricular Activities-VII	2	-	-	-		100	-
		Program Core							
3	CP402	NETWORK SECURITY & CRYPTOGRAPHY FUNDAMENTALS(NSCF)	3	3	0	-	3	40	60

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Session 2021-2025

4	CP405	Operating Systems	3	3	0	-	3	40	60
5	CP441	**Neural Networks**	3	3	-	-	3	40	60
6	CP401	Asynchronous Transfer Mode	3	3	-	-	3	40	60
7	PE401	Major Project Stage-I	1	-	-	2	2	60	40
8	CP459	**Neural Networks Lab**	1	-	-	2	2	60	40
		Program Elective							
9	CP407	Intro to Data Mining & Warehousing	3	3	-	-	3	40	60
10	CP413	Digital Image Processing	3	3	-	-	3	40	60
11	CP455	Operating System Lab	1	-	-	2	2	60	40
12	CP458	System Security Lab using C	2	-	-	2+2	2	60	40
13		Advanced Innovation and New Product Development	3	3	-	-	3	40	60
14		Development and Operations(DEV Ops)	3	3	-	-	3	40	60
15	PT401	Practical Training Seminar Stage-II	1	-	-	2	2	60	40
		University / Open Elective							
16		Green Communication and Networking	3	3	-	-	3	40	60
17	CP453	X-Windows Lab	2	-	-	2	2	60	40

Year: IV **Semester: VIII**

S. No.	Course Code	Course Name	Credits	Contact Hrs/Wk.			Exam Hrs.	Weightage (in%)	
				L	T	P		CIE	ESE
		University Core							
1	EM402	Emploiblity Skill-VII	1		2		3	60	40
2	HS402	Intellectual Property Rights	2	2	-	-	3	40	60
		Program Core							
3	CP409	Real Time Systems	3	3	0	-	3	40	60
4	CP404	Advance Computer Architectures	3	3	-	-	3	40	60
5	CP406	Compiler Construction	3	3	0	-	3	40	60
6	CP445	**Cognitive Analytics**	3	3	0	-	3	40	60
7	CP461	**Cognitive Analytics Lab**	1	-	-	2	2	60	40
8	CP452	Compiler Construction Lab	2	-	-	2+2	2	60	40
9	SM402	Seminar	1	-	-	2	2	60	40
Students required to opt minimum one theory paper and one lab from Elective Courses									
		Program Elective							
10	CP408	Distributed Systems	3	3	-	-	3	40	60
11	CP414	Embedded Systems	3	3	-	-	3	40	60
12	CP420	Parallel Computing	3	3	-	-	3	40	60
13	CP412	Cloud Computing	3	3	0	-	3	40	60
14	CP454	Advance Computer Architectures Lab	1	-	-	2	2	60	40
15	CP451	PHP Lab	1	-	-	2	2	60	40
16	CP460	Major Project Stage-II	1	-	-	2	2	60	40
17		Ethical hacking	3	3	-	-	3	40	60

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18	EC442	CAD for VlSI	3	3	0	-	3	40	60
		University / Open Elective							
17	HS-202	Elementary Research Methodology	3	3	0	0	3	40	60

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Course Title: **ECONOMICS AND SOCIAL SCIENCES**		Course Code	:**HS201**
Semester	: **III**	Core / Elective	: **UC**
Teaching Scheme in Hrs (L:T:P)	: 3**:0:0**	Credit	: 3 **Credit**
Type of course	: **Lecture + Assignments**	Total Contact Hours	: **36**
Continuous Internal Evaluation	: **40 Marks**	ESE	: **60 Marks**
Programmes	: **B.TECH. CSE & B.TECH IT**		

Pre-requisites:

Human Ethics & Value (HS101), Environmental Studies(ES101).

Course Objectives:

- Basic concepts: firm and industry.
- Market structure.
- Economics of scale and optimum firm size.
- Pricing under alternative market structures.
- Market power and concentration.
- Integration, diversification and merger.
- Behavioral and managerial theories of the firm, growth of the firm.

Course Content:

Topic and Contents	Hours	Marks
UNIT-1	7	20
Introduction: Definition meaning, nature and scope of economics.		
UNITS-2	7	20
Micro Economics: Definition, meaning and scope of Micro Economics. Importance and limitations.		
UNITS-3	7	20
Concept of Demand and supply: Utility Analysis, Law of Demand, Demand determinants, Demand Distinctions. Law of Supply, Elasticity		
UNIT-4	7	20
Introduction to social Sciences: impact of British rule on India (Economic Social and Cultural). Indian National movement, Psychograph of India.		
UNIT-5	8	20
Political Economy: Agriculture, Socio-Economic development, Challenges to Indian Democracy, Political Parties and pressure groups.		
TOTAL	**36**	**100**

Reference Books:

1. DN Dwivedi, Managerial Economics by, Vikas Publishing House Pvt Ltd, (2009)
2. M.L. Jhingn Advance Micro Economics by, Vrinda Publications(P) Ltd, (2012)
3. Bipan Chandra Chatterjee India after independence by Bipan Chandra Chatterjee , Penguin Books India Ltd ,Published by Penguin Groups, (1985).
4. Niraja Gopsl Jayal , Politics in India, , Pratap Bhanu Mehta, Oxford, (2011)

Course outcomes:

On successful completion of the course, the student will be able to:

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- At the end of this course student can understand Behavioral and managerial theories of the firm, growth of the firm.
- The students will be able to correlate industry with our economy, relation of technical knowledge with history and political science that how things are internally and externally correlated.

Mapping Course Outcomes with Program Outcomes:

Course outcomes	Program outcomes										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1	S	S	S	S	S	M	M	M	S	M	S
2	S	S	M	S	S	M	S	M	M	M	S

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Course Title:	: **Employability Skill II**	Course Code	:**ES201**
Semester	: **III**	Core / Elective	: **UC**
Teaching Scheme in Hrs (L:T:P)	: 0**:2:0**	Credit	: 1 **Credit**
Type of course	: **Lecture + Assignments**	Total Contact Hours	: **24**
Continuous Internal Evaluation	: **40 Marks**	ESE	: **60 Marks**
Programmes	: **B.TECH. CSE**		

Pre-requisites:

Employability Skills–I (**EM102)**

Course Objectives:

- To develop communication competence in prospective engineers
- To enable them to convey thoughts and ideas with clarity and focus
- To inculcate critical thinking process
- To develop quantitative aptitude
- To enable them to prepare CV and PPT
- To prepare them on problem solving skills
- To inculcate symbolic, verbal, and graphical interpretations of statements

Course Content:

Topic and Contents	Hours
UNIT-1	
Communication, Interpersonal Relationship, Interview Skills & Types	6
UNIT-2	
Number System, Ratio & Proportion, Partnership, Percentage, Profit &Loss	5
UNIT-3	
Analytical Reasoning, Coding & Decoding, Series	5
UNIT-4	
Mission, Vision ,Goal, Motivation & Types of Motivation Self Esteem, Winning strategies,	4
UNIT –5	
Self Esteem, Preparation of CV, Writing Application, Placement Mantra, PPT	4

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TOTAL	**24**

Reference Books:

1. Barun K. Mitra; "Personality Development & Soft Skills", First Edition; Oxford Publishers, (2011)
2. Kalyana "Soft Skill for Managers" First Edition; Wiley Publishing Ltd, (2015).
3. Larry James "The First Book of Life Skills"; First Edition; Embassy Books, (2016)
4. ShaliniVerma "Development of Life Skills and Professional Practice, First Edition; Sultan Chand (G/L) & Company, (2014)
5. John C. Maxwell "The 5 Levels of Leadership", Centre Street, A division of Hachette Book Group Inc, (2014)
6. R.Agarwal: Quantitative Aptitude, S. Chand Publication, (2016)
7. R.S.Agarwal: Logical Reasoning, S. Chand Publication, (2016)

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Course outcomes:

- Communicate effectively.
- Make effective presentations.
- Critically think on a particular problem.
- Solve problems.
- Can prepare CV.
- Work in Group & Teams.
- Become an effective leader.

Mapping Course Outcomes with Program Outcomes:

Course outcomes	Program outcomes										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1	M	S	S	S	S	M	M	S	M	M	S
2	M	S	S	S	S	M	M	S	M	M	S
3	M	S	S	S	S	M	M	S	M	M	S
4	M	M	M	S	S	M	M	S	M	M	S
5	M	S	S	S	S	M	M	S	M	M	S
6	M	S	S	S	S	M	M	S	M	M	S
7	M	S	S	S	S	M	M	S	M	M	S

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Course Title:	: **Advance Maths III**	Course Code	: **MA203**
Semester	: **III**	Core / Elective	: **UC**
Teaching Scheme in Hrs (L:T:P)	: 3**:0:0**	Credit	: **3 Credit**
Type of course	: **Lecture + Assignments**	Total Contact Hours	: **36**
Continuous Internal Evaluation	: **40 Marks**	ESE	: **60 Marks**
Programmes	: **B.TECH. CSE**		

Pre-requisites:

Mathematics – I (MA101**) ,**Mathematics – II (MA102)

Course Objectives:

- The concept of calculus of variation of functions (one and several variables) and their applications;
- The concept of numerical solution of partial differential equations;
- The concept of conformal mapping and the applications of complex analysis.

Course Content:

Topic and Contents	Hours	Marks
UNIT-1	**7**	**20**
Random variables (discrete and continuous); Probability mass function; Probability density function and distribution function. Distributions: Binomial, Poisson, Uniform, Exponential, Normal, t and $\chi 2$. Expectation and Variance (t and $\chi 2$ excluded)		

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UNITS-2	7	20
Moment generating function; Reproductive Property of Binomal; Poisson and Normal Distribution (proof not required). Transformation of random variables (One variable); Chebychev inequality (statement) and problems. 10L Binomial approximation to Poisson distribution and Binomial approximation to Normal distribution (statement only); Central Limit Theorem (statement); Law of large numbers (Weak law);		
UNITS-3	7	20
Simple applications. 6L Statistics: Population; Sample; Statistic; Estimation of parameters (consistent and unbiased); Sampling distribution of sample mean and sample variance (proof not required). Point estimate: Maximum likelihood estimate of statistical parameters (Binomial, Poisson and Normal distribution). Interval estimation.		
UNIT-4	7	20
Testing of Hypothesis: Simple and Composite hypothesis; Critical Region; Level of Significance; Type I and Type II Errors; Best Critical Region; Neyman-Pearson Theorem (proof not required); Application to Normal Population; Likelihood Ratio Test (proof not required);		
UNIT-5	8	20
Comparison of Binomial Populations; Normal Populations; Testing of Equality of Means; $\chi 2$—Test of Goodness of Fit (application only). 18L Simple idea of Bivariate distribution; Correlation and Regression; and simple problems.		
TOTAL	**36**	**100**

Reference Books:

1. S. Gockenbach, Understanding and Implementing the Finite Element Method, SIAM, (2006)
2. Willem Hundsdorfer, Numerical Solution of Time-Dependent Advection-Diffusion-Reaction Equations, Springer (2007).
3. Paul R. Halmos Naïve, Set Theory by 5th Edition, Martino Fine Books (August 17, 2011)

Course outcomes:

On successful completion of the course, the student will be able to:

- Problem solving skills,
- The ability to formulate proofs and to structure mathematical arguments,
- The ability to communicate mathematical ideas via extended written presentation.
- The ability to understand the idea of conformal mapping.

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Mapping Course Outcomes with Program Outcomes:

Course outcomes	Program outcomes										
	1	2	3	4	5	6	7	8	9	10	11
1	S	S	S	S	S	M	M	M	M	M	S
2	S	M	S	S	S	M	S	M	M	M	S
3	S	S	S	S	S	M	S	M	M	M	S
4	S	S	S	S	S	S	S	S	M	M	S

Course Title: **DATA STRUCTURE & ALGORITHM**		Course Code	:CP201
Semester	: **III**	Core / Elective	: **PC**
Teaching Scheme in Hrs (L:T:P)	: 3**:0:0**	Credit	: **3 Credit**
Type of course	: **Lecture + Assignments**	Total Contact Hours	: 36
Continuous Internal Evaluation	: **40 Marks**	ESE	: **60 Marks**
Programmes	: **B.TECH. CSE**		

Pre-requisites:

Computer Programming(CP104)

Course Objectives:

- To know the data structure representation and various operations performed on them.
- Choose the appropriate data structure and algorithm design method for a specified application.
- Enhance the logic design capabilities and write Pseudo Codes and their programming implementation for real world problems.

Course Content:

Topic and Contents	Hours	Marks
UNIT-1: Introduction to Data Structure & Arrays	7	20
Data Structure: Definition, Implementation, Operation, Application, Algorithm writing and convention. Analysis of algorithm, Complexity Measures and Notations Arrays: Representation of arrays (multidimensional), Address calculation using column and row major ordering, Sparse matrix.		
UNITS-2: Linked Lists	7	20
Linked Lists: Implementation, Doubly linked list, Circular linked list, unrolled linked list, skip-lists, Splices, Sentinel nodes, Application (Sparse Matrix, Associative Array, Functional Programming)		
UNITS-3 Stack & Queue	7	20

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Stack: Definition, Implementation, Application (Tower of Hanoi, Function Call and return, Parentheses Matching, Back-tracking, Expression Evaluation) **Queue:** Definition, de-queue, en-queue, priority queue, bounded queue, Implementation, Application		
UNIT-4: Trees	7	20
Tree: Definition of elements, Binary trees: Types (Full, Complete, Almost complete), Binary Search Tree, Traversal (Pre, In, Post & Level order) Pruning, Grafting. Application: Arithmetic Expressions Evaluation Variations: Indexed Binary Tree, Threaded Binary Tree, AVL tree, Multi-way trees, B tree, B+ tree, Forest, Trie and Dictionary		
UNIT-5:Graphs & Sorting	8	20
Graphs: Elementary definition, Representation (Adjacency Matrix, Adjacency Lists) Traversal (BFS, DFS) Application: Spanning Tree (Prim and Kruskal Algorithm) Dijkstra's algorithm, shortest path algorithms. **Sorting:** Bubble, Selection, Insertion, Quick, Radix Merge, Bucket, Heap, Searching: Hashing, Symbol Table, Binary Search, Simple String Searching		
TOTAL	**36**	**100**

Reference Books:

1. A. V. Aho Data Structures and Algorithms, , J. E. Hoppcroft, J. E. Ullman, Addision Wesley, (2014)
2. E. Horowitzz Fundamentals of Data Structures, , S. Sahni, Galgotia Publ, (2008)
3. C, A. S. Tanenbaum Data Structures using, (2015)
4. Wesley Algorithms, Data Structures, and Problem Solving, Addision, (2009)
5. Loomis, Marry Data Management and File Structures, PHI, (2014)

Course outcomes:

On successful completion of the course, the student will be able to:

- Present arguments for the correctness or incorrectness of a given algorithm.
- Reason about and evaluate the efficiency behaviour of a given algorithm.
- Choose appropriate data structures and algorithms for a given problem.
- Implement the chosen data structures and algorithms.
- Recognize and analyze critical computational problems, generate alternative solutions to problems, and assess their relative merits.
- Understand, analyze, and characterize those factors that influence algorithmic computational performance and memory consumption.
- Design, implement, and document appropriate, effective, and efficient data structures & algorithms for a variety of real-world problems.
- Understand detailed algorithm structures and their underlying strengths and weaknesses.
- Perform detailed, code-level design and document the design in an understandable way.

Mapping Course Outcomes with Program Outcomes:

Course	Program outcomes

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outcomes	1	2	3	4	5	6	7	8	9	10	11
1	S	M	S	S	S	M	M	M	M	M	S
2	S	M	S	S	S	S	M	M	M	M	S
3	S	M	S	S	M	M	M	M	S	M	S
4	S	S	M	S	S	M	M	M	M	M	S
5	S	M	S	S	S	M	S	M	M	M	S
6	S	M	S	S	M	M	M	M	S	M	S
7	S	S	M	S	S	M	M	M	M	M	S
8	S	M	S	S	S	S	M	M	M	M	S
9	S	M	S	S	S	M	M	M	M	M	S

Course Title: **PRINCIPLES OF PROGRAMMING LANGUAGE**		Course Code	:CP203
Semester	: **III**	Core / Elective	: **PC**
Teaching Scheme in Hrs (L:T:P)	: 3**:0:0**	Credit	: **3 Credit**
Type of course	: **Lecture + Assignments**	Total Contact Hours	: **36**
Continuous Internal Evaluation	: **40 Marks**	ESE	: **60 Marks**
Programmes	: **B.TECH. CSE**		

Pre-requisites:

Computer Programming (CP104)

Course Objectives:

- Improve the background for choosing appropriate programming languages for certain classes of programming problems.
- Be able in principle to program in an imperative (or procedural), an object-oriented, a functional, and a logical programming language.

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Course Content:

Topic and Contents	Hours	Marks
UNIT-1	7	20
Programming Language: Definition, History, Features. Issue in Language Design: Structure and Operation of computer Language Paradigms. Efficiency, Regularity. Issues in Language Translation: Syntax, Semantics, Stages analysis and synthesis, Parse Tree, CFG and BNF grammar.		
UNITS-2	7	20
Specification and Implementation of Elementary and Structured Data Types, Type equivalence, checking and Array, List, Structure, Union.		
UNITS-3	7	20
Sequence control with Expressions, Conditional Statements, Loops, Exception handling. Subprogram definition and activation, simple and recursive subprogram .Subprogram environment. Parameter passing mechanism.		
UNIT-4	7	20
Abstract Data type, information hiding, encapsulation, type definition. Static and Stack-Based Storage management Fixed and Variable size heap storage management. Garbage Collection.		
UNIT-5	8	20
Parallel Programming: Introduction, parallel processing and programming language, Threads, semaphore, monitor, message passing.		
TOTAL	**36**	**100**

Reference Books:

- MV Zelkowski Programming Languages-Design and Implementation, TW Pratt, PHI, (1999)
- K. Louden Programming Languages-Principles and Practice, PWS, R Sethi, Addision Wesley, (1989)
- Ellios Horotiz Fundamentals of Programming Languages, Galgotia Publications (1985).
- Wesley Concept of Programming Languages, Sebesta, Addision, (2009)

Course outcomes:

On successful completion of the course, the student will be able to:

- Ability to analyze the semantic differences of variables, data types, expressions, assignment statements, control structures, subprograms, data abstraction, concurrency, and exception handling in diverse programming language paradigms
- Ability to identify and use methods for describing the syntax and semantics of a programming language.
- Ability to understand the working of Compiler and Interpreter.
- Ability to understand the working of linker and loader.
- Ability to better understand Theoretical Computing.

Mapping Course Outcomes with Program Outcomes:

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Course outcomes	Program outcomes										
	1	2	3	4	5	6	7	8	9	10	11
1	M	S	S	S	S	M	M	M	M	M	S
2	M	M	S	M	S	S	M	S	M	M	S
3	M	M	M	S	S	M	M	M	M	M	S
4	M	S	S	S	S	M	M	S	M	M	S
5	M	S	S	M	S	M	M	M	M	M	S

Course Title: **Switching Theory & Logic Design**		Course Code	:**EC223**
Semester	: **III**	Core / Elective	: PE
Teaching Scheme in Hrs (L:T:P)	: 3**:0:0**	Credit	: **3 Credit**
Type of course	: **Lecture + Assignments**	Total Contact Hours	: **36**

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Continuous Internal Evaluation	: **40 Marks**	ESE	: **60 Marks**
Programmes	: **B.TECH. CSE**		

Pre-requisites:

Electrical & Electronics Engineering (EE 101)

Course Objectives:

- This course provides in-depth knowledge of switching theory and the design techniques of digital circuits, which is the basis for design of any digital circuit. The main objectives are:
- To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems.
- To understand common forms of number representation in digital electronic circuits and to be able to convert between different representations.
- To implement simple logical operations using combinational logic circuits
- To design combinational logic circuits, sequential logic circuits.
- To impart to student the concepts of sequential circuits, enabling them to analyze sequential systems in terms of state machines.
- To implement synchronous state machines using flip-flops.

Course Content:

Topic and Contents	Hours	Marks
UNIT-1	7	20
Number System and Boolean Algebra And Switching Functions: Number Systems, Base Conversion Methods, Complements of Numbers, Codes- Binary Codes, Binary Coded Decimal Code and its Properties. **Boolean Algebra:** Basic Theorems and Properties, Switching Functions, Canonical and Standard Form, Algebraic Simplification of Digital Logic Gates, Properties of XOR Gates, Universal Gates, Multilevel NAND/NOR realizations.		
UNIT-2	7	20
Minimization and Design of Combinational Circuits: Introduction, The Minimization with theorem, The Karnaugh Map Method, Five and Six Variable Maps, Prime and Essential Implications, Don't Care Map Entries, Using the Maps for Simplifying, Partially Specified Expressions, Multi-output Minimization, Minimization and Combinational Design.		
UNITS-3	7	20
Combinational Devices their design & truth table: Adder, subtractor, multiplexer, De-multiplexer, Magnitude comparator,7-segment display, BCD, Parallel adder Encoder, Decoder.		
UNIT-4	7	20
Sequential Machines Fundamentals: Introduction, Basic Architectural Distinctions between Combinational and Sequential circuits, Fundamentals of Sequential Machine Operation, The Flip-Flop, The D-Latch Flip-Flop, The "Clocked T" Flip-Flop, The " Clocked J-K" Flip-Flop, Design of a Clocked Flip-Flop, Conversion from one type of Flip-Flop to another.		

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UNIT-5	8	20
Sequential Circuits: Finite state machine-capabilities and limitations, Mealy and Moore models-minimization of completely specified and incompletely specified sequential machines. **Sequential Circuit Design and Analysis**: Introduction, State Diagram, Analysis of Synchronous Sequential Circuits, Approaches to the Design of Synchronous Sequential Finite State Machines. **Counters** - Design of Single mode Counter, Ripple Counter, Ring Counter.		
TOTAL	**36**	**100**

Reference Books:

1. Fredriac J. Hill Introduction to Switching Theory and Logic Design –, Gerald, (1974)
2. John Wiley & Sons Inc Digital Fundamentals – A Systems Approach – Thomas L. Floyd, Pearson, Peterson,3rd Ed, (2013)
3. Ye Brian and HoldsWorth Digital Logic Design – Elsevier, (2002)
4. Charles H. Roth Fundamentals of Logic Design-, Cengage L Eanring, 5th, Edition, (2004)
5. John M. Yarbrough Digital Logic Applications and Design-, Thomson Publications, (2006)
6. Digital Logic and State Machine Design – Comer, 3rd, Oxford, (2013)

Course outcomes:

On successful completion of the course, the student will be able to:

- Apply knowledge of number systems, codes and Boolean algebra to the analysis and design of digital logic circuits.
- Identify and formulate arithmetic circuits to design digital logic to automate the computations required for implementing complex systems.
- Use the sequential circuits such as flip flops, counters, registers etc., to design practical projects, necessary for engineering practice.
- To design a practical digital system with the help of components such as RAM, ROM, PLA, PAL etc., to meet desired needs in realistic constraints.
- To function on multi-disciplinary teams through digital circuit experiments and projects.
- Design and analyse small combinational circuits and to use standard combinational functions/building blocks to build larger more complex circuits.
- Design and analyse small sequential circuits and devices and to use standard sequential functions/building blocks to build larger more complex circuits.
- **Mapping Course Outcomes with Program Outcomes:**

Course outcomes	Program outcomes										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1	S	S	S	S	S	M	M	M	M	M	S
2	M	S	S	S	S	M	S	M	M	M	S
3	S	M	S	M	S	M	M	M	S	M	S
4	S	S	S	S	S	M	M	M	M	M	S

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5	M	S	S	S	S	M	S	M	M	S	S
6	S	S	S	S	S	M	M	M	M	M	S
7	S	S	M	S	M	M	M	M	M	S	S
8	M	S	S	S	M	M	M	M	M	S	S

Course Title:	: **INTERNET PROGRAMING**	Course Code	:CP205
Semester	: **III**	Core / Elective	: PE
Teaching Scheme in Hrs (L:T:P)	: 3**:0:0**	Credit	: **3 Credit**
Type of course	: **Lecture + Assignments**	Total Contact Hours	: **36**
Continuous Internal Evaluation	: **40 Marks**	ESE	: **60 Marks**
Programmes	: **B.TECH. CSE**		

Pre-requisites:

Fundamentals of Computers & IT **(**CP-103).

The course objective is to:

- Explain how the client-server model of Internet programming works.
- Design and develop interactive, client-side, executable web applications.
- Demonstrate how Internet programming tasks are accomplished.
- Build tools that assist in automating data transfer over the Internet.
- Compare the advantages and disadvantages of the core Internet protocols.

Course Content:

Topic and Contents	Hours	Marks
UNIT-1	7	20
BASIC NETWORK AND WEB CONCEPTS: Internet standards – TCP and UDP protocols – URLs – MIME – CGI – Introduction to SGML.		
UNITS-2	7	20
JAVA PROGRAMMING : Java basics – I/O streaming – files – Looking up Internet Address - Socket programming – client/server programs – E-mail client – SMTP - POP3 programs – web page retrieval – protocol handlers – content handlers - applets – image handling - Remote Method Invocation.		
UNITS-3	7	20
SCRIPTING LANGUAGES: HTML – forms – frames – tables – web page design - JavaScript introduction – control structures – functions – arrays – objects – simple web applications.		

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UNIT-4	7	20
DYNAMIC HTML: Dynamic HTML – introduction – cascading style sheets – object model and collections – event model – filters and transition – data binding – data control – ActiveX control – handling of multimedia data.		
UNIT-5	8	20
SERVER SIDE PROGRAMMING : Servlets – deployment of simple servlets – web server (Java web server / Tomcat / Web logic) – HTTP GET and POST requests – session tracking – cookies – JDBC – simple web applications – multi-tier applications.		
TOTAL	**36**	**100**

Reference Books:

1. 1. Deitel, Deitel and Nieto, "Internet and World Wide Web – How to program", Pearson Education Publishers, 2000.
2. 2. Elliotte Rusty Harold, "Java Network Programming", O'Reilly Publishers, 2002.
3. 3. R. Krishnamoorthy & S. Prabhu, "Internet and Java Programming", New Age International Publishers, 2004.

Course Outcomes:

On successful completion of the course, the student will be able to:

- Ability to understand the principal structure of the internet and know to use its most important protocols.
- Ability to design commercial web pages.
- Ability to learn dynamic web designing using .Net, PHP etc.

Mapping Course Outcomes with Program Outcomes:

Course outcomes	Program outcomes										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1	S	M	S	S	M	M	M	M	M	M	S
2	M	M	S	M	S	M	M	M	S	M	S
3	S	M	S	S	S	M	M	M	M	M	S

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Course Title	:**Electronic Devices & Circuits**	Course Code	:**EC221**
Semester	: **III**	Core / Elective	: P**E**
Teaching Scheme in Hrs (L:T:P)	: 3**:0:0**	Credit	: **3 Credit**
Type of course	: **Lecturer+ Assignments**	Total Contact Hours	: **36**
Continuous Internal Evaluation	: **40 Marks**	ESE	: **60 Marks**
Programmes	: **B.TECH. CSE**		

Pre-requisites:

Electrical & Electronics Engineering (EE101).

Course Objectives:

- Understand basic electronics fundamentals & the working of diodes, transistors.
- Understand the application of different electronic devices and simple circuits.
- Understand oscillator circuits along with their application.

Course Content:

Topic and Contents	Hours	Marks
UNIT-1	7	20
Diode circuits: Diode as a circuit. Element, load line concept. Clipping & clamping circuits, voltages multipliers.		
UNITS-2	7	20
Devices: construction, characteristics and working principles of the following devices. Diodes BJT, JFET, MOSFET, UJT, photo diodes, LEDs, photo transistors Solar cells. Thermistor, LDR		

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UNITS-3	7	20
Transistors: transistor characteristics, current components, current gains. Alpha and vita operating point. High bride model, h- parameter equivalent circuits. CE, CB and Cc configuration Dc and ac analysis of CE, CC and CB amplifiers Evers- moll model. Biasing and stabilization techniques. Thermal run away, thermal stability. Equivalent circuits and blessing of JFETs and MOSFETs. Low frequency CS and CD JFET amplifiers. FET as a voltage variable resistor.		
UNIT-4	7	20
Small signal amplifiers at low frequency: analysis of BJT and FET, dc and rc coupled amplifiers Frequency response Mid band gain, gains at low and high frequency. Analysis of dc and differential amplifiers, Millers' theorem. Cascading transistor amplifiers, Darlington and cascaded circuits. Emitter and source followers.		
UNIT-5	8	20
Oscillators: concept of feedback classification, criterion for oscillation. Tuned collector, Hartley Colpitts. Rc- phase shift, Wein bridge and crystal oscillators, astable, monostable and bistable multivibrators. Schmitt trigger		
TOTAL	**36**	**100**

Reference Books:

1. J.Millman& C.C. Halkias :Integrated Electronics, McGraw Hill, (2009)
2. MillmanGrabel: Microelectronics, McGraw Hill, (2009)

Course outcomes:

On successful completion of the course, the student will be able to:

- Ability to demonstrate the ability to design and conduct experiments, analyse and interpret data.
- Ability to demonstrate the ability to design a system, component or process as per needs.
- Learn about the electronic devices, which are in use in industry to design electronic circuits.
- Be able to effectively provide detailed explanation to the structure and operation of common linear components
- Ability to use tools/test equipment to analyze electronic components
- Ability to perform basic electronics troubleshooting
- Apply critical thinking in solving industrial electronic problems
- Perform electronics calculation.
- Design basic electronic circuits
- Gain some experience with operational amplifiers and Oscillators.

Mapping Course Outcomes with Program Outcomes:

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Course outcomes	Program outcomes										
	1	2	3	4	5	6	7	8	9	10	11
1	M	S	M	S	S	S	M	M	M	M	S
2	S	S	M	S	S	S	M	M	M	S	S
3	S	S	M	S	S	M	S	S	M	M	S
4	M	S	M	M	S	S	M	M	M	S	M
5	S	S	M	S	S	S	M	M	M	M	S
6	S	S	M	S	M	S	M	S	M	M	S
7	S	S	M	S	S	S	M	M	M	S	M
8	S	M	M	S	S	M	M	M	M	M	S
9	S	S	M	S	S	S	M	M	M	M	S
10	S	S	M	S	S	S	M	M	M	M	M

Course Title: **Data Structure and Algorithm Lab**		Course Code	: **CP251**
Semester	: **III**	Core / Elective	: **PC**
Teaching Scheme in Hrs (L:T:P)	: 0**:0:2+2**	Credit	: **2 Credit**
Type of course	: **Practical + Assignments**	Total Contact Hours	: **40**
Continuous Internal Evaluation	: **60 Marks**	ESE	: **40 Marks**
Programmes	: **B.TECH. CSE**		

Week 1: Write a C program that uses functions to perform the following:

a. Create a singly linked list of integers.

b. Delete a given integer from the above linked list.

c. Display the contents of the above list after deletion.

Week 2: Write a C program that uses functions to perform the following:

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a. Create a doubly linked list of integers.

b. Delete a given integer from the above doubly linked list.

c. Display the contents of the above list after deletion.

Week 3: Write a C program that uses stack operations to convert a given infix expression into its postfix Equivalent, Implement the stack using an array.

Week 4: Write C programs to implement a double ended queue ADT using i)array and ii)doubly linked list respectively.

Week 5: Write a C program that uses functions to perform the following:

b. Create a binary search tree of characters.

c. Traverse the above Binary search tree recursively in Post order.

Week 6: Write a C program that uses functions to perform the following:

a. Create a binary search tree of integers.

b. Traverse the above Binary search tree non recursively in in order.

Week 7: Write C programs for implementing the following sorting methods to arrange a list of integers in Ascending order:

a. Insertion sort

b. Merge sort

Week 8: Write C programs for implementing the following sorting methods to arrange a list of integers in ascending order:

a. Quick sort

b. Selection sort

Week 9:

i. Write a C program to perform the following operation:

   a. Insertion into a B-tree.

ii. Write a C program for implementing Heap sort algorithm for sorting a given list of integers in ascending order.

Week 10: Write C programs for implementing the following graph traversal algorithms:

a. Depth first traversal

b. Breadth first traversal

Course Title: **Industrial oriented Python Project Lab**		Course Code	: **CP255**
Semester	: **III**	Core / Elective	: **PC**
Teaching Scheme in Hrs (L:T:P)	: 0**:0:2+2**	Credit	: **2 Credit**
Type of course	: **Practical + Assignments**	Total Contact Hours	: **40**
Continuous Internal Evaluation	: **60 Marks**	ESE	: **40 Marks**
Programmes	: **B.TECH. CSE**		

1. Write a program to implement the operations on stacks using python.
2. Write a program to implement the operations on circular queues using python.
3. Write a program for sorting a list using Bubble sort and then apply binary search using python.

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4. Write a program to create a binary search tree and for implementing the in order, pre order, post order traversal using recursion using python.
5. Write a program for finding the Depth First Search of a graph, and Breadth First Search of a graph using python.
6. Write programs for polish notation
   (a) Write a program for converting a given infix expression to postfix form using python.
   (b) Write a program for evaluating a given postfix expression using python.
7. Write a program for implementing the operations of a de-queuer using python.
8. Write a program for the representation of polynomials using circular linked list and for the addition of two such polynomials using python.
9. Practice of the followings
   (a) Write a program for quick sort using python.
   (b) Write a program for Heap sort using python.
   (c) Write a program for Merge sort using python.
10. a) Write a program for finding the transitive closure of a digraph using python.
    b) Write a program for finding the shortest path from a given source to any vertexina digraph using Dijkstra's algorithm using python.

Course Title: **INTERNET PROGRAMING LAB**		Course Code	:CP253
Semester	: **III**	Core / Elective	: PE
Teaching Scheme in Hrs (L:T:P)	: 0**:0:2**	Credit	: **1 Credit**
Type of course	: **LAB+ Assignments**	Total Contact Hours	: **20**
Continuous Internal Evaluation	: **60 Marks**	ESE	: **40 Marks**
Programmes	: **B.TECH. CSE**		

List of Experiments:

1. Create a bio-data of self-using HTML with a photograph

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on the page and containing marks in a table.

2. Develop your web page with the following properties.
   (a) Photographs display at the same place, which can flip on mouse over.
3. Link to separate HTML file for academics, sports and other interests.
4. Enhance your Web page using style sheets, frames and setup a hyper link to your friend's page.
5. Make a form for submission of Querying about the interest rates of bank (use Text fields of HTML) and submit buttons of HTML.
6. Make a local query form, which takes in the input the range of marks through Text fields and display the list of students having marks in that range in another window.
7. Enhance the above query through password protection.
8. Build a shopping Cart page in which items of 10 types are picked and quantity and a bill is generated by the web page.
9. Enhance the above page for making a payment through electronic billing system.
10. Associate guest book in your web page.
11. Setup a Counter to count the number of visitors on your web page.

Course Title:	: **Digital Logic Design Lab**	Course Code	:EC255
Semester	: **III**	Core / Elective	: PE
Teaching Scheme in Hrs (L:T:P)	: 0**:0:2**	Credit	: **1 Credit**
Type of course	: **LAB+ Assignments**	Total Contact Hours	: **20**
Continuous Internal Evaluation	: **60 Marks**	ESE	: **40 Marks**
Programmes: **B.TECH. CSE**			

1. **Experiment 1 (Truth Table and Logic Gates)**
   (a) To study and verify the truth table of various logic

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gates (NOT, AND, OR, NAND, NOR, EX-OR, & EX-NOR).

2. **Experiment 2 (Half Adder)**
   (a) To design and verify a half adder using AND gate & X-OR gate
3. **Experiment 3 (Full Adder)**
   (a) To design and verify a full adder using two half adder
   (b) To design and verify a full adder using full adder IC 7483.
4. **Experiment 4 (Half Subtracted)**
   (a) I. To design and verify a half subtract
   (b) II. To design and verify a half sub tractor using D = x X-OR y B=x'y.
5. **Experiment 5 (Combinational Circuit, BCD, Number Converter etc.)**
   (a) I. Design a 4 bit magnitude comparator using combinational circuits.
   (b) II. Design a BCD to Excess 3 code converter using combinational circuits.
6. **Experiment 6 (Multiplexer)**
   (a) I. To design and implement a 8:1 multiplexer.
   (b) II. To design and implement an 16:1 multiplexer
7. **Experiment 7 (Demultiplexer)**
   (a) I. To design and implement a 1:8 demultiplexer.
   (b) II. To design and implement a 16:1 demultiplexer.
8. **Experiment 8 (Decoder)**
   (a) I. To design and verify a 2:4 decoder.
   (b) II. To design and verify a 3:8 decoder.
9. **Experiment 9 (Encoder)**
   (a) I. To design and implement a 4:2 encoder.
   (b) II. To design and implement a 8:3 encoder.
10. **Experiment 10 (Flip-Flops)**
    (a) I. To design and verify the operation of RS flip-flops using logic gates.
    (b) II To design and verify the operation of T,D,J-K flip-flops using logic gate.

Course Title: **Electronic Devices & Circuits Lab**		Course Code	: EC253
Semester	: **III**	Core / Elective	: PE
Teaching Scheme in Hrs (L:T:P)	: 0**:0:2**	Credit	: **1 Credit**
Type of course	: **LAB+ Assignments**	Total Contact Hours	: **24**
Continuous Internal Evaluation	: **60 Marks**	ESE	: **40 Marks**
Programmes	: **B.TECH. CSE**		

List of Experiment

1. Study the following devices:

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(a) Analog & digital multimeters

(b) Function/ Signal generators

(c) Regulated d. c. power supplies (constant voltage and constant current operations)

(d) Study of analog CRO, measurement of time period, amplitude, frequency & phase

2. Plot V-I characteristic of P- N junction diode & calculate cut-in voltage, reverse saturation current and static & dynamic resistances.
3. Plot input and output characteristics of BJT in common base configuration.
4. Plot input and output characteristics of BJT in common emitter configuration.
5. 6 . Plot input and output characteristics of BJT in common collector configuration.
6. Plot frequency response curve for single stage amplifier and to determine gain bandwidth product.
7. Plot drain current - drain voltage and drain current – gate bias characteristics of field effect transistor and measure of Idss & Vp
8. Application of Diode as clipper & clamper
9. Plot gain- frequency characteristic of two stage RC coupled amplifier & calculate its bandwidth and compare it with theoretical value.
10. Plot gain- frequency characteristic of emitter follower & find out its input and output resistances.
11. Study half wave rectifier and effect of filters on wave. Also calculate theoretical & practical ripple factor.

Course Title: **Microprocessor and Interface**		Course Code	: **EC212**
Semester	: **IV**	Core / Elective	: **PC**
Teaching Scheme in Hrs (L:T:P)	: 3**:0:0**	Credit	: **3 Credit**
Type of course	: **Lecture + Assignments**	Total Contact Hours	: **36**
Continuous Internal Evaluation	: **40 Marks**	ESE	: **60 Marks**
Programmes	: **B.TECH. CSE**		

Pre-requisites:

Switching Theory & Logic Design (EC223)

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Course Objectives:

- To learn importance of microprocessors and microcontrollers.
- To learn and understand architecture and programming of 8085 processor.
- To learn and understand interfacing techniques like memory and I/O Interfacing with 8085.
- To learn and understand architecture and programming of 8051 microcontroller.
- To learn and understand generation of time delay, serial communication and interrupts.
- To learn and understand the development of microprocessor and microcontroller based system.

Course Content:

Topic and Contents	Hours	Marks
UNIT-1	**7**	**20**
8085 Architecture: Introduction to microprocessors and microcontrollers, 8085 Processor Architecture, Internal operations, Instructions and timings, Programming the 8085 – Introduction to 8085 instructions, addressing modes and Programming techniques with Additional instructions.		
UNITS-2	**7**	**20**
Stacks and subroutines, interfacing peripherals: Basic interfacing concepts, interfacing output displays, interfacing input keyboards. Interrupts - 8085 Interrupts, Programmable Interrupt Controller (8259A). Direct Memory Access (DMA) – DMA Controller (Intel 8257), Interfacing 8085 with Digital to Analog and Analog to Digital converters.		
UNITS-3	**7**	**20**
Programmable peripheral interface (8255A), Programmable communication interface (8251), Programmable. Interval timer (I8253 and 8254), Programmable Keyboard / Display controller (8279). Serial and parallel bus standards RS 232 C.		
UNIT-4	**8**	**20**
Introduction to Microcontrollers, 8051 – Architecture – Instruction set, Addressing modes and Programming Techniques. Comparison of various families of 8-bit micro controllers. System Design Techniques Interfacing of LCD, Stepper motor, keyboard.		
UNIT-5	**7**	**20**
Microprocessor Applications and trends in microprocessor Technology – 8-bit, 16-bit and 32-bit microprocessors .Advanced Processor Architecture – Register structure, Instruction set, Addressing modes of 8086. Pentium and Multi-Core Processors.		
TOTAL	**36**	**100**

Reference Books:

1. Ramesh S Gaonkar - Microprocessor architecture, Programming and applications with 8085, 5/E Prentice Hall, (2002)
2. Barry B. Brey - The Intel Microprocessor, 8086/8088,8018/80188, 80286, 80386, 80486, Pentium and Pentium pro-processors – architecture, Programming and interfacing, 4 Edition, Prentice Hall, (1993)
3. Kenneth Ayala -"The 8051 Microcontroller" West publishing company ,(1995)

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4. Tata McGraw-Hill MykePredko- programming and customizing the 8051 Microcontroller, (1994).

Course outcomes:

On successful completion of the course, the student will be able to:

- Understand the architecture, design and signal description of 8086 microprocessor.
- Ability to program a microprocessor system using assembly language using instruction set of 8086.
- Ability to interface the microprocessor with the I/O devices.
- Develop simple applications on microprocessor and microcontroller-based systems.
- Can Interface various I/o devices like stepper motor, AID and DIA converters and go on by using interfacing devices
- Illustrate the 8051 architecture, pin configuration and memory expansion capability
- Develop assembly language programming by studying instruction set of 8051 μc.
- Interface various industrial applications and develop the micro computer based systems.

Mapping Course Outcomes with Program Outcomes:

Course outcomes	Program outcomes										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1	M	S	S	S	S	S	M	M	M	S	M
2	M	S	S	S	S	M	M	S	M	M	S
3	S	M	S	S	S	M	M	M	S	M	S
4	M	S	S	M	S	M	M	M	M	M	S
5	M	M	M	S	S	M	S	S	M	M	M
6	M	S	S	S	S	M	M	M	M	M	S
7	S	S	S	S	M	M	M	M	M	M	S
8	M	S	S	S	S	M	S	M	M	M	S

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Course Title	:**Software Engineering**	Course Code	:**CP202**
Semester	: **IV**	Core / Elective	: **PC**
Teaching Scheme in Hrs (L:T:P)	: 3**:0:0**	Credit	: **3 Credit**
Type of course	: **Lecture + Assignments**	Total Contact Hours	: **36**
Continuous Internal Evaluation	: **40 Marks**	ESE	: **60 Marks**
Programmes	: **B.TECH. CSE**		

Pre-requisites:

Principle of Programming Language (CP203), Internet Programming (CP205)

Course Objectives:

- Knowledge of basic SW engineering methods and practices, and their appropriate application;
- A general understanding of software process models such as the waterfall and evolutionary models.
- An understanding of the role of project management including planning, scheduling, risk management, etc.
- An understanding of software requirements and the SRS document.
- An understanding of different software architectural styles.
- An understanding of implementation issues such as modularity and coding standards.
- An understanding of approaches to verification and validation including static analysis, and reviews.
- An understanding of software testing approaches such as unit testing and integration testing.
- An understanding of software evolution and related issues such as version management.
- An understanding on quality control and how to ensure good quality software.
- An understanding of some ethical and professional issues that are important for software engineers.

Course Content:

Topic and Contents	Hours	Marks
UNIT-1	**7**	**20**
Overview of System Analysis & Design, Business System Concept, System Development Life Cycle, Waterfall Model, Spiral Model, Feasibility Analysis, Technical Feasibility, Cost- Benefit Analysis, COCOMO model.		
UNITS-2	**7**	**20**
System Requirement Specification – DFD, Data Dictionary, ER diagram, Process Organization & Interactions. System Design – Problem Partitioning, Top-Down And Bottom-Up design ;Decision tree, decision table and structured English; Functional vs. Object- Oriented approach		
UNITS-3	**7**	**20**
Coding & Documentation – Structured Programming, OO Programming, Information Hiding, Reuse, System Documentation Guidelines, Modern Programming Language Features: Type checking, User defined data types, Data Abstraction, Exception Handling, Concurrency Mechanism.		

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UNIT-4	8	20
Software Quality,Testing – Levels of Testing, Integration Testing, Test case Specification, Reliability Assessment .Validation &Verification Metrics, Monitoring & Control.Art of Debugging		
UNIT-5	**7**	**20**
Software Project Management – Project Scheduling , Staffing, Software Configuration Management, Quality Assurance, Project Monitoring. CASE TOOLS : Concepts, use and application		
TOTAL	**36**	**100**

Reference Books:

1. R. G. Pressman – Software Engineering, TMH, (2014)
2. Behforooz - Software Engineering Fundamentals, OUP, (2014)

Course outcomes:

On successful completion of the course, the student will be able to:

- An understanding of professional and ethical responsibility.
- An ability to communicate effectively.
- An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
- The ability to analyze, design, verify, validate, implement, apply, and maintain software systems.
- The ability to appropriately apply discrete mathematics, probability and statistics, and relevant topics in computer science and supporting disciplines to complex software systems.
- Design applicable solutions in one or more application domains using software engineering approaches that integrate ethical, social, legal and economic concerns.
- Deliver quality software products by possessing the leadership skills as an individual or contributing to the team development and demonstrating effective and modern working strategies by applying both communication and negotiation management skill.
- Apply new software models, techniques and technologies to bring out innovative and novelistic solutions for the growth of the society in all aspects and evolving into their continuous professional development.

Mapping Course Outcomes with Program Outcomes:

Course outcomes	Program outcomes										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1	M	S	M	M	S	M	M	S	M	M	S
2	S	S	S	M	S	M	S	S	M	S	M
3	S	M	S	M	S	M	M	M	M	S	M
4	S	S	S	M	S	M	S	S	M	M	M
5	S	S	S	M	S	M	S	S	M	M	M
6	S	M	S	M	S	M	M	M	M	S	S
7	S	S	S	M	S	M	S	S	M	M	S

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8	M	S	S	M	S	M	S	S	M	S	S

Course Title: **Discrete Maths and Graph Theory**		Course Code	:**CP204**
Semester	: **IV**	Core / Elective	: **PC**
Teaching Scheme in Hrs (L:T:P)	: 3**:0:0**	Credit	: **3 Credit**
Type of course	: **Lecture + Assignments**	Total Contact Hours	: **36**
Continuous Internal Evaluation	: **40 Marks**	ESE	: **60 Marks**
Programmes	: **B.TECH. CSE**		

Pre-requisites:

Data Structure and Algorithm (CP201)

Course Objectives:

- This course covers several important topics of Discrete Mathematics.
- This includes Set theory and logic, relations, partially ordered sets.
- Boolean algebra and Boolean functions, analysis of algorithms, recurrence relations, finite state machines, discrete probability and graph theory.
- The applications of these topics are also discussed.

Course Content:

Topic and Contents	Hours	Marks
UNIT-1	**7**	**20**
Set Theory : Introduction to the theory of sets; combination of sets; power sets; finite and infinite sets; principle of inclusion and exclusion; selected problems from each topic		

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UNITS-2	7	20
Logic Proposition, predicate logic, logic operators, logic proposition and proof, method of proofs. **Mathematical Induction** Different forms of the principle of mathematical induction. selected problems on mathematical induction.		
UNITS-3	**7**	**20**
Discrete Probability:-Counting principles. Random experiment; sample space; events; axioms of probability; conditional probability. Theorem of total probability; Bayes' theorem. Application to information theory: information and mutual information. **Graph theory :-**Path, cycles, handshaking theorem, bipartite graphs, sub-graphs, graph isomorphism, operations on graphs, Eulerian graphs and Hamiltonian graphs, planar graphs, Euler formula, traveling salesman problem, shortest path algorithms.		
UNIT-4	**8**	**20**
Relations :-Definitions and properties; Equivalence relations and equivalence classes. Representations of relations by binary matrices and digraphs; operations on relations. Closure of a relation; reflexive, symmetric and transitive closures. Warshall's algorithm to compute transitive closure of a relation. **Partially Ordered Sets and Lattices :-**Partial order relations; POSETS; lattices		
UNIT-5	**7**	**20**
Boolean Algebra and Boolean Functions Introduction to Boolean algebra and Boolean functions. Different representations of Boolean functions. Application of Boolean functions to synthesis of circuits **Discrete Numeric Functions :-**Introduction of discrete numeric functions; asymptotic behaviour; generating functions.		
TOTAL	**36**	**100**

Reference Books:

1. Liu C. L. - Elements of Discrete Mathematics, Second Edition, Mc Graw Hill, (1985)
2. Mott J. L. - Kandel A. and Baker T. P., Discrete Mathematics for Computer Scientists and Mathematicians, Second Edition, Prentice Hall India, (1986)
3. Harary F. - Graph Theory, Narosa, (1969)
4. Thomas H. C. - Leiserson C. E.; Rivest R. L.; Stein C., Introduction to Algorithms (2nd ed.). MIT Press and McGraw-Hill, (2001)

Course outcomes:

On successful completion of the course, the student will be able to:

- Understand the structure and types of proofs in mathematics.
- Define and relate basic notions in graph theory.
- Apply algorithms and theorems from graph theory on solving problems.

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- Use mathematics literature from variety of sources and at least one text processor and LMS suitable for mathematics.
- Structure and solve real work problems by tools from discrete mathematics and graph theory working in teams.
- Understand proofs by induction thoroughly and be fluent in their construction;
- Read and understand written descriptions of algorithms;
- Develop and apply simple algorithms to solve problems or prove theorems;
- Give the basic definitions of graph theory and a range of standard examples including, for example, complete graphs and bipartite graphs;
- Characterise planar graphs and prove the five-colour theorem.
- Apply the knowledge and skills obtained to investigate and solve a variety of discrete mathematical problems
- Communicate both technical and non-technical information in a range of forms (written, oral, electronic, graphic,) and work as an effective team member.
- Ability to learn theoretical computing.

Mapping Course Outcomes with Program Outcomes:

Course outcomes	Program outcomes										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1	S	M	M	M	S	M	S	S	M	S	S
2	M	M	S	S	S	M	M	S	M	S	M
3	S	M	S	S	S	M	S	S	M	S	S
4	S	S	S	M	S	M	S	S	M	S	S
5	S	M	S	S	S	M	S	S	M	S	S
6	S	S	S	S	S	M	M	M	M	S	M
7	S	M	M	S	S	M	S	S	M	S	S
8	S	S	S	S	S	M	S	S	M	S	S
9	S	M	S	S	S	M	S	M	M	S	S
10	S	S	S	M	S	M	S	S	M	S	S
11	S	M	S	S	S	M	S	S	M	S	S
12	S	M	S	S	S	M	S	S	M	S	S
13	S	M	S	S	S	M	S	S	M	S	S

Course Title	:**CORE JAVA**	Course Code	:**CP206**
Semester	: **IV**	Core / Elective	: **PC**
Teaching Scheme in Hrs (L:T:P)	: 3**:0:0**	Credit	: **3 Credit**
Type of course	: **Lecture + Assignments**	Total Contact Hours	: **36**

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Continuous Internal Evaluation	: **40 Marks**	ESE	: **60 Marks**
Programmes	: **B.TECH. CSE**		

Pre-requisites:

Principle of Programming Language (CP203), Internet Programming (CP205).

Course Objectives:

- Demonstrate knowledge of Java technology, the Java programming language, and the product life cycle.
- Use various Java programming language constructs to create several Java technology applications.
- Use decision and looping constructs and methods to dictate program flow.
- Implement intermediate Java technology programming and object-oriented (OO) concepts in Java technology programs.

Course Content:

Topic and Contents	Hours	Marks
UNIT-1	**7**	**20**
An overview of Java: Object oriented programming, Two paradigms, abstraction, the, OOP principles, Java class libraries Date types, variables and arrays: Integers, floating-point types, characters, Boolean, Iterates, Variable, Data types and casting, automatic type promotion in expressions arrays.		
UNITS-2	**7**	**20**
Operators: Arithmetic operators, bit wise operators, relational operators, Boolean logical assignment operators, conditional Operator, operator precedence **Control statements:** -Java's selection statements, iteration statements, jump statements **Introduction to classes:** Class fundamentals, declaring object reference variable, Introducing methods, constructors the key word, garbage collection, the finalize () method. **Methods and Classes:-**Overloading methods, using objects as parameters, recursion **Inheritance:** Inheritance basics, using super, method overriding, dynamic method dispatch, using abstract Classes		
UNITS-3	**7**	**20**
Using final with inheritance, Package and Interfaces, Package access's protection, importing packages Exception handling: Exception handling fundamentals. Exception types, Uncaught Exceptions Using try and catch, multiple catch clauses, nested try statements throw, Finally Java built in exception creating your own exception subclasses, using exceptions. **Multithreaded Programming:** The Java thread model, the main thread, creating thread, creating multiple thread, using alive () and join (). Thread priorities,		

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synchronization, Inter thread Communications, suspending resuming and stopping thread using multithreading		
UNIT-4	**8**	**20**
String handling: The string constructor, string length, special string operator character extraction, string comparison, searching string, modifying string, data conversion, changing the case of characters, string buffer.		
UNIT-5	**7**	**20**
Networking: Networking basics, Java and the Internet Address, TCP/IP client Sockets URL,URL connection, TCP/IP server Sockets The Applet Class **The Applet Class:** Its architecture displays methods. The HTML APPLET. Passing parameters to Applet. The get Documentation Base () and get Code Base () methods Applet Context and Show Document.		
TOTAL	**36**	**100**

Reference Books:

1. Schildt - 2:The Complete Reference, ata McGraw-Hill Education, (2002)
2. Cay S. - Horstmann, Core Java-I, Addison Wesley, (March 2016)
3. Cay S. - Horstmann, Core Java-II, Addison Wesley, (March 2012)

Course outcomes:

On successful completion of the course, the student will be able to:

- Ability to use the Java SDK environment to create, debug and run Java standalone and applet programs.
- Ability to design and build robust and maintainable web applications by creating dynamic HTML.
- Students will demonstrate their ability to work on larger, more complex projects by collaboratively designing and then individually implementing applications.
- Ability to learn advance java programming.
- Read and understand Java-based software code of medium-to-high complexity.
- Use standard and third party Java's API's when writing applications.
- Understand the basic principles of creating Java applications with graphical user interface (GUI).
- Understand the basic approaches to the design of software applications.
- Apply the above to design, implement, appropriately document and test a Java application of medium complexity, consisting of multiple classes.

Mapping Course Outcomes with Program Outcomes:

Course outcomes	Program outcomes										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1	S	S	S	S	S	M	S	S	M	M	M
2	S	S	S	S	S	M	S	S	S	M	S
3	S	M	M	S	S	M	S	M	M	S	M
4	S	S	S	S	S	M	S	S	S	M	S
5	M	M	M	S	S	M	S	M	M	M	S
6	S	S	S	S	M	M	M	S	M	S	M
7	M	S	M	S	S	M	M	S	M	M	S

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8	S	M	S	S	S	M	S	S	M	M	M
9	S	S	M	M	S	M	S	S	M	M	S

Course Title	: **Business Economics**	Course Code	: CP209
Semester	: **IV**	Core / Elective	: **PC**
Teaching Scheme in Hrs (L:T:P)	: 3**:0:0**	Credit	: 3 **Credit**
Type of course	: **Lecture + Assignments**	Total Contact Hours	: **36**
Continuous Internal Evaluation	: **40 Marks**	ESE	: **60 Marks**
Programmes	: **B.TECH. CSE**		

Pre-requisites:

Employability Skill 2(ES201)

Course Objectives:

- To develop communication competence in prospective engineers. To enable them to convey thoughts and ideas with clarity and focus.
- To develop report writing skills. To equip them to face interview & Group Discussion. To inculcate critical thinking process.

Course Content:

Topic and Contents	Hours	Marks
UNIT-1	6	20
Communication Skill: Introduction to Communication, The Process of Communication, Barriers to Communication, Listening Skills, Writing Skills, Technical Writing, Letter Writing, Job Application, Report Writing, Non-verbal Communication and Body Language, Interview Skills, Group Discussion, Presentation Skills, Technology-based Communication		
UNITS-2	7	20
Critical Thinking & Problem Solving: Creativity, Lateral thinking, Critical thinking, Multiple Intelligence, Problem Solving, Six thinking hats Mind Mapping & Analytical Thinking.		

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UNITS-3	7	20
Teamwork: Groups, Teams, Group Vs Teams, Team formation process, Stages of Group, Group Dynamics, Managing Team Performance & Team Conflicts.		
UNIT-4	6	20
Ethics, Moral & Professional Values: Human Values, Civic Rights, Engineering Ethics, Engineering as Social Experimentation, Environmental Ethics, Global Issues, Code of Ethics like ASME, ASCE, IEEE.		
UNIT-5	8	20
Leadership Skills: Leadership, Levels of Leadership, Making of a leader, Types of leadership, Transactions Vs Transformational Leadership, VUCA Leaders, DART Leadership, Leadership Grid & leadership Formulation.		
TOTAL	**36**	**100**

Reference Books:

1. Barun K. Mitra;, "Personality Development & Soft Skills", First Edition; Oxford Publishers, (2011).
2. Kalyana; "Soft Skill for Managers"; First Edition; Wiley Publishing Ltd, (2015).
3. Larry James; "The First Book of Life Skills"; First Edition; Embassy Books, (2016).

Course outcomes:

On successful completion of the course, the student will be able to:

- Understand and apply supply and demand analysis to relevant economic issues;
- Apply marginal analysis to the "firm" under different market conditions;
- Understand the causes and consequences of different market structures;
- Apply economic models to examine current economic issues and evaluate policy options for addressing these issues;
- Analyse the causes and effects of changes in real GDP;
- Understand the concept of macroeconomic equilibrium and implications for the management of the business cycle;
- Identify and explain changes in the money supply and analyse the effects of monetary policy changes.

Mapping Course Outcomes with Program Outcomes:

Course outcomes	Program outcomes										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1	M	S	S	S	S	M	M	S	S	S	M
2	S	S	S	S	S	S	M	M	S	S	S
3	M	S	M	S	S	M	M	M	M	M	S

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4	S	S	S	S	M	S	S	M	S	S	S
5	M	S	S	S	S	M	S	M	S	M	M
6	S	M	M	M	S	S	S	M	S	S	S
7	S	S	S	S	S	M	M	M	S	M	M

Course Title: **Open Source Technology**		Course Code	:CP208
Semester	: **IV**	Core / Elective	: **PE**
Teaching Scheme in Hrs (L:T:P)	: 3**:0:0**	Credit	: **3 Credit**
Type of course	: **Lecture + Assignments**	Total Contact Hours	: **36**
Continuous Internal Evaluation	: **40 Marks**	ESE	: **60 Marks**
Programmes	: **B.TECH. CSE**		

Pre-requisites:

Industrial oriented Python Project Lab (CP255).

Course Objectives:

- The objective is to teach the students the principles of open source technology, benefits of open source, and the product that includes permission to use its source code, design documents, or contents.
- The students will also study and understand the different open source licenses and how to start an open source project.

Course Content:

Topic and Contents	Hours	Marks
UNIT-1	7	20
OST overview: Evolution & development of OST and contemporary technologies, Factors leading to its growth. Open Source Initiative (OSI), Free Software Foundation		

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and the GNU Project, principle and methodologies. Contexts of OST (India & international). Applications of open source (open source teaching and open source media) Risk Factors. Myths regarding open source.		
UNITS-2	7	20
Philosophy of Software Freedom, Free Software, OSS, Closed software, Public Domain Software, Shared software, Shared source. Detail of few OSS like Open Audio, Video, 2d & 3d graphics software, system tools, office tools, Networking & internet, Security, Educational tools and Games.		
UNITS-3	7	20
Open Source Development Model, Starting and Maintaining an Open Source Project Open Source Hardware, Open Source Design, Ongoing OS Projects (i.e. examples of few good upcoming software projects.) Case Study: - Linux, Wikipedia.		
UNIT-4	8	20
Licenses and Patents: What Is A License, How to create your own Licenses? Important FOSS Licenses (Apache, SD, GPL, LGPL), copyrights and copy lefts, Patents.		
UNIT-5	7	20
Social and Financial impacts of open source technology, Economics of FOSS: Zero Marginal Cost, Income generation Opportunities, Problems with traditional commercial software, Internationalization, Open Source as a Business Strategy.		
TOTAL	**36**	**100**

Reference Books:

1. Viswanathan Arunachalam Introduction to Probability and Stochastic Processes with Applications - Liliana Blanco Castaneda, Selvamuthu Dharmaraja, Wiley, New Jersey, (June 2012)
2. Kishor S. Trivedi Probability and Statistics with Reliability, Queueing and Computer Science Applications, John Wiley, second edition, (2001)
3. Sheldon M. Ross Introduction to Probability Models , Academic Press, ninth edition, (2000)

Course outcomes:

On successful completion of the course, the student will be able to know about:

- To provide a basic idea of Open source technology, their software development process so as to understand the role and future of open source software in the industry along with the impact of legal, economic and social issues for such software.
- Ability to develop more robust applications.
- Ability to work on multiple platforms simultaneously.
- Ability to test and evaluates the software projects critically on different platforms.

Mapping Course Outcomes with Program Outcomes:

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Course outcomes	Program outcomes										
	1	2	3	4	5	6	7	8	9	10	11
1	S	S	S	S	M	M	M	S	S	M	S
2	M	M	S	S	S	S	M	S	M	M	M
3	S	S	S	M	S	M	M	S	S	M	S
4	M	S	S	S	M	M	S	S	S	M	M

Course Title	: **E-Commerce**	Course Code	:**CP217**
Semester	: **IV**	Core / Elective	: **PE**
Teaching Scheme in Hrs (L:T:P)	: 3**:0:0**	Credit	: **3 Credit**
Type of course	: **Lecture + Assignments**	Total Contact Hours	: **36**
Continuous Internal Evaluation	: **40 Marks**	ESE	: **60 Marks**
Programmes	: **B.TECH. CSE**		

Pre-requisites:

Internet Programming (CP205).

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Course Objectives:

1. Find and assess e-commerce web sites for quality, reliability and effectiveness;
2. Evaluate e-commerce markets and transactions, including supply chains;
3. Assess the effect of changing technology on traditional business models and strategy;
4. Assess the impact e-commerce is having on how firms are organized and behave;
5. Consider ethical and legal issues related to e-commerce technologies such as manipulation of graphic and sound information, privacy and control of electronic media;
6. Design and prepare informative, organized, and accurate e-commerce related presentations of text, audio and graphical information taking into account technical and aesthetic considerations;
7. Make ethical decisions related to e-commerce considering laws, privacy, and security.
8. Communicate effectively and ethically using electronic media
9. Transmit text, graphics, and sound data electronically.

Course Content:

Topic and Contents	Hours	Marks
UNIT-1	7	20
Introduction: Motivation, Forces behind E-Commerce Industry Framework, Brief history of Ecommerce, Inter Organizational E-Commerce Intra Organizational E-Commerce and Consumer to Business Electronic Commerce, Architectural Framework, Network Infrastructure for E-commerce, Market forces behind I way, Component of I way Access Equipment, Global Information Distribution Network, Broad Band Telecommunication.		
UNITS-2	7	20
Mobile Commerce: Introduction of Mobile Commerce, Mobile Computing Application, Wireless Application Protocols, Wap Technology, Mobile Information Devices, Web Security, Firewalls and Transaction Security, Client Server Network, Emerging Client Server Security threats, Firewalls and Network Security		
UNITS-3	7	20
Encryption: World Wide Web & Security, Encryption, Transaction Security, Secret Key Encryption, Public Key Encryption, Virtual Private Network, Implementation Management Issues.		
UNIT-4	8	20
Electronic Payments: Overview of Electronics payments, Digital Token based Electronic payment system, Smart cards, Credit card I debit Card Based EPS, Emerging Financial Instruments, Home Banking, Online Banking.		
UNIT-5	7	20
Net Commerce: EDA, EDI Application in Business, Legal Requirement in E-Commerce, Introduction to supply chain management, CRM, issues in CRM.		
TOTAL	**36**	**100**

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Reference Books:

1. David Whiteley - E-Commerce Strategy, Technology and Application, Tata McGraw Hill, (2001).
2. Mathew Reynolds - Beginning E-commerce with Visual Basic ASP, SQL Server 7.0 and MTS, Shroff Publishers & Distributors Pvt. Ltd , (2000).
3. Perrone & Chaganti - Building Java Enterprises System with J2EE, Techmedia, (2016).
4. Kalakota - Frontiers of Electronic Commerce, Pearson Education, (1996).

Course outcomes:

On successful completion of the course, the student will be able to:

1. Ability understand the e-commerce framework.
2. Ability to design and develop various e-commerce web applications as per business need.
3. Ability to understand and evaluate the trade complexities.
4. Ability to analyze the security threats of e-commerce and provide appropriate solution to overcome them.
5. Ability to identify management issues underlying e-Commerce issues including organizational structure, strategic planning, goal setting, corporate social responsibility, international arena, changing market intermediaries, resource allocation and customer service.

Mapping Course Outcomes with Program Outcomes:

Course outcomes	Program outcomes										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1	S	S	S	S	S	M	S	S	M	M	S
2	M	M	M	S	S	S	S	M	M	M	M
3	M	M	S	M	S	M	S	S	M	S	S
4	S	S	S	S	S	S	S	M	M	M	S
5	M	S	M	S	S	M	S	S	M	S	M

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Course Title: **Statistical Probability &Theory**		Course Code	:**MA204**
Semester	: **IV**	Core / Elective	: **UE**
Teaching Scheme in Hrs (L:T:P)	: 3**:0:0**	Credit	: **3 Credit**
Type of course	: **Lecture + Assignments**	Total Contact Hours	: **36**
Continuous Internal Evaluation	: **40 Marks**	ESE	: **60 Marks**
Programmes	: **B.TECH. CSE**		

Pre-requisites:

Advance Maths-III (MA203).

Course Objectives:

- This course is helpful to understand how to quantify randomly varying parameters that is mostly prevalent in real life situations, that finds applications in noise measurements in analog digital and wireless communications.
- The students learn probability theory and random variables, how to deal with Multiple random variables, conditional expectation, independence of random Variables, analysis of random process and applications t o t he signal Processing in the communication system.

Course Content:

Topic and Contents	Hours	Marks
UNIT-1	**7**	**20**
Probability Theory: Axioms of probability, Probability space, Conditional probability, Independence, Baye's rule, Random variable.		
UNITS-2	**7**	**20**
Some common discrete and continuous distributions, Distribution of Functions of Random Variable, Moments, Generating functions, Two and higher dimensional distributions.		
UNITS-3	**7**	**20**
Functions of random variables, Order statistics, Conditional distributions, Covariance, correlation coefficient, conditional expectation, Modes of convergences, Law of large numbers, and Central limit theorem.		
	8	**20**
Stochastic Processes: Definition of Stochastic process, Classification and properties of stochastic processes, Simple stochastic processes, Stationary processes, Discrete and continuous time Markov chains, Classification of states, Limiting distribution,		
UNIT-5	**7**	**20**
Birth and death process, Poisson process, Steady state and transient distributions, Simple Markovian queuing models (M/M/1, M/M/1/N, M/M/c/N, M/M/N/N).		
TOTAL	**36**	**100**

Reference Books:

1. Viswanathan Arunachalam Introduction to Probability and

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Stochastic Processes with Applications, Liliana Blanco Castaneda, Selvamuthu Dharmaraja, Wiley, New Jersey, (June 2012).

2. Probability, Random Variables & Random Signal Principles - Peyton Z. Peebles, TMH, 4th Edition, (2001)
   2. Probability, Random Variables and Stochastic Processes – Athanasios Papoulis and S. Unnikrishna Pillai, PHI, 4th Edition, (2002).
3. Henry Stark and John Probability and Random Processes with Application to Signal Processing (2002).
4. George R. Cooper, Clave D. MC Gillem Methods of Signal and System Analysis., Oxford W. Woods, Pearson Education, 3rd Edition (1999).
5. Probability, 3rd Edition, (1999).
6. S.P. Eugene Xavier Statistical Theory of Communication -, New Age Publications, (2003).
7. Sheldon M. Ross Introduction to Probability Models -, Academic Press, ninth edition, (2000).

Course outcomes:

On successful completion of the course, the student will be able to:

Knowledge and technical competence

- The ability to use the appropriate and relevant, fundamental and applied mathematical and statistical knowledge, methodologies and modern computational tools.

Problem-solving

- The ability to bring together and flexibly apply knowledge to characterise, analyse and solve a wide range of problems.
- An understanding of the balance between the complexity / accuracy of the mathematical / statistical models used and the timeliness of the delivery of the solution.

Mapping Course Outcomes with Program Outcomes:

Course outcomes	Program outcomes										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1	S	S	M	S	M	S	S	M	M	M	S
2	M	S	M	M	S	M	S	M	S	S	S
3	M	S	M	M	S	M	M	M	S	M	S

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Course Title	: **MICROPROCESSOR LAB**	Course Code	: **EC213**
Semester	: **IV**	Core / Elective	: **PC**
Teaching Scheme in Hrs (L:T:P)	: 0:0:2	Credit	: **1 Credit**
Type of course	: **Practical + Assignments**	Total Contact Hours	: **40**
Continuous Internal Evaluation	: **60 Marks**	ESE	: **40 Marks**
Programmes	: **B.TECH. CSE**		

List of Experiments:

1. Study of hardware, functions, memory, and operations of 8085 kit.
2. Program to perform integer addition (two and three numbers 8 bit).
3. Program to perform multiplication (two 8 bit numbers).
4. Program to perform division (two 8 bit numbers).
5. Transfer of a block data in memory to another place in memory in forward and reverse order.
6. Swapping of two block data in memory.
7. Addition of 10 numbers using array.
8. Searching a number in an array.
9. Sorting of array (ascending, descending order).
10. Print Fibonacci sequence. (15 elements)
11. To insert a number at correct place in a sorted array.
12. Interfacing seven segment display using 8255.

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Course Title: **Industrial Oriented Core Java Project Lab**		Course Code	: **CP254**
Semester	: **IV**	Core / Elective	: **PC**
Teaching Scheme in Hrs (L:T:P)	: **0:0:2+2**	Credit	: **2 Credit**
Type of course	: **Practical + Assignments**	Total Contact Hours	: **40**
Continuous Internal Evaluation	: **60 Marks**	ESE	: **40 Marks**
Programmes	: **B.TECH. CSE**		

List of Experiments

1. Write a Java Program to define a class, describe its constructor, overload the Constructors and instantiate its object
2. Write a Java Program to define a class, define instance methods for setting and Retrieving values of instance variables and instantiate its object
3. Write a Java Program to define a class, define instance methods and overload them and use them for dynamic method invocation.
4. Write a Java Program to demonstrate use of sub class.
5. Write a Java Program to demonstrate use of nested class.
6. Write a Java Program to implement array of objects.
7. Write a Java program to practice using String class and its methods.
8. Write a Java program to practice using String Buffer class and its methods.
9. Write a Java Program to implement Vector class and its methods.
10. Write a Java Program to implement Wrapper classes and their methods. import java.io.*

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Course Title: **DESIGN PRACTICE WITH UML LAB**		Course Code	: **CP258**
Semester	: **IV**	Core / Elective	: **PC**
Teaching Scheme in Hrs (L:T:P)	: **0:0:2**	Credit	: **1 Credit**
Type of course	: **Practical + Assignments**	Total Contact Hours	: **20**
Continuous Internal Evaluation	: **60 Marks**	ESE	: **40 Marks**
Programmes	: **B.TECH. CSE**		

In this lab first 8 experiments are to practice software engineering techniques. Use any open source CASE tool. Many of them are available at www.sourceforge.net. You can choose any other CASE tool, as per choice. Language: C++ / JAVA.

Design Approach: Object Oriented these designing can be done on any automation system e.g. library management system, billing s system, payroll system, bus reservation system, gas agency management system, book-shop management system, students management system.

1. Do feasibility study.
2. Document all the requirements as specified by customer in Software Requirement Specification.
3. Design sequence diagrams for project.
4. Design Collaboration diagram.
5. Design Data Flow Diagram for the project.
6. Design Entity Relation Diagram for the project.
7. Design Class diagram.
8. Design at least 10 test cases for each module.
9. Code and test the project, which you have designed in last 8 labs.
10. Design State Chart Diagram.

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Course Title: **Open Source Technology Lab (UNIX/LINUX)**		Course Code	: **CP256**
Semester	: **IV**	Core / Elective	: **PE**
Teaching Scheme in Hrs (L:T:P)	: 0**:0:2+2**	Credit	: **2 Credit**
Type of course	: **Practical + Assignments**	Total Contact Hours	: **20**
Continuous Internal Evaluation	: **60 Marks**	ESE	: **40 Marks**
Programmes	: **B.TECH. CSE**		

List of Experiments

1. Study of Some Basic commands: cp, mv, rm, ln, ls, who, echo, cat, mkdir, rmdir. Wildcards (? *) , I/O redirection (<, >, >>), pipelines (|).
2. Practice commands: xargs, alias, set-unset, setenv-unsetenv, export, source, ps, job, kill.
3. Practice commands: head, tail, cut, paste, sed, grep, sort, uniq, find, locate, chmod.
4. Writing a simple shell script to echo who is logged in.
5. Write a shell script to display only executable files in a given directory.
6. Write a shell script to sort a list of file either in alphabetic order or largest file first according to user response.
7. Write a shell script to count the lines. Words and characters in its input (Note: Don't use wc).
8. Write a shell script to print end of a glossary file in reverse order using array. (Hint: use awk tail).
9. Modify cal command to accept more than one month (e.g. $cal Oct, Nov,) (Hint : use alias too) .
10. Write a shell script to check whether Ram logged in, continue checking every 60 seconds until success.

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Course Title: **DATABASE MANAGEMENT SYSTEMS**		Course Code	: CP301
Semester	: **V**	Core / Elective	: **PC**
Teaching Scheme in Hrs (L:T:P)	: 3**:0:0**	Credit	: 3 **Credit**
Type of course	: **Lecture + Assignments**	Total Contact Hours	: **36**
Continuous Internal Evaluation	: **40 Marks**	ESE	: **60 Marks**
Programmes	: **B.TECH. CSE**		

Pre-requisites:

Software Engineering (CP202), Design Practice with UML Lab(CP258)

Course Objectives:

- To understand the different issues involved in the design and implementation of a database system.
- To study the physical and logical database designs, database modelling, relational, hierarchical, and network models.
- To understand and use data manipulation language to query, update, and manage a database.
- To develop an understanding of essential DBMS concepts such as: database security, integrity, concurrency, distributed database, and intelligent database, Client/Server (Database Server), Data Warehousing.
- To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modelling, designing, and implementing a DBMS.

Course Content:

Topic and Contents	Hours	Marks
UNIT-1	6	20
INTRODUCTION TO DATABASE SYSTEMS: Overview and History of DBMS. File System vs DBMS. Advantage of DBMS Describing and Storing Data in a DBMS. Queries in DBMS. Transaction management and Structure of a DBMS		

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UNITS-2	7	20
ENTITY RELATIONSHIP MODEL: Overview of Data Design Entities, Attributes and Entity Sets, Relationship and Relationship Sets. Features of the ER Model-Key Constraints, Participation Constraints, Weak Entities, Class Hierarchies, Aggregation Conceptual Data Base, Design with ER Model-Entity vs Attribute, Entity vs Relationship Binary vs Ternary Relationship and Aggregation vs ternary Relationship Conceptual Design for a Large Enterprise		
UNITS-3	7	20
RELATIONSHIP ALGEBRA AND CALCULUS: Relationship Algebra Selection and Projection, Set Operations, Renaming, Joints, Division Relation Calculus, Expressive Power of Algebra and Calculus		
UNIT-4	6	20
SQL QUERIES PROGRAMMING AND TRIGGERS: The Forms of a Basic SQL Query, Union, Intersection and Except, Nested Queries, Correlated Nested Queries, Set-Comparison Operations, Aggregate Operators, Null Values Embedded SQL, Dynamic SQL, ODBC and JDBC, Triggers and Active Databases.		
UNIT-5	8	20
SCHEMA REFINEMENT AND NORMAL FORMS: Introductions to Schema Refinement, Functional Dependencies, Boyce-Codd Normal Forms, Third Normal Form Normalization-Decomposition into BCOMPUTER NETWORK F Decomposition into 3-NF manufacturing sector.		
TOTAL	**36**	**100**

Reference Books:

1. C J Date –An introduction to Database Systems, Wesley, 2016.
2. Raghu Rama Krishnan : Database Management Systems ,2nd ed: Tata Mc-Graw Hill , (2009).
3. Silverschatz Korth and Sudarshan -Database Systems Concepts, 4th ed. Tata Mc-Graw Hill, (2009).

Course outcomes:

On successful completion of the course, the student will be able to:

- Ability to understand the role of a database management system in an organization.
- Ability to manage database of an organization.
- Ability to develop logical data models.
- Ability to implement a relational database into a database management system.
- Ability to write SQL queries to fetch data from database.
- Ability to read data mining and data warehousing.
- Ability to work successfully on a team by design and development of a database application system as part of a team.

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Mapping Course Outcomes with Program Outcomes:

Course outcomes	Program outcomes										
	1	2	3	4	5	6	7	8	9	10	11
1	S	M	M	S	S	M	M	M	M	M	M
2	M	M	M	M	S	M	M	S	M	M	S
3	S	S	M	S	M	M	S	M	M	M	M
4	M	M	M	S	S	M	M	M	S	S	S
5	S	M	S	S	S	M	M	M	M	M	S
6	S	M	M	M	S	M	S	S	S	M	S
7	S	M	M	S	S	M	M	M	M	S	S

Course Title: **COMPUTER ARCHITECTURE**		Course Code	: CP302
Semester	: **V**	Core / Elective	: **PC**
Teaching Scheme in Hrs (L:T:P)	: 3**:0:0**	Credit	: **3 Credit**
Type of course	: **Lecture + Assignments**	Total Contact Hours	: **36**
Continuous Internal Evaluation	: **40 Marks**	ESE	: **60 Marks**
Programmes	: **B.TECH. CSE**		

Perquisites:

Microprocessor and Interface (EC212).

Course Objectives:

- To provide the knowledge Computer Systems work & its basic principles.
- To provide the knowledge to analyze the system performance.
- Concepts behind advanced pipelining techniques.
- The current state of art in memory system design.
- To provide the knowledge on Instruction Level Parallelism.

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- To impart the knowledge on nano programming.

Course Content:

Topic and Contents	Hours	Marks
UNIT-1: REGISTER TRANSFER LANGUAGE	7	20
Data movement around registers. Data movement from/to memory, arithmetic and logic micro operations. Concept of bus and timing in register transfer		
UNITS-2: CPU ORGANISATION	7	20
Addressing Modes, Instruction Format. CPU organization with large registers, stacks and handling of interrupts & subroutines Instruction pipelining		
UNITS-3 ARITHMETIC ALGORITHM	7	20
Array multiplier, Booth's algorithm. Addition subtraction for signed unsigned numbers and 2's complement numbers		
UNIT-4: MICROPROGRAMMED CONTROL	7	20
Basic organization of micro-programmed controller. Horizontal & Vertical formats, Address sequencer I/O ORGANISATION: Introduction to Peripherals & their interfacing. Strobe based and handshake-based communication, DMA based data transfer, I/O processor		
UNIT-5: MEMORY ORGANISATION	8	20
Concept of RAM/ROM, basic cell of RAM. Associative memory, Cache memory organization, Virtual memory organization		
TOTAL	**36**	**100**

Reference Books:

1. J.P.Hayes -'Computer Architecture & organization', Mc-Graw Hill , (2012).
2. Heuring-Computer System Design and Architecture, Pearson Education , (2003).
3. William Stallings “Computer Organization and Architecture: Mc-Graw-Hill” 2011.
4. Roberto Naboni Ingrid Paoletti “Advanced Customization in Architectura”,PHI,2012.

Course outcomes:

On successful completion of the course, the student will be able to:

- Ability to understand the operation of electronic logic elements.
- Ability to understand the organisation of a computer system in terms of its main components.
- Ability to understand the various parts of a system memory hierarchy.
- Ability to understand the operation of modern CPUs including pipelining, memory systems and busses.
- Ability to understand the principles of operation of multiprocessor systems and parallel programming.
- Ability to design and emulate a single cycle or pipelined CPU by given specifications using Hardware Description Language (HDL).

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- Ability to work in teams to design and implement CPUs.
- Ability to write reports and make presentations of computer architecture projects.

Mapping Course Outcomes with Program Outcomes:

Course outcomes	Program outcomes										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1	M	S	M	S	S	M	M	M	M	M	S
2	S	S	M	M	S	M	M	S	M	M	M
3	M	M	M	M	M	M	M	M	S	S	S
4	S	M	M	M	S	M	S	M	S	M	M
5	M	S	M	S	S	M	M	S	M	S	M
6	S	M	M	S	S	M	M	M	M	M	S
6	M	S	M	S	S	M	S	M	S	M	M
7	S	S	M	S	S	S	S	M	S	M	S

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Course Title	: **Web Technology**	Course Code	: **CP305**
Semester	: **V**	Core / Elective	: **PC**
Teaching Scheme in Hrs (L:T:P)	: **3:0:0**	Credit	: **3 Credit**
Type of course	: **Lecture + Assignments**	Total Contact Hours	: **36**
Continuous Internal Evaluation	: **40 Marks**	ESE	: **60 Marks**
Programmes	: **B.TECH. CSE**		

Pre-requisites:

Internet Programming (CP205), Core Java (CP206).

Course Objectives:

- Analyse a web page and identify its elements and attributes.
- Create web pages using XHTML and Cascading Styles sheets.
- Build dynamic web pages using JavaScript (client side programming).
- Write non-trivial programs using C#.
- Build interactive web applications using ASP.NET and C#.
- Build web applications using PHP.
- Construct and manipulate web databases using ADO.NET.

Course Content:

Topic and Contents	Hours	Marks
UNIT-1	7	20
Introduction and Web Development Strategies History of Web Protocols governing Web, Creating Websites for individual and Corporate World, Cyber Laws Web Applications Writing Web Projects, Identification of Objects, Target Users, Web Team, Planning and Process Development.		
UNITS-2	7	20
HTML, XML and Scripting List, Tables, Images, Forms, Frames, CSS Document type definition, XML schemes, Object Models, Presenting XML, Using XML Processors: DOM and SAX .Introduction to Java Script, Object in Java Script, Dynamic HTML with Java Script		
UNITS-3	7	20
Java Beans and Web Servers Introduction to Java Beans, Advantage, Properties, BDK. Introduction to EJB, Java Beans API Introduction to Servelets, Lifecycle, JSDK, Servlet API. Servlet Packages: HTTP package, working with Http request and response, Security Issues.		

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UNIT-4	7	20
Introduction to JSP, JSP processing, JSP Application Design, Tomcat Server, Implicit. JSPobjects, Conditional Processing, Declaring variables and methods. Error Handling and Debugging, Sharing data between JSP pages- Sharing Session and Application Data.		
UNIT-5	8	20
Database Connectivity Database Programming using JDBC. Studying Javax.sql.*package, accessing a database from a JSP page. Application-specific Database Action, Developing Java Beans in a JSP page, introduction to Struts framework.		
TOTAL	**36**	**100**

Reference Books:

1. Jon Duckett "Beginning Web Programming" WROX, (2004).
2. Marty Hall and Larry Brown "Core Servlets and Java Server pages Vol. 1: Core Technologies" Pearson, (2006)
3. DanWoods and Gautam Guliani", Open Source for the Enterprise: Managing Risks, Reaping Rewards", O'Reilly, Shroff Publishers and Distributors, (2005)
4. Sebesta,"Programming World Wide Web" Pearson, (2016)
5. Dietel and Nieto, "Internet and World Wide Web – How to program", PHI/Pearson Education Asia, (2007)
6. Murach, "Murach's beginning JAVA JDK 5", SPD 5. Wang, "An Introduction to web Design and Programming" (2016)

Course outcomes:

On successful completion of the course, the student will be able to:

- Ability to maintain web server services required to host a website.
- Ability to use scripting languages and web services to transfer data and add interactive components to web pages.
- Ability to create and manipulate web media objects using editing software.
- Ability to incorporate aesthetics and formal concepts of layout and organization to design websites that effectively communicate using visual elements.
- Ability to conceptualize and plan an internet-based business that applies appropriate business models and web technologies.
- Ability to combine multiple web technologies to create advanced web components.
- Ability to design websites using appropriate security principles, focusing specifically on the vulnerabilities inherent in common web implementations.
- Ability to incorporate best practices in navigation, usability and written content to design websites that give users easy access to the information they seek.

Mapping Course Outcomes with Program Outcomes:

Course outcomes	Program outcomes										
	1	2	3	4	5	6	7	8	9	10	11

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1	S	M	M	M	S	M	M	S	M	S	M
2	M	S	S	S	S	S	M	M	S	M	M
3	S	M	S	M	S	M	S	S	M	M	S
4	M	M	M	M	S	M	M	M	M	M	S
5	M	M	S	M	S	M	S	M	M	M	M
6	M	M	M	S	S	S	M	M	M	M	S
7	M	M	S	M	S	M	M	M	M	M	S
8	S	M	M	S	S	S	M	S	M	M	S

Course Title: **LOGICAL AND FUNCTIONAL PROGRAMMING**		Course Code	: **CP309**
Semester	: **V**	Core / Elective	:**PE**
Teaching Scheme in Hrs (L:T:P)	: 3**:0:0**	Credit	: **3 Credit**
Type of course	: **Lecture + Assignments**	Total Contact Hours	: **36**
Continuous Internal Evaluation	: **40 Marks**	ESE	: **60 Marks**
Programmes	: **B.TECH. CSE**		

Pre-requisites:

Discrete Maths and Graph Theory (CP204).

Course Objectives:

- Improve the background for choosing appropriate programming languages for certain classes of programming problems.
- Be able in principle to program in an imperative (or procedural), an object-oriented, a functional, and a logical programming language.
- Obtaining a basic knowledge and practical experience in functional and logic programming. Introduction into formal concepts used as a theoretical basis for both paradigms.

Course Content:

Topic and Contents	Hours	Marks
UNIT-1	7	20
PROPOSITIONS: Fully parenthesized propositions, Evaluation of constant propositions, Evaluation of proposition n a state. Precedence rules for operators, Tautologies, Propositions a sets of states and Transforming English to prepositional for.		

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REASONING USING EQUIVALENCE TRANSFORMATIONS: The laws of equivalence, rules of substitution and transitivity.		
UNITS-2	7	20
Inference rules. Formal system of axioms and interference NATURAL DEDUCTION SYSTEM: Introduction to deductive proofs, Inference rules, proofs and sub-proofs, adding flexibility to the natural deduction system and developing natural deduction system proofs.		
UNITS-3	7	20
PREDICATES: Extending the range of a state, Quantification, Free and Bound Identifiers, Textual substitution. Quantification over other ranges and some theorems about textual substitution and states.		
UNIT-4	7	20
LOGIC PROGRAMMING: Introduction to prepositional and predicate calculus, First-order predicate calculus. Format logical systems, PROLOG programming-Facts, Rules and queries, Implementations, Applications, Strengths and Weaknesses.		
UNIT-5	8	20
FUNCTIONAL PROGRAMMING: Introduction to lambda calculus-Syntax and semantics, Computability and correctness. Features of Functional Languages-Composition of functions, Functions as first-class Objects, no side effects and clean Semantic LISP Programming-Data types and structures, Scheme dialect, primitive functions, functions for constructing functions and functional forms. Applications of functional languages and comparison of functional and imperative languages.		
TOTAL	**36**	**100**

Reference Books:

1. R. Sebesta, Concepts of Programming Languages, Addison Wesley, (2005).
2. P. Van Roy, S. Haridi, Concepts, Techniques, and Models of Computer Programming, MIT Press, (2004).
3. K. Arnold, J. Gosling, The Java Programming Language Addison Wesley, (2005).
4. R. Bird, Introduction to Functional Programming using Haskell, Prentice Hall, (1988).
5. M. Abadi, L. Cardelli, A Theory of Objects, Springer, (1996).
6. J. Reynolds, Theories of Programming Languages, Cambridge University Press, (1998).
7. U. Nilsson, J. Małuszyński, Logic, Programming and Prolog, John Wiley & Sons, (1995).

Course outcomes:

On successful completion of the course, the student will be able to:

- Master using syntax-related concepts including context-free grammars, parse trees, recursive-descent parsing, printing, and interpretation.
- Master analysing semantic issues associated with function implementations, including variable binding, scoping rules, parameter passing, and exception handling.

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- Master implementation techniques for interpreted functional languages.
- Master using object-oriented languages.
- Ability to understand the design issues of object-oriented and functional languages.
- Ability to understand the language abstraction constructs of classes, interfaces, packages, and procedures.
- Apply functional programming computation and develop higher order functions.

Mapping Course Outcomes with Program Outcomes:

Course outcomes	Program outcomes										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1	S	S	S	S	S	S	M	S	S	M	S
2	M	M	M	S	S	M	S	M	S	M	M
3	M	S	S	S	S	M	M	S	M	M	M
4	M	M	M	S	S	S	M	M	S	M	S
5	S	M	S	S	S	M	M	M	M	M	M
6	S	M	S	M	S	M	M	M	S	M	S
7	M	S	S	S	M	M	S	S	M	M	M

Course Title	: **ADVANCED DATA STRUCTURES**	Course Code	: **CP317**
Semester	: **V**	Core / Elective	: **PE**
Teaching Scheme in Hrs (L:T:P)	: 3**:0:0**	Credit	: **3 Credit**
Type of course	: **Lecture + Assignments**	Total Contact Hours	: **36**
Continuous Internal Evaluation	: **40 Marks**	ESE	: **60 Marks**
Programmes	: **B.TECH. CSE**		

Pre-requisites:

Data Structure and Algorithm (CP201), Discrete Maths and Graph Theory (CP204).

Course Objectives:

- Demonstrate familiarity with major algorithms and data structures.
- Analyze performance of algorithms.

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- Choose the appropriate data structure and algorithm design method for a specified application.
- Demonstrate understanding of the abstract properties of various data structures such as stacks, queues, lists, trees and graphs
- Use various data structures effectively in application programs.
- Demonstrate understanding of various sorting algorithms, including bubble sort, insertion sort, selection sort, heap sort and quick sort.
- Understand and apply fundamental algorithmic problems including Tree traversals, Graph traversals, and shortest paths.
- Demonstrate understanding of various searching algorithms.
- Program multiple file programs in a manner that allows for reusability of code.
- Compare different implementations of data structures and to recognize the advantages and disadvantages of the different implementations.
- Trace and code recursive functions.
- Implement various data structures in more than one manner.
- Write complex applications using structured programming methods.

Course Content:

Topic and Contents	Hours	Marks
UNIT-1	**7**	**20**
ADVANCED TREES: Definitions Operations on Weight Balanced Trees (Huffman Trees), 2-3 Trees and Red- Black Trees. Augmenting Red-Black Trees to Dynamic Order Statistics and Interval Tree Applications. Operations on Disjoint sets and its union-find problem Implementing Sets. Dictionaries, Priority Queues and Concatenable Queues using 2-3 Trees		
UNITS-2	**7**	**20**
MERGEABLE HEAPS: Merge able Heap Operations, Binomial Trees Implementing Binomial Heaps and its Operations, 2-3-4. Trees and 2-3-4 Heaps. Amortization analysis and Potential Function of Fibonacci Heap Implementing Fibonacci Heap. SORTING NETWORK**:** Comparison network, zero-one principle, bitonic sorting and merging network sorter.		
UNITS-3	**7**	**20**
GRAPH THEORY DEFINITIONS: Definitions of Isomorphic Components. Circuits, Fundamental Circuits, Cut-sets. Cut-Vertices Planer and Dual graphs, Spanning Trees, Kuratovski's two Graphs		
UNIT-4	**7**	**20**

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GRAPH THEORY ALGORITHMS: Algorithms for Connectedness, Finding all Spanning Trees in a Weighted Graph and Planarity Testing Breadth First and Depth First Search, Topological Sort, Strongly Connected Components and Articulation Point. Single Min-Cut Max-Flow theorem of Network Flows. Ford-Fulkerson Max Flow Algorithms		
UNIT-5	**8**	**20**
NUMBER THEORITIC ALGORITHM: Number theoretic notation, Division theorem GCD recursion, Modular arithmetic, Solving Linear equation, Chinese remainder theorem, power of an element RSA public key Cryptosystem, primality Testing and Integer Factorization		
TOTAL	**36**	**100**

Reference Books:

1. N1. Arsingh Deo-Graph Theory with Application to ngineering and Computer Science, Prentice Hall of India, (2004)
2. Baase-Computer Algorithms, Pearson Education, (1999)
3. Cormen-Introduction to Algorithms, Prentice Hall of India, (2010)
4. Aho A.V., Hopcrptt J.E. and Ullman J.D.-The Design and Analysis of Computer Algorithms, Pearson Education (1990).
5. Horowitz and Sawhni-Fundamentals of Data Structures Galgotia Book Source, (2011)

Course outcomes:

On successful completion of the course, the student will be able to:

- Ability to design algorithms and employ appropriate advanced data structures for solving computing problems efficiently;
- Evaluate advanced data structures and algorithms with an emphasis on persistence.
- Analyze data structure impact on algorithms, program design and program performance.
- Ability to analyze and compare the efficiency of algorithm competence of the new algorithm with the problem.
- Ability to develop algorithmic solution for real work problems.

Mapping Course Outcomes with Program Outcomes:

Course outcomes	Program outcomes										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1	S	M	S	M	S	S	M	M	M	S	S
2	S	S	S	S	S	M	S	M	M	M	M
3	S	M	S	M	S	M	M	S	M	S	S

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4	S	S	S	S	S	M	S	M	M	M	M
5	S	M	S	M	S	M	M	M	S	M	M

Course Title	: **COMPUTATIONAL COMPLEXITY**	Course Code	: **CP313**
Semester	: **V**	Core / Elective	: **PE**
Teaching Scheme in Hrs (L:T:P)	: 3**:0:0**	Credit	: **3 Credit**
Type of course	: **Lecture + Assignments**	Total Contact Hours	: **36**
Continuous Internal Evaluation	: **40 Marks**	ESE	: **60 Marks**
Programmes	: **B.TECH. CSE**		

Pre-requisites:

Data Structure and Algorithm (CP201), Graph Theory and Discrete Maths(CP204).

Course Objectives:

- Introduce students to the mathematical foundations of computation including automata theory; the theory of formal languages and grammars; the notions of algorithm, decidability, complexity, and computability.
- Enhance/develop students' ability to understand and conduct mathematical proofs for computation and algorithms.

Course Content:

Topic and Contents	Hours	Marks
UNIT-1	**7**	**20**
Models of Computation, resources (time and space), algorithms, computability, complexity.		
UNITS-2	**7**	**20**
Complexity classes, P/NP/PSPACE, reductions, hardness, completeness, hierarchy, relationships between complexity classes.		
UNITS-3	**7**	**20**
Randomized computation and complexity; Logical characterizations, incompleteness; Approximability.		
UNIT-4	**7**	**20**
Circuit complexity, lower bounds; Parallel computation and complexity; Counting problems; Interactive proofs. Lasses AM and MA; Graph non-isomorphism in AM		
UNIT-5	**8**	**20**
Probabilistically checkable proofs; Communication complexity; Quantum computation.		

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TOTAL	**36**	**100**

Reference Books:

1. Sanjeev Arora and Boaz Barak Computational Complexity - A Modern Approach by (2007).
2. Steven Rudich and Avi Wigderson Computational Complexity Theory by (Editors) (2004).

Course outcomes:

On successful completion of the course, the student will be able to:

1. Demonstrate the understanding of key notions, such as algorithm, computability, decidability, and complexity through problem solving.
2. Prove the basic results of the Theory of Computation.
3. State and explain the relevance of the Church-Turing thesis.

Mapping Course Outcomes with Program Outcomes:

Course outcomes	Program outcomes										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1	S	S	S	S	S	M	M	M	M	M	S
2	S	S	S	S	S	M	M	M	M	M	S
3	S	S	S	S	S	M	M	M	M	M	S

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Course Title	: **COMPUTER ARCHITECTURE LAB**	Course Code	: **CP352**
Semester	: **V**	Core / Elective	: **PC**
Teaching Scheme in Hrs (L:T:P)	: **0:0:2**	Credit	: 1 **Credit**
Type of course	: **Practical + Assignments**	Total Contact Hours	: **20**
Continuous Internal Evaluation	: **60 Marks**	ESE	: **40 Marks**
Programmes	: **B.TECH. CSE**		

List of Experiments

This lab will be based on assembly programming on of RISC processor simulator SPIM. SPIM simulator is available at site SPIM exercises.

1. Read an integer from the keyboard and print it out if (n => n_min AND n <= n_max).
2. Read an integer from the keyboard and print out the following as per switch-case statement Switch (n)

{ n <= 10 print "not a lot" n == 12 print "a dozen"
n == 13 print "a baker's dozen" n == 20 print "a score"
n >= 100 print "lots and lots" n! = 42 print "integer"
otherwise print "you have the answer!"
}

3. Read a string from the keyboard and count the number of letters. Use the equivalent of following for loop to count number of chars. for (s1=0; str [s1] != '\n'; ++s1)
4. Print out a line of characters using simple procedure call.
5. Print out a triangle of characters using recursive procedure call.
6. Print factorial of a number using recursion.
7. Print reverse string after reading from keyboard.
8. Print a string after swapping case of each letter.
9. Print an integer in binary and hex.
10. (a). Implement bubble sort algorithm.

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(b) Print Pascal Triangle of base size 12.

(c) Evaluate and print Ackerman function.

Course Title	: **DATABASE MANAGEMENT SYSTEM LAB**	Course Code	: **CP353**
Semester	: **V**	Core / Elective	: **PC**
Teaching Scheme in Hrs (L:T:P)	: **0:0:2+2**	Credit	: **2 Credit**
Type of course	: **Practical + Assignments**	Total Contact Hours	: **40**
Continuous Internal Evaluation	: **60 Marks**	ESE	: **40 Marks**
Programmes	: **B.TECH. CSE**		

List of Experiments

Student can use MySql (preferred open source DBMS) or any other Commercial DBMS tool (MS-Access / ORACLE) at backend and C++ (preferred) VB/JAVA at front end.

1. (a) Write a C++ program to store students records (roll no, name, father name) of a class using file handling. (Using C++ and File handling).

   (b) Re-write program 1, using any DBMS and any compatible language. (C++/MySQL) (VB and MS-Access)

2. Database creation/ deletion, table creation/ deletion.

(a) Write a program to take a string as input from user. Create a database of same name. Now ask user to input two more string, create two tables of these names in above database.

(b) Write a program, which ask user to enter database name and table name to delete. If database exist and table exist then delete that table.

3. Write a program, which ask user to enter a valid SQL query and display the result of that query.

4. Write a program in C++ to parse the user entered query and check the validity of query. (Only SELECT query with WHERE clause)

5 - 6. Create a database db1, having two tables t1 (id, name, age) and t2 (id, subject, marks).

(a) Write a query to display name and age of given id (id should be asked as input).

(b) Write a query to display average age of all students.

(c) Write a query to display mark-sheet of any student (whose id is given as input).

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(d) Display list of all students sorted by the total marks in all subjects.

7 - 8. Design a Loan Approval and Repayment System to handle Customer's Application for Loan and handle loan repayments by depositing instalments and reducing balances.

9 -10. Design a Video Library Management System for managing issue and return of Video tapes/CD and manage customer's queries.

Course Title: **INDUSTRIAL ORIENTED WEB PROGRAMING PROJECT LAB**		Course Code	: **CP355**
Semester	: **V**	Core / Elective	: **PC**
Teaching Scheme in Hrs (L:T:P)	: **0:0:2+2**	Credit	: **2 Credit**
Type of course	: **Practical + Assignments**	Total Contact Hours	: **40**
Continuous Internal Evaluation	: **60 Marks**	ESE	: **40 Marks**
Programmes	: **B.TECH. CSE**		

List of Experiments

The lab is to be conducted in Perl programming language, Perl works on all platforms (including windows)

1. Develop a static html page using style sheet to show your own profile.
    a. Add a page to show 5 photos and add a page to show your academics in a table.
    b. Add a page containing 5 links to your favourite website Add navigational links to all above pages (add menu).
2. Update your homepage, by creating few html file (e.g. header, footer, left-sidebar, right), in these file you will put all html code to be shown on every page.
3. Use Cascading Style Sheets to format your all pages in a common format.
4. Basic Php programs: Write a simple "hello word" program using php.
5. Write a program to accept two strings (name and age) from user. Print welcome statement e.g. “Hi Ram, your age is 24."
6. Write a program to create a calculator, which can support add, subtraction and multiply and division operation.
7. Write a program to take input parameters for a table (no. of rows and no. of columns), and create the desired table.
8. Create a table and implement the concept of foreign key and candidate key concept using the employee table .
9. Create a "Contact Me" page -Ask user to enter his name, email ID, Use Java-Script to verify entered email address.

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10. Store submitted value in a MySql database. Display latest 5 submitted records in contact me page. Display above record with navigation support. e.g. (next, previous, first, last).

Course Title	: **Advanced Data Structure Lab**	Course Code	: **CP357**
Semester	: **V**	Core / Elective	: **UE**
Teaching Scheme in Hrs (L:T:P)	: 0**:0:2**	Credit	: **1 Credit**
Type of course	: **Lab + Assignments**	Total Contact Hours	: **36**
Continuous Internal Evaluation	: **60 Marks**	ESE	: **40 Marks**
Programmes	: **B.TECH. CSE**		

LIST OF EXPERIMENTS:

You may use java/C++ for Programming:

1. Write a program to implement Linked lists
2. Write a program to implement Multitasks
3. Write a program to implement Double Ended Queue (Deques) & Circular Queues
4. Write a program to implement Min Heap
5. Write a program to implement Heaps
6. Write a program to implement Leftist Heap
2. Write a program to implement AVL Tree
3. Write a program to implement B:Tree
4. Write a program to implement Quick Sort
5. Write a program to implement Greedy algorithm
6. Write a program to implement Knapsack using Dynamic Programming
7. Write a program to implement Graph coloring using backtracking

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Course Title: **DESIGN & ANALYSIS OF ALGORITHMS**		Course Code	: CP308
Semester	: **VI**	Core / Elective	: **PC**
Teaching Scheme in Hrs (L:T:P)	: 3**:1:0**	Credit	: **4 Credit**
Type of course	: **Lecture + Assignments**	Total Contact Hours	: **36 +12**
Continuous Internal Evaluation	: **40 Marks**	ESE	: **60 Marks**
Programmes	: **B.TECH. CSE**		

Pre-requisites:

Data Structure and Algorithm (CP201).

Course Objectives:

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

Course Content:

Topic and Contents	Hours	Marks
UNIT-1	7	20
Review of Algorithm Complexity and Order Notations and Sorting Methods. **DIVIDE AND CONQUER METHOD**: Binary Search, Merge Sort, Quick sort and strassen's matrix multiplication algorithms. GREEDY METHOD: Knapsack Problem, Job Sequencing, Optimal Merge Patterns and Minimal Spanning		
UNITS-2	7	20
DYNAMIC PROGRAMMING: Matrix Chain Multiplication. Longest Common Subsequence and 0/1 Knapsack Problem BRANCH AND BOUND: Traveling		

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Salesman Problem and Lower Bound Theory. Backtracking Algorithms and queens problem.		
UNITS-3	7	20
PATTERN MATCHING ALGORITHMS: Naïve and Rabin Karp string matching algorithms, KMP Matcher and Boyer Moore Algorithms. ASSIGNMENT PROBLEMS: Formulation of Assignment and Quadratic Assignment Problem numbers, Telnet, Round trip time and timeout. TCP connection management		
UNIT-4	7	20
RANDOMIZED ALGORITHMS. Las Vegas algorithms, Monte Carlo algorithms, randomized algorithm for Min-Cut, randomized algorithm for 2-SAT. Problem definition of Multi commodity flow, Flow shop scheduling and Network capacity assignment		
UNIT-5	8	20
PROBLEM CLASSES NP, NP-HARD AND NP-COMPLETE: Definitions of P, NP-Hard and NP-Complete Problems. Decision Problems. Cook's Theorem. Proving NP-Complete Problems – Satisfiability problem and Vertex Cover Problem. Approximation Algorithms for Vertex Cover and Set Cover Problem.		
TOTAL	**36**	**100**

Reference Books:

1. Aho A.V, J.E. Hopcroft, J.D. Ullman: Design and Analysis of Algorithms, Pearson Educati , (2009)
2. Rivest and Cormen, Introduction to Algorithms, Prentice Hall of India, (2010)

Course outcomes:

On successful completion of the course, the student will be able to:

- Argue the correctness of algorithms using inductive proofs and invariants.
- Analyze worst-case running times of algorithms using asymptotic analysis.
- Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm.
- Synthesize divide-and-conquer algorithms.
- Derive and solve recurrences describing the performance of divide-and-conquer algorithms.
- Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize dynamic-programming algorithms, and analyse them.

Mapping Course Outcomes with Program Outcomes:

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Course outcomes	Program outcomes										
	1	2	3	4	5	6	7	8	9	10	11
1	S	M	S	M	S	M	M	S	M	M	S
2	S	S	M	S	S	M	S	S	S	S	M
3	M	M	M	S	S	S	M	M	M	M	M
4	S	M	M	S	S	M	M	S	S	S	M
5	M	M	S	S	S	M	S	M	M	M	S
6	S	S	M	M	S	M	M	S	S	M	M

Course Title: **THEORY OF COMPUTATION**		Course Code	: **CP304**
Semester	: **VI**	Core / Elective	: **PC**
Teaching Scheme in Hrs (L:T:P)	: 3**:1:0**	Credit	: **4 Credit**
Type of course	: **Lecture + Assignments**	Total Contact Hours	: **36+12**
Continuous Internal Evaluation	: **40 Marks**	ESE	: **60 Marks**
Programmes	: **B.TECH. CSE**		

Pre-requisites:

Discrete Maths and Graph Theory(CP204).

Course Objectives:

- Understand basic properties of Turing machines and computing with Turing machines
- Understand the concepts of tractability and decidability.
- Knowledge about automation of machine and pumping luma

Course Content:

Topic and Contents	Hours	Marks

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UNIT-1	9	20
Finite Automata & Regular Expression: Basic Concepts of finite state system, Deterministic and non-deterministic finite automation and designing regular expressions relationship between regular expression & Finite automata minimization of finite automation mealy & Moore Machines		
UNITS-2	**10**	**20**
Regular Sets of Regular Grammars: Basic Definition of Formal Language and Grammars. Regular Sets and Regular Grammars closure proportion of regular sets, Pumping lemma for regular sets, decision Algorithms for regular sets,		
UNITS-3	**10**	**20**
Context Free Languages& Pushdown Automata: Context Free Grammars – Derivations and Languages –Relationship between derivation and derivation trees – ambiguity – simplification of CEG – Greiback Normal form –Chomsky normal forms – Problems related to CNF and GNF Pushdown Automata: Definitions – Moves –Instantaneous descriptions – Deterministic pushdown automata.		
UNIT-4	**10**	**20**
Turing Machines: Turing machines – Computable Languages and functions – Turing Machine constructions –Storage in finite control – multiple tracks – checking of symbols – subroutines – two way infinite tape. Undesirability: Properties of recursive and Recursively enumerable languages – Universal Turing Machines as an undesirables problem – Universal Languages – Rice's Theorems		
UNIT-5	**9**	**20**
Linear bounded Automata Context Sensitive Language: Chomsky Hierarchy of Languages and automata Basic Definition& descriptions of Theory & Organization of Linear bounded Automata Properties of context-sensitive languages.		
TOTAL	**48**	**100**

Reference Books:

1. John E.Hopcroft, Rajeev Motwani and J.D, Ulman, Introduction to Automata theory Languages and Computation,
2. Pearson Education Asia. (2016)
3. John C. Martin, Introduction to Languages and the Theory of Computation, TMH. (2009).
4. Ohen, Introduction to Computer Theory, Pearson Education Asia. (2009).

Course outcomes:

On successful completion of the course, the student will be able to:

- Understand basic properties of formal languages and formal grammars.
- Understand basic properties of deterministic and nondeterministic finite automata.
- Understand the relation between types of languages and types of finite automata.
- Understand the challenges for Theoretical Computer Science and

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its contribution to other sciences.

Mapping Course Outcomes with Program Outcomes:

Course outcomes	Program outcomes										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1	M	M	M	S	S	M	M	M	S	S	S
2	S	M	S	M	S	S	M	S	S	M	M
3	M	S	M	S	S	M	M	M	M	M	S
4	M	M	S	S	M	S	M	M	S	M	M

Course Title	: **COMPUTER NETWORKS**	Course Code	: CP306
Semester	: **VI**	Core / Elective	: **PC**
Teaching Scheme in Hrs (L:T:P)	: 3**:0:0**	Credit	: **3 Credit**
Type of course	: **Lecture + Assignments**	Total Contact Hours	: **36**

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Continuous Internal Evaluation : **40 Marks**	ESE : **60 Marks**
Programmes: **B.TECH. CSE**	

Pre-requisites:

Open Source Technology (CP208).

Course Objectives:

- To provide insight about networks, topologies, and the key concepts.
- To gain comprehensive knowledge about the layered communication architectures (OSI and TCP/IP) and its functionalities.
- To understand the principles, key protocols, design issues, and significance of each layers. in ISO and TCP/IP.
- To know the basic concepts of network security and its various security issues related.
- To know the basic concepts of Routing Principals and Algorithms.
- To know the basic concepts of SONET/SDH.

Course Content:

Topic and Contents	Hours	Marks
UNIT-1	**7**	**20**
Network, Network Protocols, Edge, Access Networks and Physical Media Protocol Layers and their services models, Internet Backbones, NAP's and ISPs		
UNITS-2	**7**	**20**
Application Layer: Protocol and Service provided by application layer, transport protocols. The World Wide Web. HTTP, Message formats, User Server Interaction and Web caches. FTP commands and replies. Electronic Mail, SMTP, Mail Message Formats and MIME and Mail Access Protocols DNS The internet's directory service DNS records and Message.		
UNITS-3	**7**	**20**
Transport Layer: Transport Layer Service and Principles, Multiplexing and Demultiplexing applications, Connectionless Transport. UDP Segment structure and UDP Checksum. Principles of Reliable Data Transfer-Go back to N and Selective Repeat. Connection Oriented Transport TCP Connection and Segment Structure, Sequence Numbers and acknowledgement numbers, Telnet, Round trip time and timeout. TCP connection management.		
UNIT-4	**7**	**20**
Network Layer and Routing: Network service model, Routing principles. Link State routing Algorithm, A distant Vector routing & OSPF algorithm. Router Components; Input Prot, Switching fabric and output port. IPV6 Packet format.		

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Point To Point Protocol (PPP), transition States, PPP Layers-Physical Layer and Data Link Layer, Link Control Protocols. LCP Packets and options. Authentication PAP and CHAP, Network Control Protocol (NCP).		
UNIT-5	**8**	**20**
Data Link Layer - Design issues - Channel allocation problem - Multiple access protocols - Ethernet - Wireless LAN - 802.11 architecture.		
TOTAL	**36**	**100**

Reference Books:

1. Kurose and Ross, Pearson, Computer Networking- A Top-Down approach, 5th edition, (2012)
2. Behrouz Forouzan, Computer Networks- A Top-Down approach, McGraw Hill ,(2012)
3. Andrew Tanenbaum, Prentice Hall, Computer Networks (4th edition), (2011)
4. Fred Halsall,. Computer Networking and the Internet, Addison Wesley (5th edition), (2005)
5. Behrouz Forouzan, , Data Communications and Networking, McGraw Hill (4th edition), (2007)
6. Behrouz Forouzan, TCP/IP Protocol Suite McGraw Hill (3rd edition), (2005)

Course outcomes:

On successful completion of the course, the student will be able to:

- Independently understand basic computer network technology.
- Understand and explain Data Communications System and its components.
- Knowledge of basic network theory and layered communication architectures.
- Ability to solve problems in networking.

Mapping Course Outcomes with Program Outcomes:

Course outcomes	Program outcomes										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1	S	M	S	S	S	M	M	M	S	M	S
2	M	S	M	M	S	M	S	M	M	S	M
3	S	M	S	S	S	S	M	M	S	M	S
4	M	S	M	S	S	M	M	M	M	S	M

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Course Title: **COMPUTER GRAPHICS & MULTIMEDIA TECHNOLOGY**		Course Code	: **CP318**
Semester	: **VI**	Core / Elective	: **PC**
Teaching Scheme in Hrs (L:T:P)	: 3**:0:0**	Credit	: **3 Credit**
Type of course	: **Lecture + Assignments**	Total Contact Hours	: **36**
Continuous Internal Evaluation	: **40 Marks**	ESE	: **60 Marks**
Programmes	: **B.TECH. CSE**		

Pre-requisites:

Fundamental of Optical Communication (EC214).

Course Objectives:

- To understand computational development of graphics with mathematics.
- To provide in-depth knowledge of display systems, image synthesis, shape Modelling of 3D application.
- To Understand basic concepts related to Multimedia including data structure algorithms and software.
- To Experience development of multimedia software by utilizing existing libraries and descriptions of algorithms.

Course Content:

Topic and Contents	Hours	Marks
UNIT-1	**7**	**20**
Introduction to Raster scan displays, Storage tube displays, refreshing, flicking, interlacing, color monitors, display processors resolution, working principle of dot matrix, inkjet laser printers, working principles of keyboard, mouse scanner, digitizing camera, track ball , tablets and joysticks graphical input techniques, positioning techniques, rubber band techniques, dragging etc		
UNITS-2	**7**	**20**
Scan Version techniques, image representation, line drawing simple DDA, Bresenham's Algorithm, Circle drawing, general method, symmetric DDA Bresenham's Algorithm, curves, parametric function, Beizier Method, Bsp- line Method		
UNITS-3	**7**	**20**
2D & 3D Co-ordinate system, Translation, Rotation, Scaling, Reflection Inverse transformation, Composite transformation world coordinate system, screen		

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coordinate system, parallel and perspective projection, Representation of 3D object on 2D screen		
UNIT-4	**8**	**20**
Point Clipping. Line Clipping Algorithms, Polygon Clipping algorithms Introduction to Hidden Surface elimination, Basic illumination model, diffuse reflection, specular reflection, phong shading, Gourmands shading ray tracing color models like RGB, YIQ, CMY, HSV etc		
UNIT-5	**7**	**20**
Multimedia components, Multimedia Hardware, SCSI, IDE, MCI Multimedia data and file formats, RTF, TIFF, MIDI, JPEG, DIB, MPEG, Multimedia Tools, Presentation tools, Authoring tools, presentation color models like RGB, YIQ, CMY, HSV etc		
TOTAL	**36**	**100**

Reference Books:

1. J.Foley, A. Van dam, S.Feiner, J.Hughes, Computer Graphics Principles and Practice. Addison Wesley,(2016).
2. D.Rogers and Adams: Mathematical Elements of computer Graphics, McGraw Hill, (2014).

Course outcomes:

On successful completion of the course, the student will be able to:

- Gain proficiency in 3D computer graphics API programming.
- Enhance the perspective of modern computer system with modeling, analysis And interpretation of 2D and 3D visual information.
- Able to understand different realizations of multimedia tools.
- Able to develop interactive animations using multimedia tools.
- Gain the knowledge of different media streams in multimedia transmission.

Mapping Course Outcomes with Program Outcomes:

Course outcomes	Program outcomes										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1	M	M	S	M	S	S	M	S	M	M	S
2	S	M	M	M	M	M	M	M	M	S	S
3	M	S	S	M	S	M	M	S	M	M	M
4	S	M	M	M	M	S	M	M	S	M	S
5	S	M	S	M	S	M	M	S	M	M	M

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Course Title:	**SYSTEM SOFTWARE ENGINEERING**	Course Code	: **CP310**
Semester	: **VI**	Core / Elective	: **PE**
Teaching Scheme in Hrs (L:T:P)	: 3**:0:0**	Credit	: **3 Credit**
Type of course	: **Lecture + Assignments**	Total Contact Hours	: **36**
Continuous Internal Evaluation	: **40 Marks**	ESE	: **60 Marks**
Programmes	: **B.TECH. CSE**		

Pre-requisites:

Microprocessor and Interface (EC212).

Course Objectives:

1. To develop system software for a broad range of engineering and scientific applications.
2. To provide a deep understanding of the basic issues of interacting programs directly with the operating systems.
3. To design and implement software tools like text editor, interpreter, and program generator.

Course Content:

Topic and Contents	Hours	Marks
UNIT-1: Overview	**7**	**20**
Comparison of machine language, assembly language and high level languages External and internal representation of instructions and data. Data allocation structures, search structures and addressing modes. Activities and system software for program generation, translation and execution. Editors for source code and object code/executable code files		
UNITS-2: Assemblers	**7**	**20**
Assembly language specification. Machine dependent and independent features of assembler. Classification of assemblers. Pass structure of assemblers (problem and associated for IBM-PC.		

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UNITS-3 : Loader and Linkers	**7**	**20**
Functions and classification. Machine dependent and independent features of loaders Design of bootstrap, absolute and relocatable loaders, Design of linker. Case study of MS-DOS linker.		
UNIT-4 : Macro processors	**7**	**20**
Macro definition, call and expansion. Macro processor algorithm and data structure. Machine independent features (parameters, unique labels, conditional expansion, nesting and recursion). Pass structure and design of microprocessor and macro assembler, Case study of MASM macro processor		
UNIT-5 : High level language processor	**8**	**20**
HLL specification: Grammars and parse trees, expression and precedence. Lexical analysis: Classification of tokens, scanning methods, character recognition, lexical ambiguity. Syntactic analysis: Operator precedence parsing, recursive descent parsing. Symbol Table Management: Data structure for symbol table, basing functions for symbols, overflow technique, block structure in symbol table		
TOTAL	**36**	**100**

Reference Books:

1. D.M. Dhamdhere-System programming & operating system. L.L. Beck-System Software, Pearson Education, (2014)
2. J.J, Donovan-System programming , Tata McGraw Hill, (2009)

Course outcomes:

On successful completion of the course, the student will be able to:

- To understand the basics of system programs like editors, compiler, assembler, linker, loader, interpreter and debugger.
- Describe the various concepts of assemblers and microprocessors.
- To understand the various phases of compiler and compare its working with assembler.
- To understand how linker and loader create an executable program from an object module created by assembler and compiler.
- To know various editors and debugging techniques.

Mapping Course Outcomes with Program Outcomes:

Course outcomes	Program outcomes										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1	S	S	M	S	S	M	M	S	S	M	M
2	M	M	S	M	S	M	S	M	M	M	M
3	S	M	M	S	M	S	M	S	S	M	S
4	S	S	M	S	S	M	M	M	M	S	S

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5	M	M	M	M	S	M	S	M	M	M	S

Course Title:	: **DATA MININIG AND DATA WAREHOUSE**	Course Code	: **CP312**
Semester	: **VI**	Core / Elective	: **PE**
Teaching Scheme in Hrs (L:T:P)	: 3**:0:0**	Credit	: **3 Credit**
Type of course	: **Lecture + Assignments**	Total Contact Hours	: **36**
Continuous Internal Evaluation	: **40 Marks**	ESE	: **60 Marks**
Programmes	: **B.TECH. CSE**		

Pre-requisites:

Database Management System (CP301), Data Structure and Algorithm (CP201).

Course Objectives:

- Identify the scope and necessity of Data Mining & Warehousing for the society.
- Describe the designing of Data Warehousing so that it can be able to solve the root problems.
- To understand various tools of Data Mining and their techniques to solve the real time problems.
- To develop ability to design various algorithms based on data mining tools.

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- To develop further interest in research and design of new Data Mining Techniques.

Course Content:

Topic and Contents	Hours	Marks
UNIT-1	**7**	**20**
Overview, Motivation(for Data Mining),Data Mining-Definition & Functionalities Data Processing, Form of Data Pre-processing Data Cleaning: Missing Values, Noisy Data, (Binning, Clustering, Regression, Computer and Human inspection) Inconsistent Data, Data Integration and Transformation. Data Reduction:-Data Cube Aggregation, Dimensionality reduction Data Compression, Luminosity Reduction, Clustering, Discrimination and Concept hierarchy generation		
UNITS-2	**7**	**20**
Concept Description:- Definition, Data Generalization, Analytical Characterization, Analysis of attribute relevance, Mining Class comparisons, Statistical measures in large Databases. Measuring Central Tendency, Measuring Dispersion of Data, Graph Displays of Basic Statistical class Description Mining Association Rules in Large Databases, Association rule mining, mining Single-Dimensional Boolean Association rules from Transactional Databases– Apriority Algorithm, Mining Multilevel Association rules from Transaction Databases and Mining Multi-Dimensional Association rules from Relational Databases.		
UNITS-3	**7**	**20**
What is Classification & Prediction, Issues regarding Classification and prediction, Decision tree, Bayesian Classification, Classification by Back propagation Multilayer feed-forward Neural Network, Back propagation Algorithm, Classification methods K-nearest neighbour classifiers, Genetic Algorithm. Cluster Analysis: Data types in cluster analysis, Categories of clustering methods Partitioning methods. Hierarchical Clustering- CURE and Chameleon. Density Based Methods-DBSCAN, OPTICS. Grid Based Methods- STING, CLIQUE. Model Based Method –Statistical Approach, Neural Network approach, Outlier Analysis		
UNIT-4	**7**	**20**
Data Warehousing: Overview, Definition, Delivery Process, Difference between Database System and Data Warehouse, Multi Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept hierarchy, Process Architecture, 3 Tier Architecture, Data mining		
UNIT-5	**8**	**20**
Aggregation, Historical information, Query Facility, OLAP function and Tools. OLAP Servers, ROLAP, MOLAP, HOLAP, Data Mining interface, Security, Backup and Recovery, Tuning Data Warehouse, Testing Data Warehouse. Application-specific Database Action, Developing Java Beans in a JSP page, introduction to		

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Struts framework.		
TOTAL	**36**	**100**

Reference Books:

1. .Rob Mattson-Web Warehousing and Knowledge Management, Tata Mc-Graw Hill, (2010)
2. Tec media. Shelley Powers-Dynamic Web Publishing, (1998)
3. Anahory.-Data Warehousing in the Real World. Pearson Education Asia, (1997)

Course outcomes:

On successful completion of the course, the student will be able to:

- To understand the basic principles, concepts and applications of data warehousing and data mining
- To introduce the task of data mining as an important phase of knowledge recovery process.
- Ability to do Conceptual, Logical, and Physical design of Data Warehouses OLAP applications and OLAP deployment.
- Have a good knowledge of the fundamental concepts that provide the foundation of data mining.
- Design a data warehouse or data mart to present information needed by management in a form that is usable for management client.

Mapping Course Outcomes with Program Outcomes:

Course outcomes	Program outcomes										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1	M	S	S	M	S	M	M	S	S	M	M
2	S	M	S	M	M	S	M	M	M	S	S
3	M	M	S	S	S	M	S	M	S	M	M
4	S	S	S	M	S	M	S	M	M	S	S
5	M	M	S	M	S	M	M	M	S	M	M

Course Title	: **COMPUTER GRAPHICS LAB**	Course Code	: **CP351**
Semester	: **VI**	Core / Elective	: **PC**
Teaching Scheme in Hrs (L:T:P)	: 0**:0:2+2**	Credit	: **2 Credit**

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Type of course	: **Practical + Assignments**	Total Contact Hours	: **40**
Continuous Internal Evaluation	: **60 Marks**	ESE	: **40 Marks**
Programmes	: **B.TECH. CSE**		

List of Experiments

1. Implementation of line generation using slope's method, DDA and Bresenham's algorithms.
2. Implementation of circle generation using Mid-point method and Bresenham's algorithm.
3. Implementation of ellipse generation using Mid-point method.
4. Implementation of polygon filling using Flood-fill, Boundary-fill and Scan-line algorithms.
5. Implementation of 2D transformation: Translation, Scaling, Rotation, Mirror Reflection and Shearing (write a menu driven program).
6. Implementation of Line Clipping using Cohen-Sutherland algorithm and Bisection Method.
7. Implementation of Polygon Clipping using Sutherland-Hodgman algorithm.
8. Implementation of 3D geometric transformations: Translation, Scalind and rotation.
9. Implementation of Curve generation using Interpolation methods.
10. Implementation of Curve generation using B-spline and Bezier curves.
11. Implementation of any one of Back face removal algorithms such as Depth-Buffer algorithm, Painter's algorithm, Warnock's algorithm, Scan-line algorithm).

Course Title	: **COMPUTER NETWORK LAB**	Course Code	: **CP354**

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Semester	: **VI**	Core / Elective	: **PC**
Teaching Scheme in Hrs (L:T:P)	: **0:0:2**	Credit	: **1 Credit**
Type of course	: **Practical + Assignments**	Total Contact Hours	: **40**
Continuous Internal Evaluation	: **60 Marks**	ESE	: **40 Marks**
Programmes	: **B.TECH. CSE**		

List of Experiments

The lab is to be conducted in Perl programming language, Perl works on all platforms (including windows)

1. Write few basic programs of Perl.
   a. A Hello World Program.
   b. Write a program to add to 10 numbers.
   c. Write a program of reading input from the keyboard and displaying them on monitor.
   d. Write a program to take two strings as input and compare them 3. To understand advance constructs of Perl.
   e. Write a program to create a list of your course (all theory courses in current semester) using array and print them.
2. Write a program to accept ten number, store it into a hash table (Perl have itself) and when asked by user tell him that number exists or not. (do not store duplicate numbers) .
   a. Write a program to compute the number of lines in a file.
3. Find the IP address of a host or turn an IP address into a name.
4. Connect to an FTP server and get or put files. Automate the one-time transfer of many files to download the file everyday, which have changed since yesterday. (use Net: FTP).
5. Write a program to send mail. The programs should monitor system resources like disk space and notify admin by mail when disk space becomes dangerously low. (use Net: mail)
6. Fetch mail from a POP3 server (use Net: pop 3) .
7. Find out who owns a domain (use Net: whois, Whois is a service provided by domain name registration authorities to identify owners of domain names) .
8. Test whether a machine is alive. machine can be specified using IP address or domain name of machine.
9. You have a URL that fetch its content from a Perl script, convert it to ASCII text (by stripping html tags) and display it.
10. Writing a TCP Client, Writing a TCP Server and communicate some data over TCP.

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Course Title	: INDUSTRIAL PROJECT ORIENTED **ANDROID PROGRAMMING LAB**	Course Code	: **CP358**
Semester	: **VI**	Core / Elective	: **PC**
Teaching Scheme in Hrs (L:T:P)	: **0:0:2+2**	Credit	: **2 Credit**
Type of course	: **Practical + Assignments**	Total Contact Hours	: **40**
Continuous Internal Evaluation	: **60 Marks**	ESE	: **40 Marks**
Programmes	: **B.TECH. CSE**		

List of Experiments

1. Introduction of Eclipse software and how to install eclipse in windows system. Apply all kind of settings also.
2. WAP to implement an android application containing "HELLO" string at center of screen for all kind of screen resolutions.
3. WAP to implement some basic android GUI elements (INPUT EXTFIELD, BUTTON, TEXTAREA, LABEL).
4. WAP to implement a simple registration page for your college in an android application.
5. WAP to implement database connectivity through GUI elements in an android application.
6. WAP to implement to call different-different activities through android application.
7. WAP to implement scrolling concept in android GUI.
8. WAP to implement to synchronize API for server connectivity.
9. WAP to implement to synchronize FACEBOOK, GMAIL API in android application.
10. WAP to implement notification process through android app with extra elements features in GUI.

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Course Title: **SYSTEM SOFTWARE ENGINEERING LAB**		Course Code	: **CP356**
Semester	: **VI**	Core / Elective	: **PE**
Teaching Scheme in Hrs (L:T:P)	: **0:0:2**	Credit	: **1 Credit**
Type of course	: **Practical + Assignments**	Total Contact Hours	: **20**
Continuous Internal Evaluation	: **60 Marks**	ESE	: **40 Marks**
Programmes	: **B.TECH. CSE**		

List of Experiments

All programs have to be written in C++

1. Write a class for file handling, having functions to open/ read/ write/ close/ reset. (2-5) Develop a program which take input a file of C language
2. Print Lines of Codes and print signature of all function (including main)
3. Print number of variables in every function (with type)
4. Generate a new file without the comments. (/* */ and //) Process all #define (i.e. #define MAX 100, than replace every occurrence of MAX with 100). (Macro value 100 can be an expression also.)
5. Write a program to create a symbol table.
6. Write a program which can parse a given C file and store all variables and functions in symbol table.
7. Write a program to convert given C program into RTL code.

   Assumption

   a. input C file will have only main function,

   b. only two type of statements, either variable declaration statements (int sub1=23;) OR mathematical expression (sub1=sub2-sub3 ;).

   c. system have 16 registers (R1 to R16)

   d. RTL opcode available are: ADD, LOAD, MOVE, SUB, MULTIPLY, DIVIDE

   e. No control-flow (i.e. if-else, loop, jump etc.) expression is there in input code e.g.

   ```
   int main()
   {
   int sub1=72, sub2=85, sub3=63; float per;
   per=(sub1+sub2+sub3)/(100+100+100);
   }
   ```

8. Write a program to implement absolute loader.
9. Write a program to implement reloctable loader.
10. Write a program to implement single pass and two pass assembler.

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Course Title:	**NETWORK SECURITY & CRYPTOGRAPHY FUNDAMENTALS(NSCF)**	Course Code	: **CP402**
Semester	: **VII**	Core / Elective	: **PC**
Teaching Scheme in Hrs (L:T:P)	: 3**:0:0**	Credit	: **3 Credit**
Type of course	: **Lecture + Assignments**	Total Contact Hours	: **36**
Continuous Internal Evaluation	: **40 Marks**	ESE	: **60 Marks**
Programmes	: **B.TECH. CSE**		

Pre-requisites:

Computer Network (CP306).

Course Objectives:

- To provide students with basic concepts in information system and the benefits with these systems in modern society.
- To differentiate between data, information, and knowledge.
- To understand systems definition, systems requirements, and information needed for decision maker.

Course Content:

Topic and Contents	Hours	Marks
UNIT-1	**7**	**20**
Network security basics. Security Intruders, Viruses , worms, Trojan horses and related threads, Introduction to security attacks, services and mechanism. firewalls, types of firewalls, design principles, introduction to cryptography Conventional Encryption: Conventional encryption model, classical encryption techniques- substitution ciphers and transposition ciphers, cryptanalysis, stereography, stream and block ciphers. Modern Block Ciphers: Block ciphers principals, Shannon's theory of confusion and diffusion, festal structure, data encryption standard(DES), strength of DES, differential and linear crypt analysis of DES, block cipher modes of operations, triple DES, IDEA encryption and decryption, strength of IDEA, confidentiality using conventional encryption, Advanced Encryption System(AES), Differences in implementation of DES & AES		
UNITS-2	**7**	**20**
Introduction to graph, ring and field, prime and relative prime numbers, modular arithmetic Fermat's and Euler's theorem, primality testing, Euclid's Algorithm, Chinese Remainder theorem, discrete logarithms. Principals of public key crypto systems, RSA algorithm, security of RSA, AES, key management, Diffle-Hellman key exchange algorithm, introductory idea of Elliptic curve cryptography, Comparison of ECC with public key cryptographic algorithms. ElGamal Algorithm, Tutorial on ElGamal cryptography		
UNITS-3	**7**	**20**
Message Authentication and Hash Function: Authentication requirements, authentication functions, message authentication Code Hash functions, birthday		

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attacks, security of hash functions and MACS, MD5 message digest algorithm, Secure hash algorithm (SHA). Digital Signatures: Digital Signatures, authentication protocols, digital signature standards(DSS), proof of digital signature algorithm.		
UNIT-4	**8**	**20**
Authentication Applications: Kerberos and X.509, directory authentication service, electronic mail security-pretty good privacy (PGP), S/MIME Base 64 coding		
UNIT-5	**7**	**20**
IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management. System. Web Security: Secure socket layer and transport layer security, secure electronic transaction (SET)		
TOTAL	**36**	**100**

Reference Books:

1. Hawang & Briggs-Network securityStallings -Network Security Essentials ,Pearson Education Asia, Mc Graw Hill, 2015.
2. Atul Kahate, Principal of Information Security, TMH, 2016.

Course outcomes:

On successful completion of the course, the student will be able to:

- Define the concepts and definition of the information systems.
- Differentiate between several types of information system.
- Identify the threats to information security.
- Understand the difference between database and data warehouse.
- Differentiate between transaction processing system and functional area information system.

Mapping Course Outcomes with Program Outcomes:

Course outcomes	Program outcomes										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1	M	S	M	S	S	M	M	S	S	M	M
2	M	M	S	S	M	M	M	M	M	S	S
3	M	M	M	M	S	M	M	M	M	M	S
4	S	S	M	S	M	M	S	M	S	M	M
5	M	M	M	S	S	M	M	M	S	M	S

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Course Title:	: **OPERATING SYSTEM**	Course Code	CP405
Semester	: **VII**	Core / Elective	: P**C**
Teaching Scheme in Hrs (L:T:P)	: 3**:0:0**	Credit	: **3 Credit**
Type of course	: **Lecture + Assignments**	Total Contact Hours	: **36**
Continuous Internal Evaluation	: **40 Marks**	ESE	: **60 Marks**
Programmes	: **B.TECH. CSE**		

Pre-requisites:

Principle of Programming Language (CP203), Data Structure and Algorithm (CP201).

Course Objectives:

- Improve the background for choosing appropriate programming languages for certain classes of programming problems.
- Be able in principle to program in an imperative (or procedural), an object-oriented, a functional, and a logical programming language.

Course Content:

Topic and Contents	Hours	Marks
UNIT-1	**6**	**20**
Introduction to Operating Systems, Operating system services, multiprogramming, time-sharing system, storage Structures System calls, multiprocessor system. Basic concepts of CPU scheduling, Scheduling criteria, Scheduling algorithms, algorithm evaluation, multiple processor scheduling, real time scheduling I/0 devices organization, I/0 devices organization, I/0 devices organization, I/0 buffering.		
UNITS-2	**7**	**20**
Process concept, process scheduling, operations on processes Threads, inter-process communication, precedence graphs Critical section problem, semaphores, and classical problems of synchronization. Deadlock problem, deadlock characterization, deadlock prevention, deadlock avoidance, deadlock detection, recovery from deadlock, Methods for deadlock handling.		

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UNITS-3	7	20
Concepts of memory management, logical and physical address space swapping, contiguous and non-contiguous allocation paging, segmentation, and paging combined with segmentation.		
UNIT-4	**7**	**20**
Concepts of virtual memory, demand paging, page replacement algorithms Allocation of frames, thrashing, demand segmentation. Security threads protection intruders-Viruses-trusted system.		
UNIT-5	**8**	**20**
Disk scheduling, file concepts, file access methods, allocation methods, directory systems, file protection, Introduction to distributed systems and parallel processing case study.		
TOTAL	**36**	**100**

Reference Books:

1. A.S.Tanenbaum- Modern Operating Systems, Pearson Education Asia, (2009)
2. D.M.Dhamdhere, -Operating Systems-A Concept based approach, Tata Mc-Graw Hills, (2006)
3. Achyut godble -Operating Systems, Stallings-Operating System, Pearson 5th Edition Tata Mc-Graw, Hills, (2014).

Course outcomes:

On successful completion of the course, the student will be able to:

- Master functions, structures and history of operating systems
- Master understanding of design issues associated with operating systems
- Master various process management concepts including scheduling, synchronization, and deadlocks
- be familiar with multithreading
- Master concepts of memory management including virtual memory
- Master system resources sharing among the users
- Master issues related to file system interface and implementation, disk management
- Be familiar with protection and security mechanisms
- Be familiar with various types of operating systems including Unix.

Mapping Course Outcomes with Program Outcomes:

Course outcomes	Program outcomes										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1	S	S	S	S	S	S	M	M	M	M	M
2	M	M	M	S	M	M	M	M	S	S	S
3	M	S	S	S	S	S	S	M	M	S	M
4	S	M	S	S	M	M	S	S	M	M	S
5	M	M	S	M	S	S	M	M	M	M	M
6	S	M	M	S	M	M	S	S	S	S	S

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7	S	M	S	M	S	S	M	M	S	M	S
8	M	M	S	S	M	M	M	S	M	S	S
9	M	S	S	S	S	S	S	S	M	M	M

Course Title:	: **ARTIFICIAL INTELLIGENCE**	Course Code	: **CP407**
Semester	: **VII**	Core / Elective	: **PE**
Teaching Scheme in Hrs (L:T:P)	: 3**:0:0**	Credit	: **3 Credit**
Type of course	: **Lecture + Assignments**	Total Contact Hours	: **36**
Continuous Internal Evaluation	: **40 Marks**	ESE	: **60 Marks**
Programmes	: **B.TECH. CSE**		

Pre-requisites:

Design Analysis & Algorithm (CP308).

`Course Objectives:

- To study the artificial intelligence, fuzzy logic, expert system and neural network and find a simple way to develop theoretical as well as practical concept in the area of artificial intelligence.

Course Content:

Topic and Contents	Hours	Marks
UNIT-1	**7**	**20**
Meaning and definition of artificial intelligence, Various types of production systems, Characteristics of production systems. Study and comparison of breadth first search and depth first search. Techniques, other Search Techniques like hill Climbing, Best first		

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Search. A* algorithm, AO* algorithms etc, and various types of control strategies		
UNITS-2	**7**	**20**
Knowledge Representation, Problems in representing knowledge, knowledge representation using propositional and predicate logic, comparison of propositional and predicate logic Resolution, refutation, deduction, theorem proving, inference, monotonic and non-monotonic reasoning.		
UNITS-3	**7**	**20**
Probabilistic reasoning, Baye's theorem, semantic networks scripts schemas, frames, conceptual dependency and fuzzy logic, forward and backward reasoning.		
UNIT-4	**7**	**20**
Game playing techniques like minimax procedure, alpha-beta cut-offs etc, planning, Study of the block world problem in robotics, Introduction to understanding and natural languages processing.		
UNIT-5	**8**	**20**
Introduction to learning, Various techniques used in learning, introduction to neural networks, applications of neural networks, common sense, reasoning, some example of expert systems.		
TOTAL	**36**	**100**

Reference Books:

1. E.Rich, K Knight-Artificial Intelligence, Tata McGraw Hills, (2010)
2. S.Russell, P.Norving, - Artificial Intelligence-A Modern Approach, Pearson Education Asia, (2016)

Course outcomes:

On successful completion of the course, the student will be able to:

- Develop theoretical as well as practical concept in the area of artificial intelligence.
- They can understand fuzzy logic, expert system and neural network.

Mapping Course Outcomes with Program Outcomes:

Course outcomes	Program outcomes										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1	S	S	S	S	S	M	M	M	M	M	S
2	S	S	S	S	S	M	M	M	M	M	S

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Course Title**:**	:**CYBER LAW**	Course Code	: **CP417**
Semester	: **V11**	Core / Elective	: **PE**
Teaching Scheme in Hrs (L:T:P)	: 3**:0:0**	Credit	: **3 Credit**
Type of course	: **Lecture + Assignments**	Total Contact Hours	: **36**
Continuous Internal Evaluation	: **40 Marks**	ESE	: **60 Marks**
Programmes	: **B.TECH. CSE**		

Pre-requisites:

Operating System (CP405), Computer Network (CP306).

Course Objectives:

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- Demonstrate an understanding of the complexities involved in cases pertaining to technology.
- Find a way to reconcile the incompatibility between the ever changing technology and the stable law.
- Improve the background for choosing appropriate programming languages for certain classes of programming problems.
- Be able in principle to program in an imperative (or procedural), an object-oriented, a functional, and a logical programming language.

Course Content:

Topic and Contents	Hours	Marks
UNIT-1	**6**	**20**
Systems Vulnerability Scanning Overview of vulnerability scanning, Open Port / Service Identification, Banner / Version Check, Traffic Probe, Vulnerability Probe, Vulnerability Examples, OpenVAS, Metasploit. Networks Vulnerability Scanning - Netcat, Socat, understanding Port and Services tools - Datapipe, Fpipe, WinRelay, Network Reconnaissance – Nmap, THC-Amap and System tools. Network Sniffers and Injection tools – Tcpdump and Windump, Wireshark, Ettercap, Hping Kismet		
UNITS-2	**7**	**20**
Network Defense tools Firewalls and Packet Filters: Firewall Basics, Packet Filter Vs Firewall, How a Firewall Protects a Network, Packet Characteristic to Filter, Stateless Vs Stateful Firewalls, Network Address Translation (NAT) and Port Forwarding, the basic of Virtual Private Networks, Linux Firewall, Windows Firewall, Snort: Introduction Detection System		
UNITS-3	**7**	**20**
Resources Access Control: Effect of Resource Contention and Resource Access Control (RAC), Non-pre-emptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols Stack Based Priority-Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, Pre-emption Ceiling Protocol, Access Control in Multiple-Unit Resources, Controlling Concurrent Accesses to Data Objects		
UNIT-4	**6**	**20**
Multiprocessor System Environment: Multiprocessor and Distributed System Model, Multiprocessor Priority-Ceiling Protocol, Schedulability of Fixed-Priority End-to-End Periodic Tasks, Scheduling Algorithms for End-to-End Periodic Tasks, End-to-End Tasks in Heterogeneous Systems, Predictability and Validation of Dynamic Multiprocessor Systems, Scheduling of Tasks with Temporal Distance Constraints.		
UNIT-5	**7**	**20**
Real Time Communication: Model of Real Time Communication Priority-Based Service and Weighted Round- Robin Service Disciplines for Switched Networks		

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Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols, Real Time Protocols, Communication in Multicomputer System, An Overview of Real Time Operating Systems.		
TOTAL	**36**	**100**

Reference Books:

1. Mike Shema,Anti-Hacker Tool Kit ,Publication Mc Graw Hill (Indian Edition), (2014)
2. Nina, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, (2011)

Course outcomes:

On successful completion of the course, the student will be able to:

To master information security governance, and related legal and regulatory issues,

- To master understanding external and internal threats to an organization,
- To be familiarity with information security awareness and a clear understanding of
- its importance,
- To be familiar with how threats to an organization are discovered, analysed, and dealt with,
- To master fundamentals of secret and public cryptography,
- To master protocols for security services,
- To be familiar with network security threats and countermeasures,
- To be familiar with network security designs using available secure solutions (such as PGP, SSL, IPSec, etc).

Mapping Course Outcomes with Program Outcomes:

Course outcomes	Program outcomes										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1	S	M	M	S	S	M	S	M	S	M	S
2	M	M	S	M	S	M	M	S	M	M	M
3	S	S	M	S	M	M	S	M	M	M	S
4	S	M	S	S	S	M	M	M	M	S	S
5	M	M	M	S	S	M	M	M	S	M	M
6	S	S	M	M	S	S	M	M	M	S	M
7	M	M	M	S	S	S	S	M	S	M	S
8	S	M	M	S	S	M	M	M	M	S	M

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Course Title: **DIGITAL IMAGE PROCESSING**		Course Code	: **CP413**
Semester	: **V11**	Core / Elective	: **PE**
Teaching Scheme in Hrs (L:T:P)	: 3**:0:0**	Credit	: **3 Credit**
Type of course	: **Lecture + Assignments**	Total Contact Hours	: **36**
Continuous Internal Evaluation	: **40 Marks**	ESE	: **60 Marks**
Programmes	: **B.TECH. CSE**		

Pre-requisites:

Artificial Intelligence (CP407), Microprocessor and Interface (EC212), Switching Theory & Logic Design (EC223).

Course Objectives:

- The fundamentals of digital image processing.
- Image transform used in digital image processing .
- Image enhancement techniques used in digital image processing.
- Image restoration techniques and methods used in digital image processing .
- Image compression and Segmentation used in digital image processing.

Course Content

UNIT	Contents of the Course	Contact Hrs
I	**Introduction and Fundamentals** Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization. Image Enhancement in Spatial Domain Introduction; Basic Gray Level Functions – Piecewise-Linear Transformation Functions: Contrast Stretching; istogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations – Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing - Mean filter, Ordered Statistic Filter; Sharpening – The Laplacian.	7
II	**Image Enhancement in Frequency Domain** Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters – Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters – Gaussian Lowpass Filters; Sharpening Frequency Domain Filters – Gaussian Highpass Filters; Homomorphic Filtering.	7

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	Image Restoration A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering – Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters – Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering – Bandpass Filters; Minimum Mean-square Error Restoration	
III	**Colour Image Processing:** colour Fundamentals, Color Models, and Converting Colors to different models, Color Transformation, Smoothing and Sharpening, Color Segmentation. Morphological Image Processing: Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms – Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening	**7**
IV	**Registration:** Introduction, Geometric Transformation – Plane to Plane transformation, Mapping, Stereo Imaging – Algorithms to Establish Correspondence, Algorithms to Recover Depth Segmentation Introduction, Region Extraction, Pixel-Based Approach, Multi-level Thresholding, Local Thresholding, Region-based **Approach, Edge and Line Detection:** Edge Detection, Edge Operators, Pattern Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by Thresholding, Edge Detector Performance, Line Detection, Corner Detection.	
V	**Feature Extraction:** Representation, Topological Attributes, Geometric Attributes Description Boundary-based Description, Region-based Description, Relationship. Object Recognition Deterministic Methods, Clustering, Statistical Classification, Syntactic Recognition, Tree Search, Graph Matching	8

Reference Books:

1. Rafael C, Gonzalvez and Richard E. Woods, Digital Image Processing 2nd Edition, Published by: Pearson Education. (2007).

2, R.J, Schalkoff , Digital Image Processing and Computer Vision. Published by: John Wiley and Sons, NY. (1991)

3. A.K. Jain, Fundamentals of Digital Image Processing, Published by Prentice Hall, Upper Saddle River, NJ , (1989)

Course outcomes:

On successful completion of the course, the student will be able to:

- An ability to apply knowledge of mathematics, science, and engineering.
- An ability to design and conduct experiments, as well as to analyse and interpret data.
- An ability to design a system, component, or process to meet desired needs within.
- Realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
- An ability to function on multidisciplinary teams.
- An ability to identify, formulates, and solves engineering problems.

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- An understanding of professional and ethical responsibility.
- An ability to communicate effectively.
- The broad education necessary to understand the impact of engineering solutions in a.
- Global, economic, environmental, and societal context.
- A recognition of the need for, and an ability to engage in life-long learning.
- A knowledge of contemporary issues.

An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Mapping Course Outcomes with Program Outcomes:

Course outcomes	Program outcomes										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1	M	M	M	S	S	M	M	M	M	M	S
2	S	M	M	S	M	S	M	M	M	S	S
3	S	S	M	S	S	M	M	M	S	M	S
4	S	S	M	M	S	S	M	M	M	M	S
5	S	M	S	S	M	M	M	S	M	S	S
6	M	M	M	S	M	M	S	M	M	M	S
7	S	M	S	M	S	M	S	M	M	M	S
8	M	M	M	S	M	M	M	M	S	S	S
9	S	S	S	M	S	S	M	M	M	M	S
10	M	M	M	S	S	M	M	M	M	S	S
11	S	M	M	M	S	S	M	M	S	M	S
12	S	S	M	S	M	M	M	M	M	M	S

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Course Title: **ASYNCHRONOUS TRANSFER MODE**		Course Code	:CP401
Semester	: **V11**	Core / Elective	: PE
Teaching Scheme in Hrs (L:T:P)	: 3**:0:0**	Credit	: **3 Credit**
Type of course	: **Lecture + Assignments**	Total Contact Hours	: **36**
Continuous Internal Evaluation	: **40 Marks**	ESE	: **60 Marks**
Programmes	: **B.TECH. CSE**		

Pre-requisites:

Computer Network (CP306).

Course Objectives:

- Develop an in-depth understanding, in terms of architecture, protocols and applications, of major high-speed networking technologies.
- Solve numerical or analytical problems pertaining to the high-speed networking technologies.
- Evaluate various technologies and identify the most suitable one to meet a given set of requirements for a hypothetical corporate network .
- Perform network design using the technologies to meet a given set of requirements .
- Develop necessary background to be able to manage projects involving any of the high-speed networking technologies.

Course Content:

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Topic and Contents	Hours	Marks
UNIT-1	**7**	**20**
INTRODUCTION: An overview of communication networks protocol layering, multiplexing and switching principles of Asynchronous Transfer Mode Precursor Technologies-X 25, Frame Relay and ISDN.Broad Band-ISDN (B-ISDN)-Configuration, Interfaces, reference model and services		
UNITS-2	**7**	**20**
ATM PROTOCOL STACK :ATM reference model, Physical layer transmission convergence sub layer functions, physical medium dependent sub layer and physical layer standards for ATM		
UNITS-3	**7**	**20**
ATM layer-ATM cell header structure. ATM layer functions. ATM adaptation layer-AAL1 to AAL5 layers		
UNIT-4	**7**	**20**
TRAFFIC MANAGEMENT: Concept of Traffic and service. Traffic and service characteristics of voice and video data.ATM Traffic descriptors and QOS parameters. Factors affecting QOS parameters and service categories. QOS classes. Elements of ATM Traffic management-Traffic contracting, policing and shaping.		
UNIT-5	**8**	**20**
SWITCHING IN ATM: Performance measures and Architectural issues in switch design. ATM switching Architecture		
TOTAL	**36**	**100**

Reference Books:

1. Sunil Kasera-ATM Networks Concepts and Protocols, Tata McGraw Hills. (2016)
2. Rainer Handel-ATM Networks, 2nd Edition, Pearson Education Asia. (2014)
3. Stallings B-ISDN & ATM with Frame Relay-Pearson, (2015)

Course outcomes:

On successful completion of the course, the student will be able to:

- Implementation of different routing mechanism.
- Specifications and implementations of cell based structure.
- Implement the concepts of QOS parameter and service categories.
- Implement the various functions of ATM layers...
- Implement the network based cell routing protocols.
- Implement the OSI model in reference with ATM model.
- Implement the concept of different switching architecture.
- Implement the concept of input and output buffering.

Mapping Course Outcomes with Program Outcomes:

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Course outcomes	Program outcomes										
	1	2	3	4	5	6	7	8	9	10	11
1	S	M	S	S	S	M	M	S	M	M	S
2	M	M	M	S	S	S	M	M	S	M	M
3	M	S	S	M	SM	M	M	S	M	M	S
4	M	M	S	S	S	S	M	M	M	M	M
5	S	M	M	M	S	M	M	S	S	S	M
6	M	S	S	S	S	S	M	S	M	M	S
7	M	M	M	M	S	M	M	M	S	S	M
8	S	M	S	S	S	M	M	S	M	M	S

Course Title	: **X-WINDOWS LAB**	Course Code	: **CP453**
Semester	: **VII**	Core / Elective	: **PC**
Teaching Scheme in Hrs (L:T:P)	: **(0,0,2)**	Credit	: **1 Credit**
Type of course	: LAB **+ LAB PROJECT**	Total Contact Hours	: **20**
Continuous Internal Evaluation	: **60 Marks**	ESE	: **40 Marks**
Programmes	: **BTECH-CSE**		

List of Experiments

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1. To understand x-windows, x-lib, x-toolkit and x network protocol and learn it's commend line argument. Programs in C/C++ language.
2. Write a program to establish connection with x server and get the sender and protocol information.
3. Using X library of the server, write a program to create a new window of a given size, title, border, foreground and background colors.
4. To implement keyboard event handling/marking using x library.
5. To implement mouse event handling/marking using x library and interface with windows managers and drawing applications.
6. To implement a multiple windows application.

7-8 To implement various drag and drop based GUI components in Visual Basic.

9-10 To implement various drag and drop based GUI components in Motif and Less if.

Course Title**:**	:**OPERATING SYSTEM LAB**	Course Code	: **CP455**
Semester	: **VII**	Core / Elective	: **PE**
Teaching Scheme in Hrs (L:T:P)	: 0:0:2	Credit	: **1 Credit**
Type of course	: LAB **+ LAB PROJECT**	Total Contact Hours	: **40**
Continuous Internal Evaluation	: **60 Marks**	ESE	: **40 Marks**
Programmes	: **BTECH-CSE**		

List of Experiments

To implement CPU Scheduling Algorithms:

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1. Implementation of CPU scheduling. a) Round Robin b) SJF c) FCFS d) Priority.
2. Implement all file allocation strategies.
3. Implement Semaphores.
4. Implement Bankers algorithm for Dead Lock Avoidance.
5. Implement an Algorithm for Dead Lock Detection.
6. Implement the all page replacement algorithms a) FIFO b) LRU c) LFU
7. Implement Shared memory and IPC.
8. Implement Paging Technique f memory management.
9. Implement Threading & Synchronization Applications.
10. Simulate Paging Technique of Memory Management.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

Course Title: **SYSTEM SECURITY LAB USING C**		Course Code	: **CP458**
Semester	: **VII**	Core / Elective	: **PC**
Teaching Scheme in Hrs (L:T:P)	: **0:0:2+2**	Credit	: **2 Credit**
Type of course	: LAB **+ LAB PROJECT**	Total Contact Hours	: **40**
Continuous Internal Evaluation	: **60Marks**	ESE	: **40 Marks**
Programmes	: **BTECH-CSE**		

List of Experiments

Implement the following chipper technique in C

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1. Implementation of Caesar Cipher technique.
2. Implement the Playfair Cipher.
3. Implement Hill Cipher Algorithm.
4. Implement the Pure Transposition Cipher.
5. Implement DES Encryption and Decryption.
6. Implement the AES Encryption and decryption.
7. Implement RSA Encryption Algorithm.
8. Implementation of Hash Functions.
9. Implement MD5 Algorithm.
10. Implement SHA-1 Algorithm.

Course Title**:**	: **REAL TIME SYSTEM**	Course Code	: **CP409**
Semester	: **VIII**	Core / Elective	: **PC**
Teaching Scheme in Hrs (L:T:P)	: 3**:0:0**	Credit	: **3 Credit**
Type of course	: **Lecture + Assignments**	Total Contact Hours	: **36**
Continuous Internal Evaluation	: **40 Marks**	ESE	: **60 Marks**
Programmes	: **B.TECH. CSE**		

Pre-requisites:

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Operating System (CP405).

Course Objectives:

- Introduction of the real-time systems.
- Computing required for the real-time embedded systems.
- Communication required for the real-time embedded systems.
- Present an overview of the real-time embedded systems in practice.
- Improve the background for choosing appropriate programming languages for certain classes of programming problems.
- Be able in principle to program in an imperative (or procedural), an object-oriented, a functional, and a logical programming language.

Course Content:

Topic and Contents	Hours	Marks
UNIT-1	**6**	**20**
Introduction: Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc., Release Times, Deadlines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload Periodic Task Model, Precedence Constraints and Data Dependency.		
UNITS-2	**7**	**20**
Real Time Scheduling: Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective-Deadline-First (EDF) and Least-Slack-Time-First (LST) Algorithms, Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems		
UNITS-3	**7**	**20**
Resources Access Control: Effect of Resource Contention and Resource Access Control (RAC), Non-preemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols Stack Based Priority-Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, Preemption Ceiling Protocol, Access Control in Multiple-Unit Resources, Controlling Concurrent Accesses to Data Objects		
UNIT-4	**6**	**20**
Multiprocessor System Environment: Multiprocessor and Distributed System Model, Multiprocessor Priority-Ceiling Protocol, Schedulability of Fixed-Priority End-to-End Periodic Tasks, Scheduling Algorithms for End-to-End Periodic Tasks, End-to-End Tasks in Heterogeneous Systems, Predictability and Validation of Dynamic Multiprocessor Systems, Scheduling of Tasks with Temporal Distance Constraints		
UNIT-5	**7**	**20**

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Real Time Communication: Model of Real Time Communication Priority-Based Service and Weighted Round- Robin Service Disciplines for Switched Networks Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols, Real Time Protocols, Communication in Multicomputer System, An Overview of Real Time Operating Systems		
TOTAL	**36**	**100**

Reference Books:

1. W.S.Liu -Real-Time Systems, Pearson Education Asia, (2014)
2. Raymond A.Buhr -Introduction to Real-Time Systems, Pearson education Asia. (2014)
3. Alan Burns-Real- Time Systems and Programming Languages, Pearson Education. (2009)

Course outcomes:

On successful completion of the course, the student will be able to:

- To present the mathematical model of the system.
- To develop real-time algorithm for task scheduling.
- To understand the working of real-time operating systems and real-time database.
- To work on design and development of protocols related to real-time communication.

Mapping Course Outcomes with Program Outcomes:

Course outcomes	Program outcomes										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1	M	M	S	S	S	M	S	M	M	M	S
2	M	M	M	M	S	M	M	S	M	M	M
3	S	M	S	S	S	M	S	M	M	S	S
4	M	S	S	S	S	M	M	M	M	M	M

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Course Title:	**ADVANCED COMPUTER ARCHITECTURES**	Course Code	: **CP404**
Semester	: **VIII**	Core / Elective	: **PC**
Teaching Scheme in Hrs (L:T:P)	: 3**:0:0**	Credit	: **3 Credit**
Type of course	: **Lecture + Assignments**	Total Contact Hours	: **36**
Continuous Internal Evaluation	: **40 Marks**	ESE	: **60 Marks**
Programmes	: **B.TECH. CSE**		

Pre-requisites:

Computer Architecture (CP302).

Course Objectives:

- To provide students with basic concepts Parallel Computers.
- To provide students with basic concepts Pipelined Computers.
- To understand PRAM, THREAD architecture.
- To understand and design parallel computing application.

Course Content:

Topic and Contents	Hours	Marks
UNIT-1	**7**	**20**
INTRODUCTION**:** Parallel Computing, Parallel Computer Model, Program and Network Properties, Parallel Architectural Classification Schemes, Flynn's & Fang's Classification, Performance Metrics and Measures, peedup Performance Laws: Multiprocessor System and Interconnection Networks; IEEE POSIX Threads: Creating and Exiting Threads, Simultaneous Execution of Threads, Thread Synchronization using Semaphore and Mutex, Canceling the Threads.		
UNITS-2	**7**	**20**
PIPELINING AND MEMORY HIERARCHY: Basic and Intermediate Concepts, Instruction Set Principle; ILP: Basics, Exploiting ILP, Limits on ILP; Linear and Nonlinear Pipeline Processors; Super Scalar and Super Pipeline Design; Memory Hierarchy Design: Advanced Optimization of Cache Performance, Memory Technology and Optimization, Cache Coherence and Synchronization Mechanisms.		
UNITS-3	**7**	**20**
THREAD AND PROCESS LEVEL PARALLEL ARCHITECTURE: Introduction to MIMD Architecture, Multithreaded Architectures, Distributed Memory MIMD Architectures Shared Memory MIMD Architecture, Clustering, Instruction Level Data Parallel Architecture, SIMD Architecture, Fine Grained and Coarse Grained SIMD Architecture, Associative and Neural Architecture Data		

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Parallel Pipelined and Systolic Architectures, Vector Architectures		
UNIT-4	**8**	**20**
Parallel Algorithms: PRAM Algorithms: Parallel Reduction, Prefix Sums, Preorder Tree Traversal, Merging two Sorted lists; Matrix Multiplication: Row Column Oriented Algorithms, Block Oriented Algorithms; Parallel Quick sort, Hyper Quick sort; Solving Linear Systems: Gaussian Elimination, Jacobi Algorithm; Parallel Algorithm Design Strategies		
UNIT-5	**7**	**20**
Developing Parallel Computing Applications: OpenMP Implementation in 'C': Execution Model, Memory Model; Directives: Conditional Compilation, Internal Control Variables, Parallel Construct, Work Sharing Constructs, Combined Parallel Work-Sharing Constructs, Master and Synchronization Constructs; Run-Time Library Routines: Execution Environment Routines, Lock Routines, Timing Routines; Simple Examples in 'C'. Basics of MPI		
TOTAL	**36**	**100**

Reference Books:

1. Hawang & Briggs- Computer Architecture & Parallel Processing, Mc Graw Hill. (1986)
2. Subrata Das-Advanced Computer Architecture, Vol I & II. (2015)

Course outcomes:

On successful completion of the course, the student will be able to:

- Will know about computer performance, instruction set architecture design and implementation.
- Will know about microprocessor implementation alternatives (single- cycle, multiple-cycle, and pipelined implementations).

Mapping Course Outcomes with Program Outcomes:

Course outcomes	Program outcomes										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1	S	S	S	S	S	M	M	M	M	M	S
2	S	S	S	S	S	M	M	M	M	M	S

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Course Title:	: **COMPILER CONSTRUCTION**	Course Code	: **CP406**
Semester	: **VIII**	Core / Elective	: **PC**
Teaching Scheme in Hrs (L:T:P)	: 3**:0:0**	Credit	: **3 Credit**
Type of course	: **Lecture + Assignments**	Total Contact Hours	: **36**
Continuous Internal Evaluation	: **40 Marks**	ESE	: **60 Marks**
Programmes	: **B.TECH. CSE**		

Pre-requisites:

Logical & Functional Programming (CP309), Theory of Computation (CP304).

Course Objectives:

To introduce students to the concepts underlying the design and implementation of language processors. More specifically, by the end of the course, students will be able to answer these questions:

- What language processors are?
- What functionality do they provide to their users?
- What core mechanisms are used for providing such functionality?
- How are these mechanisms implemented?

Course Content:

Topic and Contents	Hours	Marks
UNIT-1	**7**	**20**
Compiler, Translator, Interpreter definition, Phase of compiler introduction to one pass & Multipass compilers, Bootstrapping, Review of Finite automata lexical analyzer, Input, buffering, Recognition of tokens Idea about LEX: A lexical analyzer generator, Error handling		
UNITS-2	**7**	**20**
Review of CFG Ambiguity of grammars, Introduction to parsing. Bottom up parsing Top down parsing techniques, Shift reduce parsing, Operator precedence parsing, Recursive descent parsing predictive parsers. LL grammars & passers error handling of LL parser. LR parsers, Construction of SLR, Conical LR & LALR parsing tables, parsing with ambiguous grammar. Introduction of automatic parser generator: YACC error handling in LR parsers.		
UNITS-3	**7**	**20**
Syntax directed definitions; Construction of syntax trees, L-attributed definitions, Top down translation. Specification of a type checker, Intermediate code forms		

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using postfix notation and three address code, Representing TAC using triples and quadruples, Translation of assignment statement. Boolean expression and control structures		
UNIT-4	**7**	**20**
Storage organization, Storage allocation, Strategies, Activation records, Accessing local and non local names in a block structured language Parameters passing, Symbol table organization, Data structures used in symbol tables		
UNIT-5	**8**	**20**
Definition of basic block control flow graphs, DAG representation of basic block, Advantages of DAG, Sources of optimization, Loop optimization, Idea about global data flow analysis, Loop invariant computation, Peephole optimization, Issues in design of code generator, A simple code generator, Code generation from DAG		
TOTAL	**36**	**100**

Reference Books:

1. N.Wirth-Compiler Construction, Pearson Education Asia. (2006)
2. Charles N.Fischer-Crafting a Computer in C, Pearson Education Asia. (2005)
3. A.V. Aho-Compilers principles, techniques and tools, Pearson Education Asia. (2001)

Course outcomes:

On successful completion of the course, the student will be able to:

- Be familiar with compiler architecture.
- Be familiar with register allocation.
- Be exposed to compiler optimization

Mapping Course Outcomes with Program Outcomes:

Course outcomes	Program outcomes										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1	S	S	S	S	S	M	M	M	M	M	S
2	S	S	S	S	S	M	M	M	M	M	S
3	S	S	S	S	S	M	M	M	M	M	S

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Course Title:	: **CLOUD COMPUTING**	Course Code	: **CP412**
Semester	: **VIII**	Core / Elective	: **PC**
Teaching Scheme in Hrs (L:T:P)	: 3**:0:0**	Credit	: **3 Credit**
Type of course	: **Lecture + Assignments**	Total Contact Hours	: **36**
Continuous Internal Evaluation	: **40 Marks**	ESE	: **60 Marks**
Programmes	: **B.TECH. CSE**		

Pre-requisites:

Industrial oriented Python Project Lab (CP255), Open Source Technology Lab (UNIX/LINUX)(CP256).

Course Objectives:

- The student will learn about the cloud environment, building software systems and components that scale to millions of users in modern internet, cloud concepts capabilities across the various cloud service models including Iaas, Paas, Saas, and developing cloud based software applications on top of cloud platforms.

Course Content:

Topic and Contents	Hours	Marks
UNIT-1	**7**	**20**
Scalable Computing over the Internet, Technologies for Network based systems, System models for Distributed and Cloud Computing, Software environments for distributed systems and clouds, Performance, Security And Energy Efficiency.		
UNITS-2	**7**	**20**

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Virtual Machines and Virtualization of Clusters and Data Centers: Implementation Levels of Virtualization, Virtualization Structures/ Tools and mechanisms, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management, Virtualization for Data Center Automation.		
UNITS-3	**7**	**20**
Cloud Platform Architecture: Cloud Computing and service Models, Architectural Design of Compute and Storage Clouds, Public Cloud Platforms, Inter Cloud Resource Management, Cloud Security and Trust Management. Service Oriented Architecture, Message Oriented Middleware.		
UNIT-4	**7**	**20**
Cloud Programming and Software Environments: Features of Cloud and Grid Platforms, Parallel & Distributed Programming Paradigms, Programming Support of Google App Engine, Programming on Amazon AWS and Microsoft. Azure, Emerging Cloud Software Environments.		
UNIT-5	**8**	**20**
Cloud Resource Management and Scheduling: Policies and Mechanisms for Resource Management Applications of Control Theory to Task Scheduling on a Cloud, Stability of a Two Level Resource Allocation Architecture, Feedback Control Based on Dynamic Thresholds. Coordination of Specialized Autonomic Performance Managers, Resource Bundling, Scheduling Algorithms for Computing Clouds, Fair Queuing, Start Time Fair Queuing, Borrowed Virtual Time, Cloud Scheduling Subject to Deadlines, Scheduling MapReduce Applications Subject to Deadlines		
TOTAL	**36**	**100**

Reference Books:

2. Kai Hwang, Geoffry C. Fox, Jack J. Dongarra MK Elsevier, Distributed and Cloud Computing, (2013)
3. Dan C Marinescu, MK Elsevier. Cloud Computing, Theory and Practice, (2012)
4. Arshadeep Bahga, Vijay Madisetti, University Press, A Hands on approach, Cloud Computing , (2015)

Course outcomes:

On successful completion of the course, the student will be able to:

- Understanding the key dimensions of the challenge of Cloud Computing
- Assessment of the economics, financial, and technological implications for selecting cloud computing for own organization.
- Assessing the financial, technological, and organizational capacity of employer's for actively initiating and installing cloud-based applications.
- Assessment of own organizations' needs for capacity building and training in cloud computing-related IT areas.

Mapping Course Outcomes with Program Outcomes:

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Course outcomes	Program outcomes										
	1	2	3	4	5	6	7	8	9	10	11
1	M	M	M	S	S	M	S	M	S	M	S
2	S	M	M	S	M	M	M	M	S	S	S
3	M	S	S	S	S	M	S	M	S	S	M
4	M	M	M	M	S	S	M	S	S	M	S

Course Title:	: **SOFT COMPUTING**	Course Code	: **CP416**
Semester	: **VIII**	Core / Elective	: **PE**
Teaching Scheme in Hrs (L:T:P)	: **3:0:0**	Credit	: **3 Credit**
Type of course	: **Lecture + Assignments**	Total Contact Hours	: **36**
Continuous Internal Evaluation	: **40 Marks**	ESE	: **60 Marks**
Programmes	: **B.TECH. CSE**		

Pre-requisites:

Artificial Intelligence (CP407).

Course Objectives:

The main objective of the course is to expose the students to soft computing, various types of soft computing techniques, and applications of soft computing. .Upon completion of this course, the student should be able to get an idea on :

- Artificial Intelligence, Various types of production systems,

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characteristics of production systems.

- Neural Networks, architecture, functions and various algorithms involved.
- Fuzzy Logic, Various fuzzy systems and their functions.
- Genetic algorithms, its applications and advances.

Course Content:

Topic and Contents	Hours	Marks
UNIT-1	**7**	**20**
Soft Computing: Introduction to soft computing, soft computing vs. hard computing, various types of soft computing techniques, applications of soft computing. Artificial Intelligence: Introduction, Various types of production systems, characteristics of production systems, breadth first search, depth first search techniques, other Search Techniques like hill Climbing, Best first Search, A* algorithm, AO* Algorithms and various types of control strategies. Knowledge representation issues, Prepositional and predicate logic, monotonic and non monotonic reasoning, forward Reasoning, backward reasoning, Weak & Strong Slot & filler structures, NLP.		
UNITS-2	**7**	**20**
Neural Network: Structure and Function of a single neuron: Biological neuron, artificial neuron, definition of ANN, Taxonomy of neural net, Difference b/w ANN and human brain, characteristic and applications of ANN, single layer network.		
UNITS-3	**7**	**20**
Perceptron: Perceptron training algorithm, Linear separability, Widrow & Hebb's learning rule/Delta rule, ADALINE, MADALINE, AI v/s ANN. Introduction of MLP, different activation functions, Error back propagation algorithm, derivation of BBPA, momentum, limitation, characteristics and application of EBPA **Counter propagation network:** architecture , functioning & characteristics of counter Propagation network, Hop field/ Recurrent network, configuration, stability constraints, associative memory, and characteristics, limitations and applications. Hopfield v/s Boltzman machine. Adaptive Resonance Theory: Architecture, classifications, Implementation and training. Associative Memory.		
UNIT-4	**7**	**20**
Fuzzy Logic: Fuzzy set theory, Fuzzy set versus crisp set, Crisp relation & fuzzy relations, Fuzzy systems: crisp logic, fuzzy logic, introduction & features of membership functions. Fuzzy rule base system : Fuzzy propositions, formation, decomposition & aggregation of fuzzy Rules, fuzzy reasoning, fuzzy inference systems, fuzzy decision making & Applications of fuzzy logic.		
UNIT-5	**8**	**20**
Genetic algorithm: Fundamental, basic concepts, working principle, encoding, fitness function, reproduction, Genetic modeling: Inheritance operator, cross over, inversion & deletion, mutation operator, Bitwise operator ,Generational Cycle,		

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Convergence of GA, Applications & advances in GA, Differences & similarities between GA & other traditional methods.		
TOTAL	**36**	**100**

Reference Books:

1. S.N. Sivanandam & S.N, Deepa, Principles of Soft Computing, Wiley Publications, 2nd Edition, (2011)
2. S, Rajasekaran & G.A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic & Genetic Algorithms, Synthesis & applications, PHI Publication, 1st Edition, (2009)

Course outcomes:

On successful completion of the course, the student will be able to:

- Learn about soft computing techniques and their applications
- Analyse various neural network architectures
- Understand perceptron's and counter propagation networks.
- Define the fuzzy systems
- Analyse the genetic algorithms and their applications.

Mapping Course Outcomes with Program Outcomes:

Course outcomes	Program outcomes										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1	S	M	M	M	S	M	M	M	M	M	S
2	M	S	S	S	M	S	S	S	M	S	S
3	S	M	M	M	S	M	M	M	M	M	M
4	M	S	S	S	M	S	S	S	S	M	S
5	S	M	M	S	S	M	M	S	M	S	M

Course Title:	:**DATA COMPRESSION TECHNIQUE**	Course Code	: **CP418**
Semester	: **VIII**	Core / Elective	: **PE**
Teaching Scheme in Hrs (L:T:P)	: **3:0:0**	Credit	: **3 Credit**
Type of course	: **Lecture + Assignments**	Total Contact Hours	: **36**

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Continuous Internal Evaluation	: **40 Marks**	ESE	: **60 Marks**
Programmes	: **B.TECH. CSE**		

Pre-requisites:

Data Structure and Algorithm (CP201).

Course Objectives:

- Provide students with contemporary knowledge in Data Compression and Coding.
- Equip students with skills to analyze and evaluate different Data Compression and Coding methods.

Course Content:

Topic and Contents	Hours	Marks
UNIT-1	**7**	**20**
Introduction Definitions, Historical background,, Applications, Taxonomy Intuitive Compression. Run-Length Encoding, RLE Text Compression, RLE Image Compression, Move-toFront Coding, Scalar Quantization		
UNITS-2	**7**	**20**
Statistical Methods Information Theory Concepts, Variable-Size Codes, Prefix Codes, Golomb Codes, The Kraft-MacMillan Inequality, The Counting Argument, Shannon-Fano Coding, Huffman Coding, Adaptive Huffman Coding, MNP5, MNP7, Arithmetic coding, Adaptive Arithmetic Coding, QM Coder, Text Compression, Context-Tree Weighting Dictionary Methods String Compression, Simple Dictionary Compression,LZ77 (Sliding Window), LZSS, Repetition Times, QIC-122, LZX, File Differencing: VCDIFF, LZ78, LZFG, LZRW1,LZRW 4, LZW, LZMW, LZAP, LZY, LZP, Repetition Finder, UNIX Compression, The V.42bis Protocol, XML Compression: XMill, EXE Compressors, CRC, Data Compression Patents		
UNITS-3	**7**	**20**
Image Compression Approaches to Image Compression; Image Transforms, Orthogonal Transforms. The Discrete Cosine Transform JPEG, JPEG-LS. Progressive Image Compression, JBIG, JBIG2, Simple Images: EIDAC, Vector Quantization, Adaptive Vector Quantization, Block Matching, Block Truncation Coding, Context-Based Methods, FELICS, Progressive FELICS, Differential Lossless Compression Wavelet Methods Fourier Transform, The Frequency Domain, Fourier Image, Compression, Multiresolution Decomposition, The Laplacian Pyramid, SPIHT, CREW. EZW, DjVu, JPEG 2000		
UNIT-4	**7**	**20**
Video Compression Analog Video , Composite and Components Video , Digital Video , Video Compression , MPEG , MPEG-4 , H.261		

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Audio Compression Sound, Digital Audio , The Human Auditory System , μ-Law and A-Law Companding, ADPCM Audio Compression , MLP Audio , Speech Compression , Shorten MPEG-1 Audio Layers		
UNIT-5	**8**	**20**
Other Methods and application Zip and Gzip, PNG, The Burrows-Wheeler Method ,Symbol Ranking, ACB , SortBased Context Similarity , Sparse Strings , Word-Based Text Compression , Textual Image Compression, Dynamic Markov Coding , FHM Curve Compression , Sequitur , Triangle Mesh Compression: Unicode Compression		
TOTAL	**36**	**100**

Reference Books:

1. David Salomon , A Concise Introduction to Data Compression, 1st edition, Springer. (2008)
2. David Salomon, G. Motta, D. Bryan, Data Compression: The Complete Reference, 4nd edition, Springer . (2006)
3. D.C. Hankerson, Greg A. Harris , Peter D. Johnson Jr, Introduction to Information Theory and Data Compression, Second Edition, Chapman & Hall/CRC; 2 edition. (2003)

Course outcomes:

On successful completion of the course, the student will be able to:

- Explain the evolution and fundamental concepts of Data Compression and Coding techniques.
- Analyze the operation of a range of commonly used Coding and Compression techniques
- Identify the basic software and hardware tools used for data compression.
- Identify what new trends and what new possibilities of data compression are available.

Mapping Course Outcomes with Program Outcomes:

Course outcomes	Program outcomes										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1	S	M	M	S	S	M	M	S	M	M	S
2	M	S	M	M	S	M	M	M	M	M	M
3	M	M	S	S	M	M	M	M	M	S	S
4	S	M	M	S	S	S	M	S	M	M	M

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Course Title:	: **DISTRIBUTED SYSTEM**	Course Code	: CP408
Semester	: **VIII**	Core / Elective	: **PE**
Teaching Scheme in Hrs (L:T:P)	: 3**:0:0**	Credit	: **3 Credit**
Type of course	: **Lecture + Assignments**	Total Contact Hours	: **36**
Continuous Internal Evaluation	: **40 Marks**	ESE	: **60 Marks**
Programmes	: **B.TECH. CSE**		

Pre-requisites:

Operating System (CP405), Computer Network (CP306)

Course Objectives:

- Assess how the choice of data structures and algorithm design methods impacts the performance of programs.
- Choose the appropriate data structure and algorithm design method for a specified application.
- Write programs using object-oriented design principles.
- Solve problems using data structures such as linear lists, stacks, queues, hash tables, binary trees, heaps, tournament trees, binary search trees, and graphs and writing programs for these solutions.
- Solve problems using algorithm design methods such as the greedy method, divide and conquer, dynamic programming, backtracking, and branch and bound and writing programs for these solutions.

Course Content:

Topic and Contents	Hours	Marks
UNIT-1	**6**	**20**
CHARACTERIZATION OF DISTRIBUTED SYSTEMS: Introduction, Examples of distributed Systems, Resource sharing and the Web Challenges. System Models: Architectural models, Fundamental Models Theoretical Foundation for Distributed System: Limitation of Distributed system, absence of global clock, shared memory, Logical clocks, Lamport's & vectors logical clocks, Causal ordering of messages, global state, and termination. Distributed Mutual Exclusion: Classification of distributed mutual exclusion, requirement of mutual exclusion theorem, Token based and non token based algorithms, performance metric for distributed mutual exclusion algorithms.		
UNITS-2	**7**	**20**
DISTRIBUTED DEADLOCK DETECTION: system model, resource Vs communication deadlocks, deadlock prevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection Path pushing algorithms, edge chasing algorithms. Agreement Protocols: Introduction System models, classification of Agreement Problem Byzantine agreement problem, Consensus problem, Interactive consistency Problem, Solution to Byzantine Agreement Problem Application of Agreement problem, Atomic Commit in Distributed Database system		

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UNITS-3	7	20
DISTRIBUTED OBJECTS AND REMOTE INVOCATION: Communication between distributed objects, Remote procedure call, Events and notifications, Java RMI case study. **SECURITY:** Overview of security techniques, Cryptographic algorithms, Digital signatures Cryptography pragmatics, Case studies: Needham Schroeder, Kerberos, and SSL & Millicent. **DISTRIBUTED FILE SYSTEMS:** File service architecture, Sun Network File System, The Andrew File System, Recent Advances		
UNIT-4:	**7**	**20**
TRANSACTIONS AND CONCURRENCY CONTROL: Transactions, Nested transactions, Locks, Optimistic Concurrency control, Timestamp ordering, Comparison of methods for concurrency control. DISTRIBUTED TRANSACTIONS: Flat and nested distributed transactions, Atomic Commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Replication: System model and group communication, Fault - tolerant services, highly available services, Transactions with replicated data		
UNIT-5:	**8**	**20**
DISTRIBUTED ALGORITHMS: Introduction to communication protocols, Balanced sliding window protocol, Routing algorithms, Destination based routing, APP problem, Deadlock free Packet switching, Introduction to Wave & traversal algorithms, Election algorithm. CORBA CASE STUDY: CORBA RMI, CORBA services		
TOTAL	**36**	**100**

Reference Books:

1 George Coulouris-Distributed Systems Concepts and Design, 3rd ed., Pearson Education Asia. (2001)

2 A.S. Tanenbaum-Distributed Systems Principles and Paradigms, Prentice Hall of India. (2016)

3 Larry Peterson and Bruce Davie -Developing Distributed and E-Commerce Applications, Computer Networks: A Systems Approach, fourth edition, Addition Wesley. Darrel Ince . (2016)

4 Silberschatz, Galvin and Gagne. (2013)

5 Operating Systems Concepts For the projects, please ESE Dave's Notes on Software Engineering for Systems Hackers, seventh edition, by. (2016)

6 W. Richard Stevens For programming, ESE Unix Network Programming: Networking APIs: Sockets and XTI (Volume 1) , (2003)

7 W. Richard Stevens, Advanced Programming in the Unix Environment, Addison-Wesley, (1993)

Course outcomes:

On successful completion of the course, the student will be able to:

- Analyse a problem and form a plan on how to work towards a solution.
- Construct theoretical models and implement them on a computer.
- Make realistic plans, taking other possibilities, limitations and time consume into consideration.
- Collect and analyse various types of information, and possess a healthy, critical attitude towards these sources.
- Write a longer continuous report and present her research clearly in written work.
- Communicate her knowledge orally and in writing.
- Express own reflections and attitudes in regard to the area of research.

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Mapping Course Outcomes with Program Outcomes:

Course outcomes	Program outcomes										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1	M	S	M	S	M	S	M	S	M	M	S
2	S	M	S	S	S	M	M	M	M	M	M
3	S	M	S	M	S	M	M	S	S	M	S
4	M	M	M	S	S	S	M	S	M	S	M
5	S	M	S	S	M	M	M	M	M	M	S
6	M	S	S	M	S	M	S	S	M	M	M
7	S	M	S	S	S	M	M	S	S	M	S

Course Title:	: **EMBEDDED SYSTEMS**	Course Code	: **CP414**
Semester	: **VIII**	Core / Elective	: **PE**
Teaching Scheme in Hrs (L:T:P)	: **3:0:0**	Credit	: **3 Credit**
Type of course	: **Lecture + Assignments**	Total Contact Hours	: **36**
Continuous Internal Evaluation	: **40 Marks**	ESE	: **60 Marks**
Programmes	: **B.TECH. CSE**		

Pre-requisites:

Microprocessor, Real Time System, Operating System, Database Management System

Course Objectives:

- Understand and design embedded systems and real-time systems.
- Identify the unique characteristics of real-time systems.
- Explain the general structure of a real-time system.
- Define the unique design problems and challenges of real-time systems.
- Apply real-time systems design techniques to various software programs.
- A survey of contemporary Real-time operating systems like microkernel based system.
- Application of project management techniques to embedded systems projects.
- Application of knowledge of embedded systems engineering technology, along with some specialization in at least one area of computer systems engineering technology.
- Application of mathematics including differential and integral calculus, probability, and discrete mathematics to hardware and software problems.

Course Content:

Topic and Contents	Hours	Marks
UNIT-1	**7**	**20**

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Overview of Embedded System: Embedded System, Categories and Requirements of Embedded Systems, Challenges and Issues in Embedded Software Development, Applications of Embedded Systems in Consumer Electronics, Control System, Biomedical Systems, Handheld computers, Communication devices		
UNITS-2	**7**	**20**
Embedded Hardware & Software Development Environment: Hardware Architecture, Micro- Controller Architecture, Communication Interface Standards, Embedded System Development Process, Embedded Operating systems Types of Embedded Operating systems		
UNITS-3	**7**	**20**
Design quality and Microcontroller: Quality matrix, software and hardware, Estimation 8 Bit microcontrollers Architecture, on chip peripherals, instruction set/programming of Intel MCS51 family (8 bit) Inter facing of 8051 with LCD, ADC, sensors, stepper motor, key board, DAC, memory		
UNIT-4	**7**	**20**
Real Time & Database Applications: Real- Time Embedded Software Development, Sending a Message over a Serial Link, Simulation of a Process Control System Controlling an Appliance from the RTLinux System, Embedded Database Applications using examples like Salary Survey, Energy Meter Readings		
UNIT-5	**8**	**20**
Programming Languages for Embedded Systems: Tools for building embedded systems - with case studies. Microchip PIC16 family PIC16F873 processor features architecture memory organization register file map I/O ports PORTA - PORTB PORTC Data EEPROM and flash program memory Asynchronous serial port SPI mode I2C mode		
TOTAL	**36**	**100**

Reference Books:

1 William Stallings, Embedded System (PHI, 5th Ed.) , (2003)

2 James Martin: semiconductor in computer (PHI, 3rd Ed.) , (1995)

Course outcomes:

On successful completion of the course, the student will be able to:

- The students will be able to design, simulate, built and debug complex combinational and sequential circuits based on an abstract functional specification.

Mapping Course Outcomes with Program Outcomes:

Course outcomes	Program outcomes										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1	S	S	S	S	S	M	M	M	M	M	S

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Course Title:	: **PARALLEL COMPUTING**	Course Code	: **CP420**
Semester	: **VIII**	Core / Elective	: **PE**
Teaching Scheme in Hrs (L:T:P)	: **3:0:0**	Credit	: **3 Credit**
Type of course	: **Lecture + Assignments**	Total Contact Hours	: **36**
Continuous Internal Evaluation	: **40 Marks**	ESE	: **60 Marks**
Programmes	: **B.TECH. CSE**		

Pre-requisites:

Computer Architecture (CP302)

Course Objectives:

- An ability to apply knowledge of computing and mathematics appropriate to the discipline
- An ability to analyze a problem and identify the computing requirements appropriate for its solution; an ability to design, implement and evaluate a computer-based system, process, component or program to meet desired needs;
- An ability to apply mathematical foundations, algorithmic principles and computer science theory to the modeling and design of computer based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices;

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- An ability to apply design and development principles in the construction of software systems of varying complexity.
- A ability to function effectively as a member of a team in order to accomplish a common goal.

Course Content:

Topic and Contents	Hours	Marks
UNIT-1	**7**	**20**
Parallel computer architectures: Distributed memory systems, Shared memory systems and cache coherence, Heterogeneous system architecture (GPU and Xeon Phi),Interconnection networks and routing		
UNITS-2	**7**	**20**
Principles of parallel algorithm design: Decomposition techniques, Characteristics of tasks and interactions, Mapping techniques for load balancing , Parallel algorithm models		
UNITS-3	**7**	**20**
Programming scalable systems : Programming using MPI paradigm, Programming using global address space language UPC **Programming shared-address space systems:** OpenMP, Cilk Plus		
UNIT-4	**7**	**20**
Programming heterogeneous systems: CUDA and OpenCL, OpenACC and OpenMP (4.0) **Analytical modeling of parallel program:** Scalability of parallel systems, Sources of overhead in parallel, programs, Asymptotic analysis of parallel programs		
UNIT-5	**8**	**20**
Basic communication operations Graph, algorithms Dense, matrix algorithms Numerical, algorithms Search, algorithm for discrete optimization		
TOTAL	**36**	**100**

Reference Books:

1. Ananth Grama, Anshul Gupta, George Karypis, and Vipin Kumar. Introduction to parallel computing, second edition, Addison-Wesley, (2014).
2. Wilkinson and Allen, Parallel Programming: Techniques and Applications Using Networked Workstations and Parallel Computers, Prentice Hall, 1999.
3. Quinn, M., Parallel Computing: Theory and Practice, McGraw Hill, 2014.
4. J'aJ'a, J., An Introduction to Parallel Algorithms, Addison-Wesley Pub Co, Reading, MA, 2012.
5. F. T. Leighton, Introduction to Parallel Algorithms and Architectures: Arrays, Trees, Hypercubes, Morgan Kaufmann, CA 2013.

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6. J. H. Rief, Synthesis of Parallel Algorithms, Morgan Kaufman, San Mateo, CA, 206.

Course outcomes:

On successful completion of the course, the student will be able to:

- An ability to apply knowledge of computing and mathematics appropriate to the discipline
- An ability to analyze a problem and identify the computing requirements appropriate for its solution; an ability to design, implement and evaluate a computer-based system, process, component or program to meet desired needs;
- An ability to apply mathematical foundations, algorithmic principles and computer science theory to the modeling and design of computer based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices;
- An ability to apply design and development principles in the construction of software systems of varying complexity.
- A ability to function effectively as a member of a team in order to accomplish a common goal;

Mapping Course Outcomes with Program Outcomes:

Course outcomes	Program outcomes										
	1	2	3	4	5	6	7	8	9	10	11
1	M	M	M	S	S	M	M	S	M	M	M
2	S	S	S	M	S	M	M	M	S	M	M
3	M	M	M	S	M	S	M	M	M	M	S
4	M	S	S	S	S	M	M	M	M	S	M
5	S	M	S	M	S	M	M	S	M	M	S

Course Title	: **CAD for VLSI Design**	Course Code	: **EC418**
Semester	: **VIII**	Core / Elective	: **PE**
Teaching Scheme in Hrs (L:T:P)	: **3:0:0**	Credit	: **3 Credit**
Type of course	: **Lecture + Assignments**	Total Contact Hours	: **36**
Continuous Internal Evaluation	: **40 Marks**	ESE	: **60 Marks**
Programmes	: **B.TECH. CSE**		

Pre-requisites:

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Switching theory and logic design (EC223).

Course Objectives:

- Modelling and simulation of digital VLSI systems using hardware design language.
- Synthesis of digital VLSI systems from register-transfer or higher level descriptions in hardware design languages.
- Concept of design rules.
- Trends in semiconductor technology, and how it impacts scaling and performance.
- VLSI design methodologies - the various steps and tools, the implementation choices, and good architecture practices.
- Data path design and optimization via transformations such as pipelining, parallelism, retiming, unfolding.
- Low-power design concepts and voltage-frequency scaling.
- Design for test - basic concepts, fault models (stuck-at) for combinational circuits, fault equivalence and dominance, test-vector generation, scan-path based testing.

Course Content

Topic and Contents	Hours	Marks
UNIT-1	**7**	**20**
Modern digital systems, complexity and diversity of digital systems Productivity gap and need for CAD tools. introduction to steps and CAD flow for designing with ASIC and FPGA		
UNITS-2	**7**	**20**
Introduction to VHDL, background, VHDL requirement, Elements of VHDL, top down design, convention and syntax, basic concepts in VHDL i.e. characterizing H/W languages, objects, classes, and signal assignments		
UNITS-3	**7**	**20**
Structural specification of H/W- Parts library, Wiring, modeling, binding alternatives, top down wiring. Design organization and parameterization. Type declaration, VHDL operators		
UNIT-4	**7**	**20**
VHDL subprogram parameters, overloading, predefined attributes, user defined attributes, packaging basic utilities. VHDL as a modeling language- bi-directional component modeling, multi-mode component modeling		
UNIT-5	**8**	**20**
Examples of VHDL synthesis subsets- combinational logic synthesis, sequential circuit synthesis, State machine synthesis. VHDL language grammar. Introduction to synthetic circuits and circuit repositories		
TOTAL	**36**	**100**

Reference Books:

1 M. B. Srivastava, Lecture Notes on VLSI Systems Design, available online on course website, 2016.

1. J. Rabaey, A. Chandrakasan, and B. Nicolic Digital Integrated Circuits, 2nd Edition, Prentice Hall,

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NJ, (2012)

2. P. Ashenden, The Designers Guide to VHDL, 2nd Edition, Morgan Kaufman Publishing, CA, (2016)

Course outcomes:

On successful completion of the course, the student will be able to:

- Modeling and simulation of digital VLSI systems using hardware design language.
- Synthesis of digital VLSI systems from register-transfer or higher level descriptions in hardware design languages.
- Trends in semiconductor technology, and how it impacts scaling and performance.
- VLSI design methodologies - the various steps and tools, the implementation choices, and good architecture practices.
- Data path design and optimization via transformations such as pipelining, parallelism, retiming, unfolding.
- Low-power design concepts and voltage-frequency scaling.
- Design for test - basic concepts, fault models (stuck-at) for combinational circuits, fault equivalence and dominance, test-vector generation, scan-path based testing.
- Parasitics and interconnects: modeling and estimation of R, C, and L parasitics, effect of technology scaling, sheet resistance, techniques to cope with ohmic drop and capacitive cross talk, sizing cascaded buffers, estimating RC delay, inductive effects.

Mapping Course Outcomes with Program Outcomes:

Course outcomes	Program outcomes										
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
1	M	S	S	S	S	S	S	M	S	M	S
2	S	S	M	S	S	M	S	M	M	M	M
3	S	S	M	M	S	S	M	M	M	M	M
4	S	M	S	S	S	M	S	M	M	S	M
5	M	S	M	S	M	S	S	M	S	M	M
6	S	S	S	S	S	M	M	M	M	M	S
7	S	S	M	M	S	M	S	M	S	M	M
8	S	S	S	S	S	M	S	M	S	M	M

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Course Title: **COMPILER CONSTRUCTION LAB**		Course Code	: **CP452**
Semester	: **VIII**	Core / Elective	: **PC**
Teaching Scheme in Hrs (L:T:P)	: **0:0:2+2**	Credit	: **2 Credit**
Type of course	: LAB **+ LAB PROJECT**	Total Contact Hours	: **20**
Continuous Internal Evaluation	: **60Marks**	ESE	: **40 Marks**
Programmes	: **BTECH-CSE**		

List of Experiments

1,2 Write a Program to identify data storage statements in an 8086 assembly language program and estimate the size of data segment.

3. Write a program to identify macro definitions in an assembly language program.

4,5. Extend the above program to implement simple and recursive macro expansion.

6. Write a program to process 'include' and 'define' macro in C language.

7, 8 Write a program to parse source code string of C-language and identify token in terms of keywords and identifiers.

9. Construct parse tree of arithmetic statements in C language program.

10. Write a program to implement operator precedence of a given string.

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Course Title: **ADVANCE COMPUTER ARCHITECTURE LAB**		Course Code	: **CP454**
Semester	: **VIII**	Core / Elective	: **PE**
Teaching Scheme in Hrs (L:T:P)	: **(0,0,2)**	Credit	: **1 Credit**
Type of course	: LAB **+ LAB PROJECT**	Total Contact Hours	: **40**
Continuous Internal Evaluation	: **60 Marks**	ESE	: **40 Marks**
Programmes	: **B. TECH-CSE**		

List of Experiments

1-2. Implementation of Architecture of Star 100 & T1-ASC.

3. Implementation of Architecture of Cyber-205

4. Implementation of Pentium & power PC addressing modes.

5. Implementation of RISC pipelining.

6. Implementation of Pentium 4.

7. Implementation of Job Sequencing & collision prevention.

8-9. Implementation of Load Balancing – Static & Dynamic.

10. Case study of Parallel search algorithm.

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Course Title:	: **.NET LAB**	Course Code	: **CP451**
Semester	: **VIII**	Core / Elective	: **PE**
Teaching Scheme in Hrs (L:T:P)	: **0:0:2**	Credit	: **1 Credit**
Type of course	: **Practical + Assignments**	Total Contact Hours	: **40**
Continuous Internal Evaluation	: **60 Marks**	ESE	: **40 Marks**
Programmes	: **B.TECH. CSE**		

List of Experiments

1. Web Form Fundamentals.
2. The Anatomy of an Asp.Net Application, Server Controls, HTML Control.
3. Access, Page Class, Application Events, Asp.Net Configuration.
4. Web Controls Web Controls Basics, Web Control Classes, List Controls, Table Controls,
5. Web Controls Event and auto post back.
6. State Management.
7. View State, Transferring Information between Pages, Cookies, Session State,
8. Session State Configuration, Application State.
9. Rich Controls.
10. Calendar, AdRotator, Multiple Views.
11. Styles, Themes, and Master Pages.
12. Style sheets, Themes, Skins, Master Pages, Content.

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Course Title	: INDUSTRIAL ORIENTED PHP PROJECT LAB	Course Code	: CP460
Semester	: **VIII**	Core / Elective	: **UE**
Teaching Scheme in Hrs (L:T:P)	: 0**:0:2+2**	Credit	: **2 Credit**
Type of course	: **Lecture + Assignments**	Total Contact Hours	: **40**
Continuous Internal Evaluation	: **60 Marks**	ESE	: **40 Marks**
Programmes	: **B.TECH. CSE**		

List of Experiments

1. Write a PHP Program to demonstrate the variable function: Gettype() and Settype().
2. Write a PHP program to create a table and insert record into a table using MySQL.
3. Write a PHP program to drop table and perform update table operation using MySQL.
4. Write a PHP program to select data and show into table format.
5. Write a PHP program that demonstrate form element(input elements).
6. Create a student Registration in PHP and Save and Display the student Records.
7. Write a program to Develop student registration form and display all the submitted data on another page.
8. Write a program to read customer information like c_no, c_name, item_purchased and mob_no from customer table and display all this information in table format on output screen.
9. Write a program that keeps track of how many times a visitor has loaded the page.
10. Write a program that displays a different message based on time of day. For example page should display “Good Morning” if it is accessed in the morning.

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Course Title	: **CAD FOR VLSI DESIGN LAB**	Course Code	: **EC458**
Semester	: **VIII**	Core / Elective	: **PE**
Teaching Scheme in Hrs (L:T:P)	: 0**:0:2**	Credit	: **1 Credit**
Type of course	: **Lecture + Assignments**	Total Contact Hours	: **20**
Continuous Internal Evaluation	: **40 Marks**	ESE	: **60 Marks**
Programmes	: **B.TECH. CSE**		

List of Experiments

1. Half adder, Full adder, Subtractor Flip Flops, 4bit comparator.
2. Parity generator.
3. Bit up/down counter with load able count.
4. Decoder and encoder.
5. 8 bit shift register.
6. 8:1 multiplexer.
7. Test bench for a full adder.
8. Barrel shifter.
9. N by m binary multiplier.
10. RISC CPU (3bit opcode, 5bit address).

TOOLS:

Xilinx Tools/ Synopsis Tools/ Cadence Tools/ Model SIM/ Leonardo Spectrum Tools/VIS/SIS Tools to be used.

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