ANNEXURE - II

LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
SCHEME OF INSTRUCTIONS & EXAMINATION [LR-21]
(W.e.f Academic Year 2023-24)
B.E. V-Semester (Tentative)

S. No.	Course Code	Category	Course Title	Scheme of Instructions				Scheme of Examination			
				L	T	P/D	Contact Hours/Week	Maximum Marks		Duration in Hours	CREDITS
								CIE	SEE		
Theory Course											
1	U21CM501	PCC	Automata Theory, Languages and Computation	3	0	0	3	40	60	3	3
2	U21CS501	PCC	Design and Analysis of Algorithms	3	1	0	4	40	60	3	4
3	U21CS503	PCC	Operating Systems	3	1	0	4	40	60	3	4
4	---	PEC	Professional Elective-I	3	0	0	3	40	60	3	3
5	---	OEC	Open Elective-I	3	0	0	3	40	60	3	3
Practical/ Laboratory Course											
6	U21CS5L1	PCC	Design and Analysis of Algorithms Lab	0	0	3	3	25	50	3	1.5
7	U21CS5L2	PCC	Operating systems Lab	0	0	3	3	25	50	3	1.5
Internship											
8	U21CS5P1	PROJ	Internship (During Vacation Period after IV Sem)	-	-	2	2	50	-	-	1
Total				15	2	8	25	300	400	--	21

L: Lecture *(Hrs/Wk/Sem)*   T: Tutorial *(Hrs/Wk/Sem)*   P: Practical   D: Drawing *(Hrs/Wk/Sem)*

CIE: Continuous Internal Evaluation   SEE: Semester End Examination
PCC: Program Core Course   PEC: Professional Elective Course
OEC: Open Elective Course   CS: Computer Science
PROJ: Project

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SCHEME OF INSTRUCTIONS & EXAMINATION [LR-21]
(W.e.f Academic Year 2023-24)
B.E. VI-Semester (Tentative)

S. No.	Course Code	Category	Course Title	Scheme of Instructions				Scheme of Examination			CREDITS
				L	T	P/D	Contact Hours/Week	Maximum Marks		Duration in Hours	
								CIE	SEE		
Theory Course											
1	U21MB601	HSMC	Business Economics and Financial Analysis	3	0	0	3	40	60	3	3
2	U21CS601	PCC	Compiler Design	2	1	0	3	40	60	3	3
3	U21IT602	PCC	Computer Networks	3	0	0	3	40	60	3	3
4	--	PEC	Professional Elective-II	3	0	0	3	40	60	3	3
5	--	OEC	Open Elective II	3	0	0	3	40	60	3	3
Practical/ Laboratory Course											
6	U21IT6L1	PCC	Computer Networks Lab	0	0	3	3	25	50	3	1.5
7	U21CS6L1	PCC	Compiler Design Lab	0	0	3	3	25	50	3	1.5
8	U21CS6L2	PCC	Scripting Language Lab	-	-	2	2	50	-	-	1
Seminar											
9	U21CS6P1	PROJ	Technical Seminar	-	-	2	2	50	-	-	1
Skill Development Course											
10	U21MA6L1	BSC	Aptitude and Reasoning Skills Lab	-	-	2	2	25	50	3	1
Total				14	1	12	27	375	450	--	21

L: Lecture *(Hrs/Wk/Sem)*   T: Tutorial *(Hrs/Wk/Sem)*   P: Practical   D: Drawing *(Hrs/Wk/Sem)*

CIE: Continuous Internal Evaluation
OEC: Open Elective Course
MB: Management Studies
PEC: Professional Elective Courses
HSMC: Humanities and Social Sciences
    including Management Course

SEE: Semester End Examination
PCC: Program Core Courses
PROJ: Project
CS: Computer Science
MA: Mathematics

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SCHEME OF INSTRUCTIONS & EXAMINATIONS
(w.e.f Academic Year 2022-23)
PROFESSIONAL ELECTIVE COURSES

S. No.	Course Code	Category	Course Title	Scheme of Instructions				Scheme of Examination			
				L	T	P/D	Contact Hours/Week	Maximum Marks		Duration in Hours	CREDITS
								CIE	SEE		
Theory Course											
1	U21CS504	PEC-I	Software Testing Methodologies	3	0	0	3	40	60	3	3
	U21CS505		Advanced Computer Architecture	3	0	0	3	40	60	3	3
	U21CS506		Basics of Data Science	3	0	0	3	40	60	3	3
	U21CS507		Fundamentals of Cryptography	3	0	0	3	40	60	3	3
2	U21CS603	PEC-II	Software Project Management	3	0	0	3	40	60	3	3
	U21CS604		Web and Internet Technologies	3	0	0	3	40	60	3	3
	U21CS605		Artificial Intelligence	3	0	0	3	40	60	3	3
	U21CS606		Mobile Computing	3	0	0	3	40	60	3	3
3	U21CS703	PEC-III	Secure Software Design and Enterprise Computing	3	0	0	3	40	60	3	3
	U21CS704		Service Oriented Architecture	3	0	0	3	40	60	3	3
	U21CS705		Machine Learning	3	0	0	3	40	60	3	3
	U21CS706		Block Chain Technologies	3	0	0	3	40	60	3	3
4	U21CS707	PEC-IV	Semantic web	3	0	0	3	40	60	3	3
	U21CS708		Web Services	3	0	0	3	40	60	3	3
	U21CS709		Deep Learning	3	0	0	3	40	60	3	3
	U21CS710		Digital Forensics	3	0	0	3	40	60	3	3
5	U21CS802	PEC-V	Agile Methodologies	3	0	0	3	40	60	3	3
	U21CS803		Fundamentals of Computer Interaction	3	0	0	3	40	60	3	3
	U21CS804		Natural Language Processing	3	0	0	3	40	60	3	3
	U21CS805		Cloud Computing	3	0	0	3	40	60	3	3

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SCHEME OF INSTRUCTIONS & EXAMINATIONS
(w.e.f Academic Year 2022-23) (Tentative)

PROFESSIONAL ELECTIVES – IV THREADS

S. No.	PE-I	PE-II	PE-III	PE-IV	PE-V
1	Software Testing Methodologies	Software Project Management	Secure Software Design and Enterprise Computing	Semantic web	Agile Methodologies
2	Advanced Computer Architecture	Web and Internet Technologies	Service Oriented Architecture	Web Services	Fundamentals of Computer Interaction
3	Basics of Data Science	Artificial Intelligence	Machine Learning	Deep Learning	Natural Language Processing
4	Fundamentals of Cryptography	Mobile Computing	Block Chain Technologies	Digital Forensics	Cloud Computing

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(W.e.f Academic Year 2022-23)
OPEN ELECTIVE COURSES OFFERED

S. No.	Course Code	Category	Course Title
1	U21EE508	OEC 1	Non-Conventional Energy Systems
	U21EE509		Energy Conservation and Management
	U21CS508		Fundamentals of Data Base Management Systems*
	U21IT506		Data Structures*
	U21ME509		Basics of Mechanical Engineering
	U21ME510		Modern Manufacturing Processes
	U21CE509		Disaster Preparedness and Management
	U21CE510		Green Building Technologies
	U21EC507		Principles of Communication Theory
	U21EC508		Basic Electronics
	U21MB501		Managerial Communication
	U21MB503		Managerial Science and Theory

S. No.	Course Code	Category	Course Title
2	U21EE608	OEC 2	Fundamental of Power Electronics
	U21EE609		Electrical Installation and Safety
	U21CS607		Introduction to Programming in JAVA*
	U21IT606		Operating Systems*
	U21ME608		Basics Of 3-D Printing
	U21ME609		Optimization Methods for Engineers
	U21CE608		Construction Materials
	U21CE609		Road Safety Engineering
	U21EC607		Principles of Data Communication and Network
	U21EC608		Embedded Systems
	U21MB602		Total Quality Management
	U21MB603		Innovation Management

S. No.	Course Code	Category	Course Title
3	U21EE711	OEC 3	Introduction to Electrical Vehicles
	U21EE712		Design estimation and Costing of Electrical Systems
	U21CS711		Data Sciences*
	U21IT705		Basics of Artificial Intelligence*
	U21ME711		Renewable Energy Resources
	U21ME712		Cooling of Electronic Components
	U21CE711		Environmental Systems
	U21CE712		Urban Transportation System
	U21EC703		IOT and its protocols
	U21EC704		Television and Video Engineering
	U21MB702		Logistics Management
	U21MB703		Management of Start Up's

S. No.	Course Code	Category	Course Title
4	U21EE804	OEC 4	Smart Building Systems
	U21EE805		Industrial Automation
	U21CS806		Basics of Machine Learning*
	U21IT802		Cloud computing*
	U21ME806		Hybrid Vehicle Technology
	U21ME807		Power Plant Engineering
	U21CE806		Green Building Technology
	U21CE807		Environmental Impact Assessment
	U21EC805		Fundamentals of Wireless Communication
	U21EC806		Fundamental Digital Design using Verilog HDL
	U21MB802		Entrepreneurship
	U21MB803		E – Marketing

Note:

*Open Elective subjects are not offered to the students of CSE and Allied departments.

Course Code	Course Title						Core/Elective
U21CM501	**AUTOMATA THEORY, LANGUAGES AND COMPUTATION**						**Core**
Prerequisite	**Contact Hours per Week**				CIE	SEE	**Credits**
	L	**T**	**D**	**P**			
Discrete Mathematics	3	-	-	-	40	60	3

Course Objectives

The Objective of this course is to:

1. Develop a formal notation for strings, languages and machines.
2. Understand Regular Expression and algebraic laws.
3. Design context free grammars and PDA, to generate strings from a context free language and convert them into normal forms.
4. Identify the hierarchy of formal languages, grammars and machines.
5. Distinguish between computability and non-computability and Decidability and undecidability.

Course Outcomes

At the end of this course, the students are able to:

1. Gain knowledge of the various abstract machines
2. Use regular languages and regular expression for constructing different finite state machines
3. Understand and design different types of grammars
4. Construct Push down Automata
5. Construct Turing Machine.

UNIT-I

Introduction to Finite Automata, Structural Representations, Basic Concepts of Automata Theory – Symbol, Alphabets, Strings, Languages, Kleene Closure, Positive Closure

Finite Automata without Output: Deterministic Finite Automata, Nondeterministic Finite Automata, Finite Automata with Epsilon-Transitions, Conversion of NFA to DFA

UNIT-II

Regular Expressions: Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Properties of regular sets, Conversion of Finite Automata to Regular Expressions.

Pumping Lemma for Regular Languages, Statement of the pumping lemma, Applications of the Pumping Lemma.

Closure Properties of Regular Languages: Closure properties of Regular languages, Decision Properties of Regular Languages, Minimization of Automata- Equivalence, Myhill - Nerode Theorem

UNIT-III

Context-Free Grammars: Definition of Context-Free Grammars, Derivations Using a Grammar, Leftmost and Rightmost Derivations, the Language of a Grammar, Sentential Forms, Parse Trees, Ambiguity in Grammars.

Push down Automata: Definition of the Pushdown Automaton, the Languages of a PDA, Equivalence of PDA's and CFG's, Acceptance by final state & empty stack, Deterministic PDA Conversion of CFG to PDA, Conversion of PDA to CFG

UNIT-IV

Normal Forms for Context- Free Grammars: Grammar Simplification, Chomsky Normal form, Greibach Normal form.
Context-Free Languages: Statement of pumping lemma, Applications pumping lemma
Properties of Context-Free Languages: Closure properties of CFL's, Decision Properties of CFL's

UNIT-V

Turing Machines: Introduction, Techniques for construction of Turing machines, Modifications of TM, TM as enumerator, Restricted TM.
Undecidability: Recursive and Recursively enumerable languages, Halting problem, Rice Theorem, Post's correspondence problem, P,NP,NP-Complete, NP-Hard Problems, Chomsky's Hierarchy–Regular grammars, Unrestricted grammar, CSL

Suggested Reading:

1. "Introduction to Automata Theory, languages, and Computation", John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman, Pearson Education India, 3rd Edition,2008.
2. "Automata and Computability, Undergraduate Texts in Computer Science", Dexter C. Kozen, Springer, 2007.
3. "Introduction to the Theory of Computation", Michael Sipser, PWS Publishing 3rd Edition,2014.
4. "Introduction to Languages and the Theory of Computation", John Martin, Tata Mc Graw Hill, 3rd Edition,2002.

Course Code	Course Title						Core/Elective
U21CS501	DESIGN AND ANALYSIS OF ALGORITHMS						Core

Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Data Structures	3	1	-	-	40	60	4

Course Objectives:

The objectives of this course are:
1. Acquire the knowledge of Algorithm and problem-solving technique, limitations of algorithms.
2. Understand different techniques like divide and conquer, transfer and conquer etc., to solve problems.
3. Understand different techniques like greedy method and dynamic programming
4. Understand the concepts of Np-Hard And Np-Complete.
5. Illustrating the methods of backtracking and branch bound techniques to solve the problems like N-queens problem, graph coloring

Course Outcomes

At the end of the course, the students will be able to:
1. Identify asymptotic notations and basic efficiency classes.
2. Solve problems using various techniques like divide-and-conquer and transfer-and-conquer.
3. Use different algorithms like TSP, Floyd's etc. to solve real world problems.
4. Introduce the P and NP classes.
5. Develop solutions for n - Queens problem, Subset – Sum Problem, Assignment problem, Knapsack problem etc.

UNIT - I

Introduction: Algorithm, Fundamentals of algorithmic problem solving, Fundamentals of the analysis of algorithm efficiency, Asymptotic Notations and basic efficiency classes, Mathematical Analysis of Non-Recursive and Recursive Algorithms, The substitute method, Recursion tree method, Master method.

UNIT - II

Divide and conquer: Divide and Conquer: General Method, Binary Search, finding minimum and maximum Merge Sort analysis, Quick Sort analysis, Strassen's matrix multiplication.

Transfer and conquer: Introduction, Balanced search trees, Heap and Heap sort.

UNIT - III

The greedy method: The General Method, Knapsack problem, Job Sequencing with Deadlines, Minimum- Cost Spanning Trees: Prim's Algorithm, Kruskal's Algorithm, Single Source Shortest Paths.

Dynamic programming: The General Method, multistage graph, Warshall's Algorithm, Floyd's Algorithm for the All-Pairs Shortest Paths Problem, single source shortest path, The Travelling Salesperson problem, optimal binary search,0/1 knapsack.

UNIT – IV

Pattern Matching: The naïve string-matching algorithm, Brute Force String Matching, KMP algorithm.

Np-Hard and Np-Complete Problems: Basic concepts: non-deterministic algorithms, the classes NP - Hard and NP, NP Hard problems, clique decision problem, chromatic number decision problem, Cook's theorem.

UNIT V

Backtracking: n - Queens Problem, Subset – Sum of Subsets Problem, graph coloring.

Branch and bound: Assignment problem, Knapsack problem, 15 puzzle problem, travelling salesman problem

Tries: Standard Tries, Compressed Tries, Suffix Tries, Search Engine Indexing.

Suggested Readings:

1. "Introduction to The Design and Analysis of Algorithms", Anany Levitin (Chapters 1-5,7,9,11), Pearson Education, Delhi, 2nd Edition, 2007, ISBN: 9780321358288.
2. "Fundamentals of Computer Algorithms", Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran: (Chapters 1,3-8,10-12), Universities Press, Hyderabad, 2nd Edition, 2007, ISBN: 10: 8173716129.
3. "Introduction to Algorithms", Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein: PHI, London, England, 3rd Edition, 2010, ISBN: 9780262033848.
4. "Introduction to the Design and Analysis of Algorithms A Strategic Approach", R.C.T. Lee, S.S. Tseng, R.C. Chang and Y.T. Tsai: McGraw-Hill Higher Education, USA, International Edition, 2005, ISBN-13: 978-0071243469.

Course Code	Course Title						Core/Elective
U21CS503	OPERATING SYSTEMS						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Programming for Problem Solving	3	1	-	-	40	60	4

Course Objectives:

The objectives of this course are:

1. To understand CPU, Memory, File and Device management
2. To learn about concurrency control, protection and security
3. To gain knowledge of Linux and Windows NT internals
4. To understand the services provided by and the design of an operating system.
5. To understand different approaches to memory management.

Course Outcomes:

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

1. Explain the components and functions of operating systems
2. Analyze various Scheduling algorithms
3. Apply the principles of concurrency
4. Compare and contrast various memory management schemes
5. Perform administrative tasks on Linux Windows Systems

UNIT-I

Introduction to Operating Systems: OS structure and strategies, Process concepts, Threads, Inter Process communication. CPU scheduling algorithms, Process synchronization, Critical section problem, Semaphores, Monitors.

UNIT-II

Memory management, Swapping, Contiguous allocation, Paging, Static and Dynamic partitions, Demand paging, Page replacement algorithms, Thrashing, Segmentation, Segmentation with paging.

File system interface: File concepts, Access methods and protection. File system implementation: File system structure, Allocation methods, Directory implementation.

UNIT-III

Deadlocks: Necessary conditions, Resource allocation graph, Methods for handling deadlocks, Prevention, Avoidance, Detection and Recovery.

Protection: Goals, Domain of protection, Access matrix. Security: Authentication, Threat monitoring, Encryption.

UNIT-IV

Device Management: Disk scheduling methods, Disk management, Device drivers and interfaces, CPU Device interactions, I/O optimization.

UNIT-V

Case Studies: The Linux System–Design principles, Kernel modules, Process management, Scheduling, Memory management, File systems, Input and Output, Inter process

communication Windows NT – General Architecture, The NT kernel, The NT executive. Stable-Storage Implementation, Tertiary-Storage Structure.

Suggested Readings:

1. "Operating System Principles", Abraham Silberschatz, Peter Galvin, Greg Gagne, ninth Edition, John Wiley & Sons Publication,2012
2. "Modern Operation Systems", A. Tanenbaum-. Third edition, Pearson Education, 2008.
3. "Operating System Concepts", Abraham Silberschatz, Peter B Galvin, Addison Wesley, 2006
4. "Operating Systems-Internals and Design Principles", William Stallings, , 5th edition, PHI, 2005
5. "Operating Systems-Internals and Design Principles", Andrew S Tanenbaum, Modern Operating Systems, 4th edition, Pearson, 2016

Course Code	Course Title					Core/Elective
U21CS504	SOFTWARE TESTING METHODOLOGIES					PE-II
Prerequisite	**Contact Hours per Week**				**CIE**	**SEE**	**Credits**

Prerequisite	L	T	D	P	CIE	SEE	Credits
Software Engineering	3	-	-	-	40	60	3

Course Objectives:
The objectives of this course are:
1. To understand and learn the basic concepts of Testing.
2. To follow the methodology of White Box Testing.
3. To Obtain knowledge of Integration and System Testing
4. To understand the concepts of Object-Oriented Testing.
5. To gain the knowledge of complex problems

Course Outcomes
At the end of the Course, Student will be:
1. Gain the basic knowledge of Testing.
2. Acquire the knowledge of White Box Testing methods
3. Test an application using Functional Testing.
4. Use Object Oriented Testing and Millennium Testing methods
5. Solve software complexities with best practices

UNIT - I

Basic definitions, Test cases, Insights from a Venn diagram, Identifying test cases, Error and fault taxonomies, Verification, Validation and Testing, Levels of testing. Examples: Generalized pseudo code, The triangle problem, The NextDate function, The commission problem, The SATM (Simple Automatic Teller Machine) problem, The currency converter, Saturn windshield wiper

UNIT – II

Water fall model– V–model– Spiral model– Agile model, Life cycle of testing, Static Testing dynamic testing, Code coverage testing, Code complexity testing, White box testing Block box testing, Regression testing, Integration Testing ,System and Performance Testing

UNIT - III

Paths, Path products and Regular expressions: Path products & path expression, reduction procedure, applications, regular expressions & flow anomaly detection, Boundary Value Analysis, Data Flow Testing, Slice based testing.

UNIT - IV

Test planning, cost–benefit analysis of testing, monitoring and control, test reporting, test control Specialized testing, Object Oriented Testing.

UNIT – V

Automated tools for testing, Tool Selection & Implementation, Challenges in test automation, GUI Testing, Software Technical Reviews, Software Testing Excellence- Best Practices.

Suggested Readings:

1. "Software Testing: A Craftsman's Approach", Paul C. Jorgensen, CRC Press, 4th Edition, 2007
2. "Software Testing Techniques", Boris Biezer, Dreamtech Press, 2nd Edition, 2003
3. "Software Testing Tools", Dr. K.V. K. K. Prasad, Dreamtech.
4. "Foundations of Software Testing", Aditya P. Mathur, Pearson Education, 2013.
5. "Effective Methods for Software Testing", William E. Perry, Wiley, 2nd Edition.
6. "Software Testing, Principles and Practices", Srinivasan Desikan, Gopalaswamy Ramesh, Pearson Education, 2006.

Course Code	Course Title						Core/Elective
U21CS505	ADVANCED COMPUTER ARCHTECTURE						PE-I
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Digital Electronics and Computer Organization	3	-	-	-	40	60	3

Course Objectives:

The objectives of this course are:

1. Understand the Concept of Parallel Processing and its applications.
2. Implement the Hardware for Arithmetic Operations.
3. Analyze the performance of different scalar Computers.
4. Develop the Pipelining Concept for a given set of Instructions.
5. Distinguish the performance of pipelining and non-pipelining environment in a processor.

Course Outcomes

At the end of the Course, the Student will able to:

1. Know the types of computers, and new trends and developments in computer architecture.
2. Understand the addressing modes, implementation of function calls
3. Understand the computer architecture, arithmetic operations and performance metrics of micro processors.
4. Understand the performance and efficiency in advanced multiple issue processors.
5. Understand symmetric shared –memory architectures and their performance

UNIT - I

Introduction: Introduction to computer architecture, Software-hardware interface, Performance and Power, Performance metrics, Performance measurement, Benchmark Programs

UNIT – II

Instructions: Instruction Set, Operations, Operands and addressing modes, Role of compilers and system software, understanding implementation of function calls and returns, array references, pointers.

UNIT - III

Computer Architecture: Signed integers, floating point, Rounding and accuracy, addition and subtraction, multiplication, division
Processor: Data path elements, Data path control

UNIT - IV

Pipelining: Speedup, Pipeline hazards, Staling, Forwarding, Branch prediction, Exceptions, Speculation, Multiple issue.
Dynamic Scheduling: Cache memory, Locality of reference, Cache Organization and access, Multilevel caches, Performance, Cache coherence.

UNIT – V

Virtual Memory: Hardware support for address translation, page fault handling, translation look aside buffer, Hardware-software interface

Input/Output: Hard disk, flash memory, I/O interfacing, Memory mapped, I/O interrupt driven, I/O direct memory access, redundant arrays of inexpensive disks, introduction to multi-core architecture, multi processors, clusters.

Suggested Readings:

1. "Computer Organization and Design: The Hardware and Software Interface", David A. Patterson and John L. Hennessy, Morgan Kaufmann Publishers, 4th Edition (2009)
2. "Computer Architecture: A Quantitative Approach", John L. Hennessy and David A. Patterson, Morgan Kaufmann Publishers (2007).

Course Code	Course Title						Core/Elective
U21CS506	**BASICS OF DATA SCIECNE**						PE-I
Prerequisite	**Contact Hours per Week**				**CIE**	**SEE**	**Credits**
	L	**T**	**D**	**P**			
Database Management System	3	-	-	-	40	60	3

Course Objectives

The Objectives of this course are:

1. To identify the scope and essentially of Data warehousing and Data Mining.
2. To develop research interest towards advances in data mining.
3. To analyze the data, data science life cycle,
4. To analyze the data collection and cleaning, exploratory data analysis
5. To analyze the visualization, statistical inference and prediction, and decision-making algorithms for respective applications.

Course Outcomes

At the end of the Course, the Student will able to:

1. Understand the basic concepts in data science, including real world applications
2. Understand fundamentals of data and Data Mining Principles.
3. To Understand importance of qualitative data, terminologies related to Data Science.
4. Understand and Extract knowledge using data pre-processing concepts in data science.
5. Understand the basics of R Programming environment: R language, R- studio and R packages

UNIT-I

Introduction to Data Science: Data Science Definition - The Data Science Venn Diagram Terminology Types of Data: - Flavors of Data- Structured and Unstructured Data-Quantitative versus qualitative Data Four Levels of Data- Case study.

UNIT-II

Evolutionary of Data Science: - Overview of Evolutionary (Five Steps)- Explore the Data Data set 1 – Data set 2 – Titanic Communication Data: Communication matter- Identifying effective and ineffective visualizations- graphs and statistics Be- Verbal Communication.

UNIT III:

Basics of Data Mining: Importance of Data Mining, moving toward the Information Age Data Mining as the Evolution of Information Technology, What Is Data Mining, What Kinds of Data Can Be Mined, Database Data, Data Warehouses, Transactional Data, Other Kinds of Data, OLTP & Online Analytical Processing (OLAP), GraphsDatabase.

UNIT IV:

Identification Of Data: Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity and Dissimilarity: Euclidean, Jaccard's Index & Cosine Similarity

Data Pre-processing: Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization (ETL Operations).

UNIT V:

Introduction to R Programming, getting started with R: Installation of R software and using the interface, Variables and data types, R Objects, Vectors and lists, Operations: Arithmetic, Logical and Matrix operations, Data frames, functions, Control structures, Debugging and Simulation in R.

Suggested Readings:

1. "Principles of Data Science", Sinon Ozdemir, Packt Publishing Ltd,2016 (Unit 1& 2)
2. "Data mining concepts and techniques third edition.", Han, Jiawei, Micheline Kamber, and Jian Pei. The Morgan Kaufmann Series in Data Management Systems 5.4 (2011). (Unit 3 &4)
3. "Practical Data Science with R", Nina Zumel, Manning Publications, 2014
4. "Principles of Data Science: Mathematical techniques and theory to succeed in data-drivenindustries", Sinan Ozdemir Packt Publishing Limited (13 December 2016)
5. "Introducing data science: big data, machine learning, and more, using Python tools", Cielen, Davy, Arno DB Meysman, and Mohamed Ali, Manning Publications Co., 2016.

Course Code	Course Title						Core/Elective
U21CS507	FUNDAMENTALS OF CRYPTOGRAPHY						PE - I
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Operating Systems,Engineering Mathematics, Cyber Security,Ethics & Laws	3	-	-	-	40	60	3

Course Objectives:
The objectives of this course are:
1. Understand computer attacks and security aspects
2. Obtain Knowledge on importance and application of each of confidentiality, integrity, authentication and availability
3. Understand various cryptographic algorithms.
4. Understand the basic categories of threats to computers and networks
5. Obtain knowledge on public-key cryptosystems.

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

1. Student will be able to understand various computer attacks and security aspects
2. Student will be able to understand basic cryptographic a algorithms,
3. Students will be able to understand basic message and web authentication and security issues.
4. Ability to identify information system requirements for both of them such as client and server.
5. Ability to understand the current legal issues towards information security.

UNIT –I
Attacks on Computers and Computer Security: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms.
Cryptography: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography.

UNIT-II
Symmetric key Ciphers: Mathematics of Symmetric Key Cryptography, Block Cipher principles & Algorithms: Data Encryption Standard, Advanced Encryption Standard, and Blowfish.

UNIT-III
Asymmetric key Ciphers: Principles of public key cryp to systems, Algorithms (RSA, Diffie-Hellman, ECC), Key Distribution.

UNIT – IV
Message Authentication Algorithms and Hash Functions: Authentication requirements, Functions, Message authentication codes, Hash Functions, Secure hash algorithm, Whirlpool, HMAC, Digital signatures.

UNIT – V

Authentication Applications: Kerberos, X.509 Authentication Service, Public – Key Infrastructure, Biometric Authentication. Case Studies on Cryptography and security: Cross site Scripting Vulnerability, Virtual Elections

Suggested Readings:
1. "Cryptography and Network Security William Stallings", Pearson Education,4th Edition
2. "Cryptography and Network Security", Behrouz Forouzan, Debdeep Mukhopadhyay, MCGraw Hill, 3"" Edition.

Course code	Course Title						Core/Elective
U21EE508	NON-CONVENTIONAL ENERGY SYSTEMS						OEC-1
Pre-requisites	Contact Hours Per Week				CIE	SEE	Credits
BEE	L	T	D	P			
Engineering Chemistry	3	-	-	-	40	60	3

Course Objectives

The objectives of this course are:

1. To understand the concepts and Importance of renewable energy sources such as solar energy and Solar radiation
2. To understand the concept of Solar energy Storage and applications
3. To understand the wind energy performance characteristics
4. To understand the concept of Bio-mass and Geothermal Energy applications
5. To understand the concept of energy extraction from OTEC

Course Outcomes

At the end of the course, the student will be able to

1. Acquire the knowledge of various components, principle of operation and present scenario ofdifferent conventional and non-conventional sources.
2. Able to understand the solar energy operation and its characteristics.
3. To educate the wind energy operation and its types.
4. The student will be able to cope up with upcoming technologies in the energy storage systems.
5. Illustrate the concepts of Direct Energy Conversion systems & their applications.

UNIT-I

Principles of Solar Radiation: Role and potential of new and renewable source, Environmental impact of solar power, physics of the sun, extra-terrestrial and terrestrial solar radiation, types & instruments for measuring solar radiations.

UNIT-II

Solar Energy Storage and Applications: Different methods, Sensible, Latent heat and Stratified Storage, Solar Ponds.
Solar applications: solar heating/cooling techniques, solar distillation and drying, solar photovoltaic energy conversion.

UNIT-III

Wind Energy: Sources and potentials, Horizontal and Vertical axis windmills, Performance characteristics

UNIT-IV

Bio-Mass: Principles of Bio-Conversion, Anaerobic /aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of biogas, utilization for cooking.
Geothermal Energy: Resources, types of wells, methods of harnessing the energy.

UNIT-V

Ocean Energy: OTEC, Principles, utilization, setting of OTEC plants, thermodynamic cycles.
Tidal and Wave energy: Potential and conversion techniques, mini-hydel power plants.

Suggested Reading:

1. Renewable Energy Resources / Tiwari and Ghosal / Narosa
2. Non- conventional Energy Sources / G.D. Rai/ Khanna Publishers
3. Biological Energy Resources/ Malcolm Fleischer & Chris Lawis/ E&FN Spon

Course code	Course title		Core/Elective
U21EE509	ENERGY CONSERVATION AND MANAGEMENT		OEC-1

Pre-requisites	Contact Hours Per Week				CIE	SEE	Credits
Basic of Electrical Engineering	L	T	D	P	40	60	3
	3	-	-	-			

Course Objectives

The objectives of this course are:
1. Familiarize present energy scenario, and energy auditing methods.
2. Explain components of electrical systems, lighting systems and improvements in performance.
3. Demonstrate different thermal systems, efficiency analysis, and energy conservation methods.
4. Train on energy conservation in major utilities.
5. Instruct principles of energy management and energy pricing.

Course Outcomes

At the end of the course, the student will be able to
1. Explain energy utilization and energy auditing methods.
2. Analyze electrical systems performance of electric motors and lighting systems.
3. Examine energy conservation methods in thermal systems.
4. Estimate efficiency of major utilities such as fans, pumps, compressed air systems, HVAC and D.G. Sets.
5. Elaborate principles of energy management, programs, energy demand and energy pricing.

UNIT-I

Introduction: Energy, Power, Past & Present Scenario of World, National Energy Consumption Data, Environmental Aspects Associated with Energy Utilization, Energy Auditing: Need, Types, Methodology and Barriers, Role of Energy Managers, Instruments for Energy Auditing.

UNIT-II

Electrical Systems: Components of EB Billing, HT and LT Supply, Transformers, Cable Sizing, Concept of Capacitors, Power Factor Improvement, Harmonics, Electric Motors, Motor efficiency computation, Energy efficient motors, Illumination, Lux, Lumens, Types of lighting, Efficacy, LED Lighting and Scope of Economy in Illumination.

UNIT-III

Thermal Systems: Stoichiometry, Boilers, Furnaces and Thermic Fluid Heaters, Efficiency Computation and Encon Measures. Steam, Distribution & Usage, Steam Traps, Condensate Recovery, Flash Steam Utilization, Insulators & Refractories.

UNIT-IV

Energy Conservation in Major Utilities: Pumps, Fans, Blowers, Compressed Air Systems, Refrigeration and Air Conditioning Systems, Cooling Towers, D.G. Sets.

UNIT-V

Energy Management: Principles of Energy Management, Energy Pricing.

Suggested Reading:

1.   Energy   Manager   Training   Manual   (4   Volumes)   Available   At www.energymanagertraining.com, A Website Administered By Bureau Of Energy Efficiency (BEE), A Statutory Body Under Ministry Of Power, Government Of India, 2004.

2.   Guide books for National Certification Examination for Energy Manager / Energy Auditors Book-1, General Aspects (available online).

3.   Witte. L.C., P.S. Schmidt, D.R. Brown, "Industrial Energy Management and Utilisation" Hemisphere Publ, Washington, 1988.

4.   Callaghn, P.W. "Design And Management For Energy Conservation", Pergamon Press, Oxford, 1981.

5.   Dryden. I.G.C., "The Efficient Use Of Energy" Butter worths, London, 1982

Course Code	Course Title						Core/Elective
U21CS508	FUNDAMENTALS OF DATABASE MANAGEMENT SYSTEM						OEC-1
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Programming for Problem Solving	3	-	-	-	40	60	3

Course Objectives:

The objectives of this course are:

1. To Understand the role of database management system in an organization and learn the database concept

2. To Design database using data modeling and logical database design techniques.

3. To Construct database queries using relational algebra and calculus.

4. To Understand the concept of database transaction and related concurrent, recovery facilities.

5. To become familiar with database storage structures and access techniques.

Course Outcomes:

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

1. Demonstrate the basic elements of a relational database management system.

2. Construct database queries using relational algebra and calculus.

3. Recognize and identify use of normalization in database design.

4. Understand the transaction processing system concurrency control mechanism.

5. Understand t storage of data, indexing, and hashing.

UNIT – I

Conceptual modeling Introduction

Introduction to database, Purpose of database system, Roles in the Database Environment, Advantages and Disadvantages of DBMSs, Database Languages, Data Models, Functions of a DBMS, various Components of overall DBS architecture, various concepts of ER model, Basics of relational model.

SQL Query basis

SQL – Data Definition command, Data Manipulation command.

UNIT – II

The Relational Algebra

Unary Operations, Set Operations, Join Operations, Division Operation, Aggregation and Grouping Operations

Relational Calculus: Tuple relational Calculus, Domain relational calculus.

UNIT – III

Introduction to NoSQL

Overview and History of NoSQL Database-The Definition of the four types of NoSQL Database, Difference between SQL and NoSQL.

Normalization

The Purpose of Normalization, How Normalization Supports Database Design, Data Redundancy and Update Anomalies, The Process of Normalization,1NF, 2NF, 3NF, BCNF

UNIT – IV
Transaction Management
Transaction Processing: Transaction concept, transaction state, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Check points of Deadlock handling.

UNIT – V
Data Storage
Overview of physical storage media, magnetic disks, storage access, files organization, Organization of record in file.
Indexing and Hashing
Basic concept, Types of indexing, Static hashing, Dynamic Hashing

Suggested Readingss:
1. "Database Management Systems", Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill 3rd Edition, 2003.
2. "Database System Concepts", Abraham Silberschatz, Henry Korth and S. Sudarshan, Mc Graw Hill,6th Edition 2017.
3. "Fundamentals of Database Systems", Ramez Elmasri, Shamkant B. Navathe, Pearson Eduation,6th Edition,2014
4. "Database System Implementation", Héctor García-Molina, Jeffrey Ullman, Pearson Eduation United states,1st Edition,2000.
5. "Database Systems: Design, Implementation, and Management", Peter Rob, Thomson learning course Technology, 5th Edition.2003.

Course Code	Course Title						Core/Elective
U21IT506	DATA STRUCTURES						OEC-1
Prerequisite	Contact Hours Per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	-	-	-	40	60	3

Course Objectives:

The objectives of this course are:

1.   Develop skills to design and analyze simple linear and non-linear data structures, such as stacks, queues and lists and their applications.
2.   Gain programming skills to implement sorting and searching algorithms
3.   Strengthentheabilitytoidentifyandapplythesuitabledatastructuresforthe   given   real   world problem.
4.   Gain knowledge in practical applications of data structures
5.   Understand essential for future programming and software engineering courses.

Course Outcomes

At the end of this course, the student will be able to

1. Implement various data structures using arrays, linked lists
2. Develop ADT necessary for solving problems based on Stacks and Queues
3. Implement binary trees, general tree structures, advanced search trees, heaps, graphs.
4. Implement hash functions and handle collisions.
5. Implement various kinds of sorting techniques and apply appropriate techniques for solving a given problem.

UNIT – I

Introduction Data Structures and Algorithms

Introduction to data structures, classification of data structures, operations on data structures; Algorithm Specification, Recursive algorithms, Data Abstraction.

Performance analysis - Time Complexity and Space Complexity, Asymptotic Notation-Big O, Omega, and Theta notations.

UNIT – II

Stacks and Queues

Stacks: Stack ADT, definition and operations, Implementations of stacks using array, applications of stacks, Arithmetic expression conversion and evaluation.

Queues: Queue ADT, definition and operations, Implementation of queues using Arrays, applications of linear queue, circular queue.

UNIT – III

Linked Lists: Introduction, Singly linked list, representation of a linked list in memory, operations on a Singly Linked List, Implementation of Singly Linked List.

Doubly Linked Lists: Operations on Doubly Linked List, Implementation of Doubly Linked List, Circular linked list, Implementation of Stack and Queue using linked list.

UNIT – IV

Searching Techniques: Linear search and Binary Search algorithms.

Sorting Techniques: Bubble Sort, Insertion sort, Selection Sort, Merge Sort, and Quick Sort. Comparison among sorting techniques.

UNIT – V

Trees: Introduction, Binary Trees, Tree Traversals, Threaded Binary Trees, Binary Search Tree, Heap Tree, AVL Tree.

Graphs: Graph Abstract Data Type, Representation of Graph, Graph Traversals -DFS and BFS, Introduction to Spanning Tree.

Suggested Readings:

1. "Fundamentals of Data Structures in C", Ellis Horowitz, Sartaj Sahani, Susan Anderson Freed, Computer Science Press, 2004.
2. "Data Structures", S. Lipschutz, Tata McGraw Hill Education, 1st Edition, 2008.
3. "Classic Data Structures", D. Samanta, PHI Learning, 2nd Edition, 2004.
4. "Data Structures and Algorithm Analysis In C", Mark A Weiss, Second Edition (2002), Pearson.

Course Code	Course Title						Core / Elective
U21ME509	Basics of Mechanical Engineering						OEC-1
Prerequisite	Contact Hours Per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	-	-	-	40	60	3

Course Objectives:

The objective of the course is to:

1. Learn the fundamental concepts of energy, its sources and conversion
2. Comprehend the basic concepts of thermodynamics
3. Understand the concepts of boilers, turbines, pumps, internal combustion engines and refrigeration
4. Distinguish different metal joining techniques.
5. Enumerate the knowledge of working with conventional machine tools, their specifications.

Course Outcomes:

At the end of this Course, the student will be able to:

1. Identify different sources of energy and their conversion process.
2. Explain the working principle of steam boiler, hydraulic turbines, pumps, IC engines.
3. Recognize the use of internal combustion engine.
4. Recognize various metal joining processes and power transmission elements
5. Understand the properties of common engineering materials and their applications in engineering industry.

UNIT-I

Sources of Energy: Introduction and application of energy sources like fossil fuels, hydel, solar, wind, nuclear fuels and bio-fuels; environmental issues like global warming and ozone depletion. **Basic concepts of Thermodynamics:** Introduction, states, concept of work, heat, temperature; Zeroth, 1st, 2nd and 3rd laws of thermodynamics. Concept of internal energy, enthalpy and entropy (simple numericals).

UNIT-II

Steam: Formation of steam and thermodynamic properties of steam (simple numericals). **Boilers:** Introduction to boilers, classification, Lancashire boiler, Babcock and Wilcox boiler. Introduction to boiler mountings and accessories (no sketches).

Turbines: Hydraulic Turbines – Classification and specification, Principles and operation of Pelton wheel turbine, Francis turbine and Kaplan turbine (elementary treatment only).

Hydraulic Pumps: Introduction, classification and specification of pumps, reciprocating pump and centrifugal pump, concept of cavitation and priming.

UNIT-III

Internal Combustion Engines Classification, I.C. Engines parts, 2 and 4 stroke petrol and 4-stroke diesel engines. P-V diagrams of Otto and Diesel cycles. Simple problems on indicated power, brake power, indicated thermal efficiency, brake thermal efficiency, mechanical efficiency and specific fuel consumption.

UNIT-IV

Properties, Composition and Industrial Applications of engineering materials Metals – Ferrous: cast iron, tool steels and stainless steels and nonferrous: aluminum, brass, bronze. Polymers - Thermoplastics and thermosetting polymers. Ceramics - Glass, optical fiber glass, cermets. Composites - Fiber reinforced composites, Metal Matrix Composites Smart materials – Piezoelectric materials, shape memory alloys, semiconductors and insulators.

Joining Processes: Soldering, Brazing and Welding Definitions. Classification and methods of soldering, brazing and welding. Brief description of arc welding, oxy-acetylene welding, TIG welding, and MIG welding

UNIT-V

Belt drives: Open & crossed belt drives, Definitions -slip, creep, velocity ratio, derivations for length of belt in open and crossed belt drive, ratio of tension in flat belt drives, advantages and disadvantages of V belts and timing belts, simple numerical problems.

Gear drives: Types–spur, helical, bevel, worm and rack and pinion. Velocity ratio, advantages and disadvantages over belt drives, simple numerical problems on velocity ratio.

Suggested Readings:

1. "Elements of Mechanical Engineering", R.K. Rajput, Firewall Media, 2005
2. "Elements of Mechanical Engineering", Dr. A. S. Ravindra, Best Publications, 7th edition, 2009.
3. "Elements of Mechanical Engineering", K. R. Gopalakrishna, Subhas Publications, Bangalore, 2008.
4. "Elements of Mechanical Engineering", Vol.-1 & 2, Hajra Choudhury, Media Promoters, New Delhi, 2001.
5. "A Text Book of Elements of Mechanical Engineering", S. Trymbaka Murthy, 3rd revised edition 2006, I .K. International Publishing House Pvt. Ltd., New Delhi.

Course Code	Course Title						Core / Elective
U21ME510	**Modern Manufacturing Process**						OEC-1
Prerequisite	Contact Hours Per Week				CIE	SEE	Credits
--	L	T	D	P	40	60	3
	3	-	-	-			

Course Objectives:

The objective of the course is to:
1. Know the importance of classification of various Non-Traditional machining processes and their applicability to various metals, non - metals & alloys.
2. Teach the mechanics and thermal issues associated with chip formation
3. Teach the effects of tool geometry on machining force components and surface finish
4. Teach the machining surface finish and material removal rate

Course Outcomes:

After completing the course, the student will be able to:
1. Understand the basic techniques of modern manufacturing processes.
2. Analyze and decide the process parameters to be adopted and applicability of various materials that are suitable for mechanical energy and spark energy-based machining processes
3. Understand the process parameters to be adopted and applicability of various materials that are suitable for chemical and electrical energy-based processes.
4. Analyze and decide the process parameters to be adopted and applicability of various materials that are suitable for chemical and electro-chemical energy-based machining processes
5. Analyze and decide the process parameters to be adopted and applicability of various materials that are suitable for thermal based machining processes.

Unit-I

Introduction: Need for non-traditional machining methods- Classification of modern machining processes – considerations in process selection, Materials, Applications, Ultrasonic machining – Elements of the process, mechanics of metal removal process, parameters, economic considerations, applications and limitations, recent development.

Unit-II

Mechanical Energy Based Processes: Abrasive Jet Machining – Water Jet Machining – Abrasive Water Jet Machining- Ultrasonic Machining (AJM, WJM, AWJM, USM). Working Principles – equipment used – Process parameters – MRR – Applications.

Unit-III

Electrical Energy Based Processes: Electric Discharge Machining (EDM) – working Principles-equipments - Process Parameters- MRR- electrodes Used – Power Circuits – Dielectric – Flushing – Applications, Wire Cut EDM- Applications.

Unit-IV

Chemical and Electro-Chemical Energy Based Processes: Chemical Machining and Electro-Chemical machining (CHM and ECM)-Etchants- maskants -techniques of applying maskants- Process Parameters – MRR-Applications- Principles of ECM equipments - MRR-Processes Parameters.

Unit-V

Thermal Energy Based Processes: Laser Beam Machining (LBM), Plasma Arc Machining (PAM) and Electron Beam Machining (EBM), Principles-Equipment- Process Parameters - Applications.

Advanced Machining Processes: Magnetic abrasive finishing, Abrasive flow finishing, Electro stream drilling, shaped tube electrolyte machining.

Suggested Readings:

1. "Advanced Machining Processes", Vijay K. Jain, Allied Publishers.
2. "Modern Machining Processes", P. C. Pandey, H. S. Shan, Tata McGraw- Hill Education.
3. "Nontraditional Manufacturing Processes", Benedict. G. F, Marcel Dekker.
4. "Advanced Methods of Machining", McGeough, Chapman and Hall, London.
5. "Unconventional Machining Processes", P. K. Mishra, Narosa.

Course Code	Course Title						Core/Elective
U21CE509	DISASTER PREPAREDNESS AND MANAGEMENT						OEC-1
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Environmental Engineering	3	-	-	-	40	60	3

Course Objectives:
1. Learn about the basic principles of disaster management and the types of disasters
2. Understand the disaster management cycle and framework.
3. Know about the disaster management systems in India and the applications of the latest technologies in disaster management
4. Understand about the different types of disasters.
5. Know about the past disasters occurred across the globe.

Course Outcomes:
After completing this course, the student will be able to
1. Apply the concepts of disaster management to evaluate a disaster situation.
2. Classify the various categories of disasters and their specific characteristics.
3. Classify the areas under disaster management.
4. Select appropriate pre-disaster, during disaster and post-disaster measures and framework.
5. Apply the geo informatics technology in disaster situation.
6. Identify the disaster management acts and frameworks specific to India relevant to a situation.

UNIT-I
Introduction: Understanding the Concepts and definitions of Disaster, Hazard, Vulnerability, Risk and Capacity– Disaster and Development, and disaster management.

UNIT-II
Disasters: Geological Disasters (earthquakes, landslides ,tsunami, mining); Hydro-Meteorological Disasters (floods, cyclones, lightning, thunder-storms, hail storms, avalanches, droughts, cold and heat waves) Biological Disasters (epidemics, pest attacks, forest fire); Technological Disasters (chemical, industrial, radiological, nuclear) and Manmade Disasters (building collapse, rural and urban fire, road and rail accidents, nuclear, radiological, chemicals and biological disasters) Global Disaster Trends – Emerging Risks of Disasters –Climate Change and Urban Disasters.

UNIT-III
Disaster Management Cycle and Framework: Disaster Management Cycle – Paradigm Shift in Disaster Management Pre-Disaster – Risk Assessment and Analysis, Risk Mapping, zonation Micro zonation, Prevention and Mitigation of Disasters, Early Warning System; Preparedness, Capacity Development; Awareness. During Disaster–Evacuation–Disaster Communication – Search and Rescue – Emergency Operation Centre – incident Command System – Relief and Rehabilitation. Post-disaster–Damage and Needs Assessment, Restoration of Critical Infrastructure–Early Recovery–Reconstruction and Redevelopment; IDNDR.

UNIT-IV

Disaster Management in India: Disaster Profile of India – Mega Disasters of India and Lessons Learnt Disaster Management Act 2005 – Institutional and Financial Mechanism National Policy on Disaster Management, National Guidelines and Plans on Disaster Management; Role of Government (local, state and national), Non-Government and Inter Governmental Agencies.

UNIT-V

Applications of Science and Technology for Disaster Management: Geo-informatics in Disaster Management (RS, GIS, GPS and RS) Disaster Communication System (Early Warning and Its Dissemination) Land Use Planning and Development Regulations Disaster Safe Designs and Constructions Structural and Non-Structural Mitigation of Disasters S&T Institutions for Disaster Management in India.

Suggested Reading

1. Disaster Management Global Challenges and Local Solutions" Rajib, Sand Krishna Murthy, R.R, CRC Press, 2009.

2. Earth and Atmospheric Disasters Management, Natural and Manmade. Navele, P & Raja, C.K, B. S. Publications, 2009

3. Disaster Science and Management, Bhattacharya, Tata Mc GrawhillCompany,2017

4. Manual on natural disaster management in India, MC Gupta, NIDM, New Delhi

5. An overview on natural & man-made disasters and their reduction, RK Bhandani, CSIR, New Delhi

6. Disaster Management Act 2005, Published by Govt. of India

Course Code	Course Title						Core/Elective
U21CE510	GREEN BUILDING TECHNOLOGIES						OEC-1
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	-	-	-	40	60	3

Course Objectives:

1. Know about the Ethics and sustainability
2. Learn LEED Building Design and construction Rating system
3. Understand the Executing the Green Building Project
4. Learn Building Energy Issues
5. Know the Articulating Performance Goals for Future Green Buildings

Course Outcomes

After completing this course, the student will be able to:

1. Understand the Green building concept and focus on approaches that makes building sustainable.
2. Illustrate Green building assessment and accreditation system.
3. Able to apply low energy building strategies.
4. Design green building to improve sustainability of infrastructure.
5. Classify the economic benefits of green buildings.

UNIT – I

Introduction: The shifting landscape of Green buildings, The driving forces for sustainable construction, Ethics and sustainability, Basic Concepts and Vocabulary, Major Environmental and resource concerns. International Building Assessment systems.

UNIT – II

The green building assessment system: Structure of the LEED suite of Building rating systems, LEED Credentials, LEED Building Design and construction Rating system, Green Globes Building Rating Tools, Structure of Green Globes for New Construction, Green Globes Assessment and Certification Process, Green Globes Professional Credentials, IGBC Building design, Rating system and Professional credentials, Green Building Documentation Requirements

UNIT – III

Green building design: Conventional versus Green Building Systems, green materials, material selection criteria, Executing the Green Building Project, Integrated Design Process, Role of the charrette in the design process,.

UNIT – IV

Low – energy building strategies: Building Energy Issues, High – Performance Building Energy Design Strategy, Passive Design Strategy, Building Envelope, Internal Load Reduction, Smart Buildings and Energy Management Systems.

UNIT – V

Green building economics and sustainable construction: General approach, The Business Case for High – Performance Green Buildings, Economics of Green Building, Quantifying Green Building Benefits, Articulating Performance Goals for Future Green Buildings.

Suggested Readings:

1. Sustainable Construction, Charles J. Kibert, John Wiley & sons, 4th Edition, 2016.
2. Sun, Wind & Light- Architectural design strategies, Mark Dekay & G.Z Brown, John Wiley & sons, 3rd Edition, 2014
3. IGBC Reference Manual (2016)

Course Code	Course Title						Core/Elective
U2IEC507	PRINCIPLES OF COMMUNICATION THEORY						Open Elective-I
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Analog and Digital Communication	3	-	-	-	40	60	3

Course Objectives

The objectives of this course are:

1. Provide an introduction to fundamental concepts in the understanding of communications systems.
2. Provide an introduction to fundamental concepts in the understanding analog and digital communications.
3. Provide an introduction to network model and some of the network layers including physical layer, data link layer, network layer and transport layer.
4. Provide an introduction to fundamental concepts in the understanding telephone communication systems and optical communication systems.
5. Provide an introduction to the evolution of wireless systems and current wireless technologies.

Course Outcomes

1. Students will be able to understand the concepts related to signal transmission and related communication parameters.
2. Students will be able to learn various modulation and demodulation techniques in analog and digital communication systems.
3. Students will be able to understand the OS Inter work model and the working of data transmission
4. Students will be able to understand the evolution of communication technologies by learning basic concepts of traditional telephony systems and fundamental concepts related to optical communication systems.
5. Students will be able to understand the fundamental concepts of various current wireless technologies.

UNIT–I

Introduction to communication systems: Electromagnetic Frequency Spectrum, Elements of Electronic Communications System, Types of Communication Channels. Signal Transmission Concepts: Baseband transmission and Broadband transmission, Communication Parameters: Transmitted power, Channel bandwidth and Noise, Need for Modulation. Signal Radiation and Propagation: Principle of electromagnetic radiation, Types of Antennas, Antenna Parameters and Mechanisms of Propagation.

UNIT–II

Analog and Digital Communications: Amplitude modulation and demodulation, FM modulation and demodulation, /Digital modulation schemes – ASK, FSK ,PSK QPSK, Digital demodulation.

UNIT–III

Data Communication and Networking: Topologies, Synchronous and asynchronous data transfer, Modes of Data Communication, OSI Model, Data Link Layer–Media Access control and Logic link control, Network Layer – Internet Protocol (IPv4/IPv6), Transport Layer–

TCP,UDP.

UNIT–IV

Telecommunication Systems: Standard Telephone set, Basic Telephone call procedure, Public Telephone Network, Instruments, local loops, trunk circuits and various telephone Exchanges Optical Communications: Block diagram Optical Fiber Communication Systems, Optical Fiber – Classification and Configurations, Optical Fiber versus Metallic cable facilities, Wave length Division Multiplexing.

UNIT–V

Wireless Communications: AMPS overview, GSM architecture and channels, CDMA IS-95 forward and reverse channels. Current Wireless Technologies: WLL, Wireless LAN, Bluetooth, PAN and ZigBee, RFID communication, Comparison between 1G,2G,2.5G.3G.4G, 5G. Cellular telephone, Cell Splitting, Sectoring, Segmentation, Roaming and Handoffs. Satellite Orbits, Satellite Classification, Spacing and frequency Allocation, Satellite systems link models

Suggested Readings:

1. "Electronic Communication Systems", Wayne Tomasi, 5e, Pearson,2013.
2. "Data Communications and Networking", Behrouz A. Forouzan, 5e TMH,2012.
3. "Electronic Communications systems", Kennady, Davis, 4e, McGraw Hill,1999.

Course Code	Course Title						Core/Elective
U21EC508	BASIC ELECTRONICS						OEC-1
	Contact Hours per Week				CIE	SEE	Credits
Prerequisite	L	T	D	P			
Physics	3	-	-	-	40	60	3

Course Objectives
1. Study the behavior of Semiconductor diodes in Forward and Reverse bias.
2. Familiarize with the half wave and Full wave rectifiers with L, C Filters.
3. Understand the V-I characteristics of Bipolar Junction Transistor in CB, CE & CC configurations.
4. Familiarize the V-I characteristics of FETs, MOSFETs and study IC fabrication techniques
5. Study the operation of special purpose devices

Course Outcomes :
Students will be able to
1. Interpret the characteristics and apply diode models to analyze various applications of diodes.
2. Identify the merits and demerits of various filters, formulate and design rectifier circuits with filters Calculate ripple factor, efficiency and percentage regulation of rectifier circuits.
3. Discriminate the BJT configurations to recognize appropriate transistor configuration for any given application and design the biasing circuits with good stability.
4. Distinguish the working principles of BJT and FET also between FET&MOSFET.
5. Acquire knowledge on special purpose devices.

UNIT-1
Basics of Semiconductors: Energy bands in intrinsic and extrinsic Silicon. Carrier transport: diffusion current, drift current, mobility and resistivity, Hall Effect.
Junction Diode: PN Junction formation, Characteristics, biasing–band diagram and current flow, Diode current equation, Break down in diodes, Diode as a circuit element.

UNIT-2
PN Diode Applications: Half wave, Full wave and Bridge rectifiers–their operation performance characteristics and analysis Filters (L, C filters) used in power supplies and their ripple factor calculations, design of Rectifiers with and without Filters.

UNIT-3
BIPOLAR JUNCTION TRANSISTOR: Transistor Junction formation(collector-base, base-emitter Junctions),Transistor biasing –band diagram for NPN and PNP transistors, current components and current flowing BJT Ebers moll model, Modes of transistor operation, BJT V-I characteristics in CB, CE, CC configurations

UNIT-4
Junction Field Effect Transistor (FET): Construction, Principle of Operation, Pinch-Off Voltage, Comparison of BJT and FET, FET as Voltage Variable Resistor.

UNIT-5

Special Purpose Devices: Zener Diode, Voltage Regulator, Silicon Cathode Rectifier, TRIAC (triode for alternating current), DIAC(Diode for alternating current), Tunnel Diode, Uni junction Transistor(UJT), Varactor Diode, Light Emitting Diode, LASERS, Photo Diode, Photo Detector

Suggested Readings:

1. "Fundamentals of Electronic Devices and Circuits" David Bell, 2ndEdition, McGraw Hill Publication, 2009.
2. "Electronic Devices and Circuits " S. Salivahanan ,N Suresh Kumar 4th Edition McGraw Hill Publication,2017
3. "Electronic Devices and Circuits", Millman and Halkias, 2nd Edition, McGraw Hill Publication, 2007.
4. "Electronic Devices and Circuit Theory", Robert L. Boylestad,10th Edition, PHI, 2009.

Course-Code	Course Title					Core/ Elective
P21MB212	Managerial Communication					Open Elective - IV
Prerequisites	Contact Hour per Week			CIE	SEE	Credits
	L	T	P			
	4	-	-	40	60	4

Course Objectives:
The objective of this course is to help students understand the various approaches / aspects of business communication.

Course Outcomes:
After Completion of the Course, Students will be able to understand
1. The importance of Communication in Business
2. To develop writing skills and presentation
3. writing business proposals and letters
4. Application of business communication in the self-development process.
5. Infuse the relational management with various stakeholders

Unit – I:
The role of and process of communication. Barriers to communication surmount barriers to communication, Types of communication; Listening process–Elements of good listening–improving listening competence. Importance of feedback – Principles of feedback.

Unit – II:
Characteristics of non-verbal communication–Types and functions of non-verbal communication–Interpreting non-verbal communication; Negotiations-Approaches to negotiations–Preparing for and conducting negotiations

Unit – III:
Making Presentations–Choosing a method of speaking–Analyzing the audience–Nonverbal dimensions of presentations–Speeches for commemorative occasions–Effective presentation strategies. Persuasive speaking.

Unit – IV:
Report writing–Types of reports–Structure of reports–Individual and committee reports–Essentials of good report writing .Business letters–Drafting letters relating to enquiries and replies; orders and replies; complaints and claims. Effective business correspondence
    .drafting a resume

Unit – V:
Media relations–Building better relations with media. Investor relations–Framework for managing investor relations. Managing government relations–ways and means of managing governing power. Crisis communication–Do"s and dont"s in the wake of a crisis.

Suggested Books:

1. Penrose, Rasberry and Myers, "Business Communication for Managers", CengageLearning.
2. Kathleen Fearn-Banks, "Crisis Communications, A Casebook Approach", RoutledgMary Munter, "Guie to Managerial Communication" 6th Ed Pearson Education.

3. Lesikar, R.V. and M.E. Flatley, "Basic Business Communication", 2008 11th Ed.New York,McGraw

4. Disanza, "Business and Professional communication", Pearson Education.

5. CSG Krishnamacharyalu and L.Ramakrishnan, "Business Communications", 2009,HimalayaPublishing House.

6. Paul A Argenti, "Strategic Corporate Communications", Tata McGraw Hill.

7. Krizan, Merrier, Logan and Williams, "Effective Business Communication", 2008CengageLearning.

8. Paul R.Timm, "Straight Talk: Written communication for career success", RoutledgePublication.

9. David Irwin, "Effective Business Communications", 2009, Viva Books.

10. Kelly Quintanilla and Shawn T Wahl, "Business and Professional communication",Sage Publications.

11. U S Rai& S M Rai, "Business Communication", Himalaya Publishing House.

Course-	Course Title					Core/ Elective
U21MB503	**MANAGERIAL SCIENCE AND THEORY**					Elective
Prerequisites	**Contact Hour per Week**			**CIE**	**SEE**	**Credit**
	L	**T**	**P**			
	5	**-**	**-**	**40**	**60**	**5**

Course Objectives:

Student will be able to

1. Define the basic concepts in the field of management.
2. Discusses organizational theories and models which are the important infrastructures of the management field
3. To provide them tools and techniques to be used in the performance of the managerial job.
4. To enable them to analyze and understand the environment of the organization.
5. To help the students to develop cognizance of the importance of management principles.

Course Outcomes: Student will be able to

1. Concepts related to Business.
2. Demonstrate the roles, skills and functions of management.
3. Analyze effective application of PPM knowledge to diagnose and solve organizational problems and develop optimal managerial decisions.
4. Complexities associated with management of human resources in the organizations and integrate the learning in handling these complexities.
5. Practices Contemporary Management Theories and Models.

UNIT-I
Introduction to Management and Organisation: Concepts of Management and organization- nature, importance and Functions of Management, Systems Approach to Management - Taylor's Scientific Management Theory- Fayal's Principles of Management-

UNIT-II
Designing Organisational Structures & Motivation: Maslow's theory of Hierarchy of Human Needs- Douglas McGregor's Theory X and Theory Y - Hertzberg Two Factor Theory of Motivation - Leadership Styles, Social responsibilities of Management, Designing Organisational Structures: Basic concepts related to Organisation - Departmentation and Decentralisation, Types and Evaluation of mechanistic and organic structures of organisation and suitability.

UNIT-III
Human Resources Management(HRM): Concepts of HRM, HRD and Personnel Management and Industrial Relations (PMIR), HRM vs PMIR, Basic functions of HR

Manager: Manpower planning, Recruitment, Selection, Training and Development, Placement, Wage and Salary Administration, Promotion, Transfer, Separation, Performance Appraisal, Grievance Handling and Welfare Administration, Job Evaluation and Merit Rating.

UNIT-IV
Strategic Management and Contemporary Strategic Issues: Mission, Goals, Objectives, Policy, Strategy, Programmes, Elements of Corporate Planning Process, Environmental Scanning, Value Chain Analysis, SWOT Analysis, Steps in Strategy Formulation and Implementation, Generic Strategy alternatives. Bench Marking and Balanced Score Card as Contemporary Business Strategies.

UNIT-V
Contemporary Management Practices: Basic concepts of Just-In-Time (JIT) System, Total Quality Management (TQM), Six sigma and Capability Maturity Model (CMM) Levels, Value Chain Analysis, Enterprise Resource Planning (ERP), Performance Management, Business Process outsourcing (BPO), Business Process Re-engineering and Bench Marking, Balanced Score Card.

Suggested Readings:
1. Aryasri: Management Science, TMH, New Delhi.
2. Kotler Philip & Keller Kevin Lane: Marketing Mangement 12/e, PHI, 2007
3. Koontz &Weihrich: Essentials of Management, 6/e, TMH, 2007
4. Thomas N.Duening& John M.Ivancevich Management—Principles and Guidelines, Biztantra,2007.
5. Kanishka Bedi, Production and Operations Management, Oxford University Press, 2007.
6. Memoria &S.V.Ganker, Personnel Management, Himalaya, 25/e, 2007
7. Schermerhorn: Management, Wiley, 2007.
8. Parnell: Strategic Management, Biztantra,20073.
9. L.S.Srinath: PERT/CPM,Affiliated East-West Press, 2007

Course Code	Course Title						Core/Elective
U21CS5L1	DESIGN AND ANALYSIS OF ALGORITHMS LAB						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Data Structures	-	-	-	3	25	50	1.5

Course Objectives:

The objectives of this course are:

1. Understand problems by applying appropriate algorithms.
2. Analyze the efficiency of various algorithms.
3. Apply techniques of stacks and queues to solve problems.
4. Solve a program in many ways using different techniques.
5. Identify and evaluate complex problems using principles of mathematics and engineering science.

Course Outcomes

At the end of this Course, the student will be able to:

1. Solve problems by applying appropriate algorithms.
2. Analyze the efficiency of various algorithms.
3. Apply techniques of stacks and queues to solve problems.
4. Develop a program that can be solved in many ways using different techniques.
5. Identify and evaluate complex problems using principles of mathematics and engineering science.

Design, develop and implement the specified algorithms for the following problems using C/Java/python Language

1. Implement a program to sort the elements by using quick sort method.

2. Implement a program to sort the elements by using merge sort method.

3. Obtain the Topological ordering of vertices in a given digraph.

4. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.

5. Implement 0/1 Knapsack problem using Dynamic Programming.

6. Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.

7. Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm.

8. a. Compute the transitive closure of a given directed graph using Warshall's algorithm.

    b. Implement All-Pairs Shortest Paths Problem using Floyd's algorithm.

9. a. Print all the nodes reachable from a given starting node in a digraph using BFS method.

    b. Check whether a given graph is connected or not using DFS method.

10. Implement N Queen's problem using Back Tracking.

Suggested Readings:

1. "Introduction to the Design and Analysis of Algorithms", Anany Levitin: Pearson Education, Delhi, 2nd Edition, 2007, ISBN: 9780321358288.

2. "Fundamentals of Computer Algorithms", Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran: Universities Press, Hyderabad, 2nd Edition, 2007, ISBN-10: 8173716129.

Course Code	Course Title						Core/Elective
U21CS5L2	OPERATING SYSTEMS LAB						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Digital Electronics and Computer Organization	-	-	-	3	25	50	1.5

Course Objectives:
The objectives of this Course are:
1. To explain the difference between hardware, software; operating systems, programs and files.
2. To learn the purpose of different software applications.
3. To learn shell programming and the use of filters in the LINUX environment.
4. To practice multi-threaded programming.
5. To implement CPU Scheduling Algorithms and memory management algorithms.

Course Outcomes:
At the end of this Course, the student will be able to:
1. Evaluate the performance of different types of CPU scheduling algorithms.
2. Implement producer-consumer problem, reader-writers problem, Dining philosopher's problem.
3. Simulate Banker's algorithm for deadlock avoidance.
4. Implement paging replacement and disk scheduling techniques.
5. Use different system calls for writing application programs

List of Experiments:
I. CASE STUDY
Perform a case study by installing and exploring various types of operating systems on a physical or logical (virtual) machine.
II. List of Experiments (preferred programming language is C Using Linux)
1. Implement a C program to implement UNIX system calls and file management.
2. Implement C programs to demonstrate various process related concepts.
3. Implement C programs to demonstrate various thread related concepts.
4. Implement C programs to simulate CPU scheduling algorithms: FCFS, SJF, and Round Robin.
5. Implement C programs to simulate Intra & Inter – Process Communication (IPC) techniques: Pipes, Messages Queues, and Shared Memory.
6. Implement C programs to simulate solutions to Classical Process Synchronization Problems: Dining Philosophers, Producer – Consumer, Readers – Implementers.
7. Implement a C program to simulate Bankers Algorithm for Deadlock Avoidance.
8. Implement C programs to simulate Page Replacement Algorithms: FIFO, LRU.
9. Implement C programs to simulate implementation of Disk Scheduling Algorithms: FCFS, SSTF.

Suggested Readings:
1. "An Introduction to Operating Systems", P.C.P Bhatt, 2nd edition, PHI.

2. "Modern Operating Systems", Andrew S Tanenbaum, 3rd Edition, PHI.

Course Code	Course Title					Core / Elective
U21CS5P1	INTERNSHIP					Core
Prerequisite	Contact Hours Per Week				CIE	SEE	Credits
	L	T	D	P			
-	-	-	-	2	50	-	1

Course Objectives:

The objective of the course is to:

1. Produce an accurate record of work performed during the Internship/Co-op
2. Apply engineering knowledge to a problem in industry
3. Produce a technical report
4. Discuss work in a team environment, if relevant to the project
5. Conduct herself/himself responsibly, safely, and ethically in a professional environment

Course Outcomes:

At the end of this course, the student will be able to:

1. Design/develop a small and simple product in hardware or software.
2. Complete the task or realize a pre specified target, with limited scope, rather than taking up a complex task and leave it.
3. Learn to find alternate viable solutions for a given problem
4. Learn to evaluate these alternatives with reference to pre specified criteria.
5. Implement the selected solution and document the same.

Guidelines:

Internship is introduced as part of the curricula of encouraging students to work on problems of interest to industries. A batch of three students will be attached to a person from the Government or Private Organizations/Computer Industry/Software Companies/R&D Organization for a period of 4 weeks. This will be during the summer vacation following the completion of the III-year Course. One faculty coordinator will also be attached to the group of 3 students to monitor the progress and to interact with the industry co- ordinate (person from industry). The course schedule will depend on the specific internship/training experience. The typical time per topic will vary depending on the internship

1. Overview of company/project
2. Safety training
3. Discussions with project teams
4. Background research, review of documents, white papers, and scientific papers
5. Planning, designing, and reviewing the planned work
6. Executing the plans
7. Documenting progress, experiments, and other technical documentation
8. Further team discussions to discuss results
9. Final report writing and presentation

After the completion of the project, each student will be required to:

1. Submit a brief technical report on the project executed and
2. Present the work through a seminar talk (to be organized by the Department)

Note: Students have to undergo summer internship of 4 weeks at the end of semester IV and credits will be awarded after evaluation in V semester.

Note: Students have to undergo summer internship of 4 weeks at the end of semester IV and credits will be awarded after evaluation in V semester.

LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institution)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
SCHEME OF INSTRUCTIONS & EXAMINATION [LR-21]
(W.e.f Academic Year 2023-24)
B.E. VI-Semester (Tentative)

S. No.	Course Code	Category	Course Title	L	T	P/D	Contact Hours/Week	CIE	SEE	Duration in Hours	CREDITS
			Theory Course								
1	U21MB601	HSMC	Business Economics and Financial Analysis	3	0	0	3	40	60	3	3
2	U21IT602	PCC	Computer Networks	3	0	0	3	40	60	3	3
3	U21CS601	PCC	Compiler Design	2	1	0	3	40	60	3	3
4	--	PEC	Professional Elective-II	3	0	0	3	40	60	3	3
5	--	OEC	Open Elective II	3	0	0	3	40	60	3	3
			Practical/ Laboratory Course								
6	U21IT6L1	PCC	Computer Networks Lab	0	0	3	3	25	50	3	1.5
7	U21CS6L1	PCC	Compiler Design Lab	0	0	3	3	25	50	3	1.5
8	U21CS6L2	PCC	Scripting Language Lab	-	-	2	2	50	-	-	1
			Seminar								
9	U21CS6P1	PROJ	Technical Seminar	-	-	2	2	50	-	-	1
			Skill Development Course								
10	U21MA6L1	BSC	Aptitude and Reasoning Lab	-	-	2	2	25	50	3	1
	Total			14	1	12	27	375	450	--	21

L: Lecture *(Hrs/Wk/Sem)*   **T:** Tutorial *(Hrs/Wk/Sem)*   **P:** Practical   **D:** Drawing *(Hrs/Wk/Sem)*

CIE: Continuous Internal Evaluation   **SEE:** Semester End Examination
OEC: Open Elective Course   **PCC:** Program Core Courses
MB: Management Studies   **PROJ:** Project
PEC: Professional Elective Courses   **CS:** Computer Science
HSMC: Humanities and Social Sciences   **MA:** Mathematics
    including Management Course

Note:
1. Each contact hour is a Clock Hour.
2. The duration of the practical class is three hours, however it can be extended wherever necessary, to enable the student to complete the experiment.

Course Code	Course Title					Core/Elective
U21MB601	BUSINESS ECONOMICS AND FINANCIAL ANALYSIS					Core Course
Prerequisites	Contact Hour per Week			CIE	SEE	Credit
	L	T	P			
	3	-	-	40	60	3

Course Objectives:

Student will be able to

1. Understand the concepts of Business and Economics
2. Comprehend the concepts of market dynamics namely elasticity of demand and pricing in different market structures.
3. Gain the knowledge on the production theories and cost analysis while dealing with the production and the concept of break even analysis.
4. To acquire the in depth knowledge on Financial Accounting concepts and principles and preparation of final accounts.
5. To understand the financial statements through ration analysis and cash flow techniques.

Course Outcomes:

Student will be able to

1. Apply the concepts of business and economics during his professional and personal life.
2. Understand the elasticity of the demand of the product, different types, and measurement of elasticity of demand and factors influencing on elasticity of demand.
3. Recognize the Production function, features of Iso-Quants and Iso-Costs, different types of internal economies, external economies and law of returns with appropriate examples.
4. Prepare the financial statements of the firm.
5. To Analyze the financial statements using ratio analysis and cash flow techniques.

UNIT – I

Introduction to Business and Economics: Business: Structure of Business Firm, Theory of Firm, Types of Business Entities, Sources of Capital for a Company, Non-Conventional Sources of Finance. Economics: Significance of Economics, Micro and Macro Economic Concepts, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Multidisciplinary nature of Business Economics.

UNIT – II

Demand and Supply Analysis: Elasticity of Demand: Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Elasticity of Demand in decision making, Demand Forecasting: Characteristics of Good Demand Forecasting, Steps in Demand Forecasting, Methods of Demand Forecasting.

UNIT- III

Production, Cost, and Market Structures & Pricing: Production Analysis: Factors of Production, Production Function, Production Function. Cost analysis: Types of Costs, Short run and Long run Cost Functions. Market Structures: Features of Perfect competition, Monopoly, Oligopoly, and Monopolistic Competition. Pricing: Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, & Cost Volume Profit Analysis.

UNIT – IV

Financial Accounting: Accounting concepts and Conventions, Accounting Equation, Double Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, and Preparation of Final Accounts.

UNIT - V

Financial Analysis through Ratios: Concept of Ratio Analysis, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios (simple problems),

Suggested Readings:

1.   A.R. Aryasri, "Managerial Economics and Financial Analysis", TMH Publications, 3nd Edition, 2007.
2.   D.N. Dwivedi, "Managerial Economics", Vikas Publication House Pvt. Ltd, 2nd Edition, 2012.
3.   S.N. Maheshwari & S.K. Maheshwari, "Financial Accounting", Vikas Publication House Pvt. Ltd, 4th Edition, 2012.
4.   R. Narayana Swamy, "Financial Accounting- A managerial Perspective", Pearson publications, 1st Indian Reprint Edition, 2012.
5.   J.V. Prabhakar Rao & P.V. Rao, "Managerial Economics & Financial Analysis", Maruthi Publishers, 1st Revised Edition, 2011.
6.   M.Kasi Reddy & Saraswathi, "Managerial Economics and Financial Analysis", PHI Publications, New Delhi, 10th Revised Edition, 2012.
7.   Varshney & Maheswari, "Managerial Economics", Sulthan Chand Publishers, 1st Revised Edition, 2009.

Course Code	Course Title						Core/Elective
U21CS601	COMPILER DESIGN						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Automata Theory, Language & Computation	2	1	-	-	40	60	3

Course Objectives:

The objectives of this course is to

1. To understand and list the different stages in the process of compilation.
2. Identify different methods of lexical analysis
3. Design top-down and bottom-up parsers
4. Identify synthesized and inherited attributes
5. Develop syntax directed translation schemes

Course Outcomes

At the end of this course, the student will be able to:

1. For a given grammar specification, develop the lexical analyzer.
2. For a given parser specification, design top-down and bottom-up parsers.
3. Develop syntax directed translation schemes.
4. Develop algorithms to generate code for target machine.
5. Develop the different analysis of Code generation

UNIT - I

Introduction: The Structure of a Compiler, Phases of Compilation, The Translation Process, Major Data Structures in a Compiler, Bootstrapping and Porting.

Lexical Analysis (Scanner): The Role of the Lexical Analyzer, Input Buffering, Specification of Tokens, Recognition of Tokens, The Lexical Analyzer Generator Lex.

UNIT – II

Syntax Analysis

The Role of the Parser, Syntax Error Handling and Recovery, Top-Down Parsing: Backtracking , Recursive-descent Parsing, Predictive Parsers, LL (1) grammars, Bottom-Up Parsing: Simple LR Parsing, More Powerful LR Parsing, Using Ambiguous Grammars, Parser Generator YACC

UNIT - III

Syntax-Directed Translation: Syntax-Directed Definitions, S-attributed and L- attributed Definitions, Evaluation Orders for SDD's, Applications of Syntax-Directed Translation.

Symbol Table: Structure, Operations, Implementation and Management.

UNIT - IV

Intermediate Code Generation: Variants of Syntax Trees, Three-Address Code, Types and Declarations, Translation of Expressions, Type Checking, Control Flow, Back patching, Switch-statements, Intermediate Code for Procedures.

Run-time environment: Storage Organization, Stack Allocation of Space, Access to Non-local Data on the Stack, Parameter passing, Heap Management and Garbage Collection

UNIT – V

Code Generation: Issues in the Design of a Code Generator, The Target Language, addresses in the Target Code, Basic Blocks and Flow graphs, Optimization of Basic Blocks, Peephole Optimization, Register Allocation and Assignment.

Machine-Independent Optimizations: The Principal Sources of Optimizations, Introduction to Data-Flow Analysis

Suggested Readings:

1. "Compilers–Principles, Techniques and Tools", Alfred V.Aho, Ravi Sethi, Jeffrey D, Ullman, Pearson Education,2nd Edition, 2006.
2. "Compiler Construction–Principles and Practice", Kenneth C. Louden, Thomson, PWS Publishing, 1st Edition, 1997.
3. "Modern Compiler Implementation C", Andrew W. Appel, Cambridge University Press, Revised Edition, 2004.

Course Code	Course Title					Core/Elective
U21IT602	COMPUTER NETWORKS					CORE
Prerequisite	Contact Hours Per Week				CIE	SEE	Credits
Operating Systems	L	T	D	P	40	60	3
	3	-	-	-			

Course Objectives:

Develop ability to

1. Become familiar with layered communication architectures (OSI and TCP/IP).
2. Familiarize with flow control and error control mechanisms in data link layer
3. Study the design issues in network layer and various routing algorithms
4. Learn sockets programming and how to implement client/server programs.
5. Understand the concepts of reliable data transfer and how TCP implements these concepts

Course Outcomes:

At the end of the course, student would be able to

1. Explain the function of each layer of OSI and trace the flow of information from one Node to another node in the network
2. Familiarize with the Transmission Media, Flow Control and Error Detection and Correction
3. Understand the principles of IP addressing and internet routing
4. Describe the working of various networked applications such as DNS, mail, file transfer and www
5. Implement client-server socket-based networked applications

Unit-I

Introduction: Network Uses, Topologies, Transmission Modes, Types of computer networks,Examples of Networks, Network Technology-from local to global, Reference Models- OSI, TCP/IP.

The Physical Layer: Transmission Media, Guided transmission media, Twisted Pair,Coaxial Cable, Fiber Optics , Wireless transmission- Electromagnetic Spectrum,Frequency Hopping Spread Spectrum, Direct Sequence Spread Spectrum,Ultra Wide Band Connection,Cellular Networks-Common Concepts, Technology, Analog Voice, Digital Voice, GSM, Digital Voice and Data,Packet Switching and 5G technology.

Unit-II

The Data Link Layer: Design Issues, Error Detection and Correction-Error Detecting Codes, Error Correcting Codes, Elementary Data Link Protocols-Initial Simplifying Assumptions,Basic Transmission and receipts,Simplex Link Layer Protocols.

The Medium Access Sub layer: Channel allocations problem- Static Channel Allocation,Assumptions for Dynamic Channel Allocation, multiple access protocols-CSMA,Collision Free Protocols,Wireless LAN Protocols, Ethernet, Wireless LAN.

Unit-III

The Network Layer: Network layer design issues, Routing Algorithms- Distance Vector Routing, Link State Routing, Hierarchical Routing,Broadcast Routing,Multicast Routing.

Inter-networking: Concatenated virtual circuits, Connection-less internet working, Tunneling, The network layer in the internet-IP protocol, IP addresses, OSPF, BGP, (IPv4 and IPv6), Internet Control Protocols- ARP,RARP,ICMP,DHCP.

UNIT-IV

Network Programming: Socket Interface- Sockets, Socket Address, Elementary Sockets, Advanced Sockets.(Book 2: Chapter 2)

The Transport Layer: Transport service, elements of transport protocol-Addressing,Connection Establishment, Connection Release,Multiplexing, UDP-Introduction, RPC, TCP- Introduction, TCP Service Model,TCP Protocol,Segment Header, Connection Establishment and Connection release.

UNIT-V

The Application Layer: Domain Name System, Electronic Mail-Architecture and Services, World Wide Web-architectural overview, dynamic web document, http, HTTPS, Web Privacy, Content Delivery-Content and Internet Traffic, Server Farms and Web Proxies, Peer –to- Peer Networks, Evolution of the Internet.

Suggested Readings:
1 "Computer Networks", Andrew S.Tanenbaurn, Pearson Education, Sixth Edition, 2021.
2."Unix Network Programming", W. Richard stevens, Prentice Hall/PearsonEducation, 2009.
3."Computer Networking: A Top-Down Approach Featuring the Internet", JamesF.Kurose, KeithW,Ross, PearsonEducation, Third Edition, 2005.
4."Data Communications and Networking with TCP/IP Protocol Suite", Behrouz A. Forouzan, McGraw Hill LLC, Sixth Edition, 2021.

Course Code	Course Title						Core/Elective
U21CS603	SOFTWARE PROJECT MANAGEMENT						PE-II
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Software Engineering	3	-	-	-	40	60	3

Course Objectives:

The objectives of this course are:

1. Understand the Software Project Planning and Evaluation techniques.
2. To plan and manage projects at each stage of the software development life cycle
3. Learn about the activity planning and risk management principles.
4. Manage software projects and control software deliverable.
5. Develop skills to manage the various phases involved in project management and people

Course Outcomes

At the end of the Course, Student will be:

1. Gain extensive knowledge about the basic project management concepts, framework and the process models.
2. Obtain adequate knowledge about software process models and software effort estimation techniques.
3. Estimate the risks involved in various project activities.
4. Define the checkpoints, project reporting structure, project progress and tracking mechanisms using project management principles.
5. Learn staff selection process and the issues related to people management

UNIT - I

Importance of Software Project Management: Activities - Methodologies – Categorization of Software Projects – Setting objectives – Management Principles – Management Control – Project portfolio Management – Cost-benefit evaluation technology – Risk evaluation – Strategic program Management – Stepwise Project Planning.

UNIT - II

Software process and Process Models: Choice of Process models - Rapid Application development – Agile methods – Dynamic System Development Method – Extreme Programming– Managing interactive processes – Basics of Software estimation – Effort and Cost estimation techniques – COSMIC Full function points - COCOMO II - a Parametric Productivity Model.

UNIT - III

Objectives of Activity planning: Project schedules – Activities – Sequencing and scheduling – Network Planning models – Formulating Network Model – Forward Pass & Backward Pass techniques – Critical path (CRM) method – Risk identification – Assessment – Risk Planning –Risk Management – PERT technique – Monte Carlo simulation – Resource Allocation – Creation of critical paths – Cost Schedules.

UNIT - IV

Framework for Management and control: Collection of data – Visualizing progress – Cost monitoring – Earned Value Analysis – Prioritizing Monitoring – Project tracking – Change

control – Software Configuration Management – Managing contracts – Contract Management.

UNIT - V
Managing people: Organizational behavior – Best methods of staff selection – Motivation – The Oldham – Hackman job characteristic model – Stress – Health and Safety – Ethical and Professional concerns – Working in teams – Decision making – Organizational structures – Dispersed and Virtual teams – Communications genres – Communication plans – Leadership.

Suggested Readings:

1. " Software Project Management", Bob Hughes, Mike Cotterell and Rajib Mall: – Fifth Edition, Tata McGraw Hill, New Delhi, 2012.

Course Code	Course Title						Core/Elective
U21CS604	WEB AND INTERNET TECHNOLOGIES						PEC-II
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
C, C++, Java	3	-	-	-	40	60	3

Course Objectives:

The Objective of this Course are:

1. Learn various client-side technologies for developing web- based applications.
2. Learn the concepts of JavaScript and Angular JS for adding rich GUI.
3. To Know about XML applications with DTD and Schema.
4. To familiarize the concepts about Servlets and JSPs in dynamic web applications.
5. To learn how to establish database connectivity in web applications.

Course Outcomes

At the end of this course, the student will able to:

1. Understand the concepts of HTML and CSS.
2. Acquire the knowledge to build AJAX based applications using Javascript.
3. Understand and apply the concepts of servlet framework.
4. Implement JSP to build interactive web applications.
5. Acquire the knowledge of database connectivity in web applications.

UNIT- I

A Brief Introduction to Internet, The World Wide Web, Web Browsers, Web Servers, Uniform Resource Locators, MIME, HTTP

HTML5: Evolution of HTML and XHTML, Basic Syntax, Document Structure, Links, Images, Multimedia, Lists, Tables, Creating Forms

UNIT – II

JavaScript: Overview, Object Orientation and JavaScript, Syntactic Characteristics, Primitives, Operators, Expressions, Input and Output, Control Statements, Objects Creation and modification, Arrays, Functions, Constructors, Pattern Matching. Manipulating DOM, HTML DOM Events.

UNIT - III

XML: Introduction to XML, Syntax, XML document structure, Document Type Definition, Name spaces, XML Schemas, displaying raw XML documents, XPath Basics

J2EE: Exploring Enterprise architecture styles, Features of J2EE platform, Web servers and application servers.

Database programming with JDBC: JDBC Drivers, Exploring JDBC Processes with the java.sql Package.

UNIT - IV

Servlets Technology: Exploring the Features of Java Servlet, Exploring the Servlet API, Explaining the Servlet Life Cycle, creating a Sample Servlet, Working with ServletConfig and ServletContext Objects, Implementing Servlet Collaboration, Exploring the Session Tracking Mechanisms.

UNIT – V
JSP Technology: Advantages of JSP over Java Servlet, Architecture of a JSP Page, Life Cycle of a JSP Page, Working with JSP Basic Tags and Implicit Objects, Working with Action Tags in JSP, Tag Extension API, Working with Simple Tag Handlers, Accessing Database from Servlet and JSP.

Suggested Readings:

1. "Programming the World Wide Web", Robert W.Sebesta, 4th Edition, Pearson Education, 2009
2. "Java Server Programming Java EE7 (J2EE 1.7): Black Book", (2014), Dreamtech Press
3. "Web Programming and Internet Technologies an E-Commerce Approach", Porter Scobey, Pawan Lingras: , 2nd Edition, Jones & Bartlett Learning, 2009.
4. Bryan Basham, Kathy Sierra, Bert Bates: Head first Servlets & JSP, 2nd edition, OREILLY, 2008

Course Code	Course Title						Core/Elective
U21CS605	ARTIFICIAL INTELLIGENCE						PE-II
Prerequisite	Contact Hours Per Week				CIE	SEE	Credits
Discrete Mathematics, Mathematics-III	L	T	D	P	40	60	3
	3	-	-	-			

Course Objectives
Develop ability to

1. Understand the importance of the field of AI by discussing its history and various applications.
2. Learn about one of the basic applications of A.I, search state formulations
3. Learn knowledge representation implementation.
4. Learn how to reason when an agent has only uncertain information about its task.
5. Know various supervised and unsupervised learning algorithms

Course Outcomes
At the end of the course, student would be able to

1. Illustrate basic principles of AI in solutions that require problem solving, search, inference
2. Demonstrate understanding of steps involved in building of intelligent agents, expert systems, Bayesian networks
3. Differentiate between learning paradigms to be applied for an application
4. Demonstrate Expert system its utilization
5. Illustrate AI application machine learning & its types.

Unit-I:
Introduction to Artifiical Intelligence: Foundations of artificial intelligence (AI) ,Intelligent Systems, History of AI, Subareas of AI, Applications, Structure of Agents,Types of agents,AI problems, Agents and Environments.

UNIT -II:
Basic Search Strategies: Problem Spaces, Uninformed Search (Breadth-First, DepthFirst Search, Depth-first with Iterative Deepening), Heuristic Search (Hill Climbing, Generic Best-First, A*), Constraint Satisfaction (Backtracking, Local Search) (Book-2: Chapters-2,3)
Advanced Search: Constructing Search Trees, Stochastic Search, A* Search Implementation, Minimax Search, Alpha-Beta Pruning.

UNIT-III:
Reasoning: Knowledge based agent, Propositional Logic, Inference, Predicate logic (first order logic),Inference,Resolution,Frames,Semantic Nets
Uncertainty : Basic probability, Bayes rule, Naive Bayes, Belief networks,Inference in Bayesian Network.

UNIT-IV
Expert System and Applications: Introduction, Phases in Building Expert Systems, Expert System Architecture, Applications.

UNIT-V
Machine-Learning Paradigms: Introduction, Machine Learning Systems, Supervised and Unsupervised Learning,Reinforcement learning with applications,Natural Language processing,Speech recognition.
Suggested Readings:
1. "Artificial Intelligence – A Modern Approach", Stuart Russell and Peter Norvig, Pearson Education Press Fourth Edition.
2."Artificial Intelligence", Saroj Kaushik, Cengage Learning, 2011.
3."Artificial Intelligence", Kevin Knight,ElaineRich,B.Nair, McGraw Hill, 3rd Edition, 2008.

Course Code	Course Title						Core/Elective
U21CS606	MOBILE COMPUTING						PE-II
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Computer Networks	3	-	-	-	40	60	3

Course Objectives

The objectives of this course are:

1. To introduce basics of wireless voice and data communication technologies
2. To build working knowledge on various telephone and satellite networks
3. To study the working principles of wireless LANs and standards
4. To study principles of adhoc networks and routing
5. To gain knowledge on integration of mobile networks into Internet

Course Outcomes

At the end of this course, the student will be able to:

1. Understand the various LAN networks and its technologies
2. Understand and apply various techniques involved in planning and construction stages.
3. Implement Adhoc Network Routing protocols.
4. Mini based project based on tracking, localization and routing in wireless networks.
5. Implement file transfer, access and authentication-based applications for mobile computing.

UNIT - I

Introduction, Wireless transmission, Frequencies for radio transmission, Signals, Antennas, Multiplexing, Modulations, spread spectrum, Cellular Wireless Networks, 4G Introduction, features and challenges, Applications of 4G, 4G Network architecture.

UNIT – II

Telecommunication systems, GSM, GPRS, DECT, UMTS, IMT-2000, Satellite Networks, Basics Parameters and Configurations, Capacity Allocation, FAMA and DAMA, Broadcast Systems, DAB DVB.

UNIT - III

Wireless LAN, IEEE 802.11, Architecture, services, MAC, Physical layer, IEEE 802.11a, 802.11b standards, HIPERLAN, Blue Tooth.

UNIT - IV

Routing Ad-hoc Network Routing Protocols, Ad-hoc Network Routing Protocols, Destination Sequenced Distance Vector Algorithm, Cluster Based Gateway Switch Routing, Global State Routing, Dynamic Source Routing, Ad-hoc on-demand Routing. Mobile IP - Dynamic Host Configuration Protocol. Traditional TCP - Classical TCP Improvements, WAP, WAP 2.0, Wireless TCP.

UNIT – V

Data Dissemination: Pull and Push Based Data Delivery models, Data Dissemination by Broadcast, Broadcast Disks, Directory Service in Air, Energy Efficient Indexing scheme for Push Based Data Delivery.

Suggested Readings:

1. "Mobile Communications", Jochen H. Schiller, Addison Wesley, Second Edition, 2003.
2. "Wireless Communications and Networks", William Stallings PHI/Pearson Education, 2002.
3. "Principles of Wireless Networks", Kaveh Pahlavan, Prasanth Krishnamurthy, Prentice Hall, 2003.
4. "Principles of Mobile Computing", Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, Springer, 2003.
5. "Mobile Communication Systems", Krzyszt of Wesolowski, , John Wiley and Sons Ltd, 2002.

Course code	Course Title						Core/Elective
U21EE608	FUNDAMENTALS OF POWER ELECTRONICS						OEC-2
Pre-requisites	Contact Hours Per Week				CIE	SEE	Credits
BEE	L	T	D	P			
	3	-	-	-	40	60	3

Course Objectives

1. Understand the performance of various power electronic devices.
2. Understand the VI characteristics of SCR and TRIAC.
3. Understand single phase-controlled rectifier circuits.
4. Understand choppers circuits
5. Understand the performance of AC voltage regulators.

Course Outcomes

At the end of the course students will be able to

1. Understand the performance of various power electronic devices.
2. Understand performance characteristics of SCR,TRIAC.
3. Understand performance of controlled rectifiers.
4. Understand the performance of chopper circuits.
5. Understand the performance of inverter, AC voltage regulators and cycloid converters.

UNIT-I

Introduction to power electronics, scope and applications, principle and operation of BJT, principle of operation of MOSFET and principle and operation of IGBT

UNIT-II

Power semiconductor switches and their V-I characteristics-diodes, SCR, TRIAC, Thyristor ratings andprotection semiconductor switches applications.

UNIT-III

Principles of single-phase half-controlled converter with R, RL, and RLE load, rinciples of single-phasefully-controlled converter with RL and RLE load, Single phase dual converters.

UNIT-IV

Introduction, Basic principles of step-down and step-up operation, chopper classification study of Buck, Boostand Buck-Boost regulators.

UNIT-V

Introduction, Principle of operation of inverters and its applications, principle of operation of single-phase voltage regulators and cyclo converter and its applications for R, R-L & R-L-E loads.

Suggested Readings

1. Power Electronics: Circuits, Devices & Applications, M.H.Rashid, Pearson Education India, 2009.
2. Power Electronics by Nihal kularanta
3. Fundamentals of Power Electronics by S.K. Bhattacharya
4. Power Electronics: Converters, Applications and Design, N. Mohan and T. M. Undeland, John Wiley & Sons, 2007

Course code	Course Title						Core/Elective
U21EE609	ELECTRICAL INSTALLATION AND SAFETY						OEC-2
Pre-requisites	Contact Hours Per Week				CIE	SEE	Credits
BEE	L	T	D	P			
	3	-	-	-	40	60	3

Course Objectives
1. Understand the safety and security measures to prevent the electrical shocks
2. Acquire the knowledge on installation of electrical plant.
3. Understand the safety measures on Residential, agriculture and commercial electrical installations
4. Understand the safety measures on hazardous zones and earthing.
5. Acquire the knowledge on fire extinguishing techniques

Course Outcomes

At the end of the course, the student will be able to
1. Explain the objectives and precautions of Electrical Safety, effects of Shocks and their Prevention.
2. Summarize the Safety aspects during Installation of Plant and Equipment.
3. Describe the electrical safety in residential, commercial and agricultural installations.
4. Describe the various Electrical Safety in Hazardous Areas, Equipment Earthing and System Neutral Earthing.
5. Understand the use of fire extinguishing techniques

UNIT-I

Introduction to Electrical Safety, Shocks and their Prevention: Objectives of safety and security measures, Hazards associated with electric current, and voltage, principles of electrical safety, approaches to prevent Accidents, scope of subject electrical safety. Primary and secondary electrical shocks, possibilities of getting electrical shock and its severity, medical analysis of electric shocks and its effects, shocks due to flash/ Spark over's, prevention of shocks, safety precautions against contact shocks, flash shocks, burns, residential buildings and shops.

UNIT-II

Safety during Installation of Plant and Equipment: Introduction, preliminary preparations, preconditions for start of installation work, during, risks during installation of electrical plant and equipment, safety aspects during installation, field quality and safety during erection.

UNIT-III

Electrical Safety in Residential, Commercial and Agricultural Installations: Wiring and fitting, Domestic appliances, water tap giving shock, shock from wet wall – fan firing shock, multi-storied building, Temporary installations, Agricultural pump installation, Do's and Don'ts for safety in the use of domestic electrical appliances.

UNIT-IV

Electrical Safety in Hazardous Areas: Hazardous zones, class 0,1 and 2, spark, flashovers and corona discharge and functional requirements, Specifications of electrical plants, equipment's for hazardous locations, Classification of equipment enclosure for various hazardous gases and vapours, classification of equipment/enclosure for

hazardous locations.

UNIT-V

Fire Extinguishers: Fundamentals of fire-initiation of fires, types; extinguishing techniques, prevention of fire, types of fire extinguishers, fire detection and alarm system; CO_2 and Halogen gas schemes; foam schemes.

Suggested Reading:

1.   "Electrical safety, fire safety Engineering and safety management", S. Rao, Prof. H.L.Saluja, Khanna Publishers. New Delhi, 1988 (units-I to V)1.
2.   "Energy management policy, planning and utilization", Pradeep Chaturvedi, ConceptPublishing company, New Delhi, 1997.

Course Code	Course Title						Core/Elective
U21CS607	INTRODUCTION TO PROGRAMMING IN JAVA						OEC-2
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Programming for problem solving	3	-	-	-	40	60	3

Course Objectives:

The objectives of this course are:

1. To understand fundamentals of object-oriented programming in Java which includes defining classes, invoking methods, difference between applet and application programs, using class libraries

2. Illustrate inheritance concepts for reusing the program.

3. To create Java application programs using sound OOP practices such as interfaces, packages.

4. Demonstrate the user defined exceptions by exception handling keywords and use multi - threading concepts to develop inter process communication.

5. Apply JDBC to provide a program level interface for communicating with database using java programming

Course Outcomes:

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

1. Achieve proficiency in object-oriented concepts and also learns to incorporate the same into the Java programming language.

2. Create Java application programs using sound OOP practices e.g. Inheritance, proper program structuring by using packages.

3. Create Java application programs using sound OOP practices such as interfaces, packages.

4. Understand and Implement the concepts of Exception Handling in java.

5. Apply JDBC to provide a program level interface for communicating with database using java programming.

UNIT – I
Object-Oriented Programming
Benefits of Object- Oriented Programming
Introduction to JAVA
Data types, variables, scope and life time of variables, arrays, operators, expressions, control statements, type conversion and casting, simple java program, concepts of classes, objects, constructors, methods, access control, this keyword, overloading methods and constructors, parameter passing.

UNIT – II
Inheritance - Inheritance hierarchies, super and sub classes, Member access rules, super keyword, preventing inheritance: final classes and methods, the Object class and its methods.
Polymorphism- dynamic binding, method overriding, abstract classes and methods.

UNIT – III
Interfaces Defining an interface, implementing interfaces, accessing implementations through interface references, extending interface.
Packages-Defining, Creating and Accessing a Package, importing package.

UNIT – IV

Exception handling: Benefits of exception handling, classification, checked exceptions and unchecked exceptions, usage of try, catch, throw, throws and finally.

Multithreading: Java Thread Model, The Main Thread, creating a Thread, creating multiple threads, using is Alive() and join().

UNIT – V

Files: streams- byte streams, character streams, text Input/output, binary input/output, random access file operations, File management using File class.

An overview of Advanced JAVA

Introduction to JDBC, Types of JDBC Drivers, connecting to a database, querying a database and processing the results, updating data with JDBC.

Suggested Readings:

1. "The Complete Reference Java" Herbert Scheldt, Tata McGraw Hill, 7th Edition,2006
2. Programming and Problem Solving with JAVA" James M Slack, Thomson Learning,2002
3. "An Introduction to Object Oriented Programming with Java", C Thomas, McGraw Hill Publishing,5th Edition,2010.
4. "Thinking in Java", Bruce Eckel, Pearson Education,2006.
5. "Programming in Java", S. Malhotra and S. Choudhary, Oxford Univ. Press, 2nd Edition,2018.

Course Code	Course Title						Core/Elective
U21IT607	OPERATING SYSTEMS						OEC-2
Prerequisite	Contact Hours Per Week				CIE	SEE	Credits
Digital Electronics and Computer Organization	L	T	D	P	40	60	3
	3	-	-	-			

Course Objectives:
The Objective of this Course are:
1. Understand the services provided by and the design of an operating system.
2. Learn the structure and organization of the file systems.
3. Understand what a process is and how processes are synchronized and scheduled.
4. Understand different approaches to memory management.
5. Understand Virtual machine concepts, calls for managing processes, memory and the file system

Course Outcomes:
At the end of the course, the student will be able to
1. Understand the fundamental concepts and Functions of operating system.
2. Analyze various scheduling algorithms.
3. Understand deadlock, prevention and avoidance algorithms.
4. Compare and contrast various memory management schemes.
5. Understand the functionality of file systems and perform administrative tasks on Linux Servers

UNIT-I

Introduction: Computer System organization & Architecture, Operating System Structure & Operations, Process, Memory and Storage Managements, Protection and Security, Distributed and Special-Purpose Systems, Computing Environments.

Process Concept: Overview, Process Scheduling, Operations on Processes, Inter process communication, Communication in Client/Server Systems, Operating System Examples.

UNIT-II

Process Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms (FCFS, SJF, Priority, Round Robin)

Synchronization: Background, The Critical-Section Problem, Peterson's Solution, Synchronization.

Deadlocks: System Model, Deadlock characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

UNIT-III

Memory-Management Strategies:
Background, Swapping, Contiguous Memory Allocation, Paging, Structure of the Page Table, Segmentation.

Virtual Memory Management: Background, Demand paging, Copy-on-write, Page Replacement, Allocation of Frames, Thrashing, Memory-Mapped Files, Allocating Kernel Memory.

UNIT-IV

Storage Management: File System, File Concept, Access Methods, Directory Structure, File-System Mounting, File sharing, Protection.

Secondary Storage Structure: Overview of Mass-Storage Structure, Disk Structure, Disk Attachment, RAID Structure, Stable-Storage Implementation, Tertiary-Storage Structure.

UNIT-V

Protection and Security: Goals of Protection, Principles of Protection, Domain of protection, Access Matrix, Implementation of Access Matrix, Access control, Revocation of access rights,

Suggested Readings:
1. "Operating System Principles", Abraham Silberschatz, Peter Galvin, Greg Gagne, Ninth Edition, John Wiley & Sons Publication, 2012.
2. "Modern Operation Systems", A.Tanenbaum, Third edition, Pearson Education, 2008.
3. William Stallings - Operating Systems, Fifth Edition, Pearson Education, 2005.
4. Operating Systems: Principles and Practice, Thomas Anderson and Michael Dahlin, Recursive Books, 2014.

Course Code	Course Title						Core / Elective
U21ME608	Basics Of 3-D Printing						OEC 2
Prerequisite	Contact Hours Per Week				CIE	SEE	Credits
-	L	T	D	P	40	60	3
	3	-	-	-			

Course Objectives:

The objective of the course is to:

0. Understand the fundamental concepts of 3D Printing, its advantages and limitations.
1. Know the working principle, advantages, disadvantages and applications of liquid, solid and Powder based 3D Printing Technologies.
2. Able to understand the method of manufacturing of liquid based, powder based and solid based techniques.
3. Understand the manufacturing procedure of a prototype using FDM technique.
4. Know diversified applications of 3D Printing Technologies.

Course Outcomes:

After completing the course, the student will be able to:

1. Understand the fundamental concepts of 3D Printing, its advantages and limitations.
2. Understand the working principle and process parameters of 3D printing processes
3. Understand the methodology to manufacture the products using LOM and FDM technologies and study their applications, advantages and case studies
4. Know the working principle, advantages, disadvantages and applications of liquid, solid and Powder based 3D Printing Technologies.
5. Know diversified applications of 3D Printing Technologies and explore the applications of 3D Printing processes in various fields

Unit-I

Introduction: Prototyping fundamentals: Need for time compression in product development, Historical development, Fundamentals of 3D Printing, 3D Printing Process Chain, Advantages and Limitations of 3D Printing, 3D Printing wheel, commonly used Terms, Classification of 3D printing processes. Fundamental Automated Processes: Distinction between 3D Printing and Conventional Machining Processes.

Unit-II

Liquid-based 3D Printing Systems: Stereo Lithography Apparatus (SLA): Models and specifications, Process, working principle, photopolymers, photo polymerization, Layering technology, laser and laser scanning, Applications, Advantages and Disadvantages, Case studies. Polyjet: Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies.

Unit-III

Solid-based 3D Printing System: Laminated Object Manufacturing (LOM): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies. Fused Deposition Modeling (FDM): Models and specifications, Process, working principle, Applications, Advantages and Disadvantages, Case studies.

UNIT-IV

Powder Based 3D Printing Systems: Working principle, Specifications, Materials used, Process, Applications, Advantages and Disadvantages, Case studies of the following 3D Printing Technologies like Selective laser sintering (SLS), Selective Laser Melting (SLM) and Direct Metal Laser Sintering (DMLS), Laser Engineered Net Shaping (LENS), Electron Beam Melting (EBM).

Unit-V

Applications of 3D Printing: Application in Design, Application in Engineering, Analysis and Planning, Aerospace Industry, Automotive Industry, Electronic Industry, Jewellery Industry, Coin Industry, GIS application, Arts and Architecture. RP Medical and Bioengineering Applications: Planning and simulation of complex surgery, Customized Implants & Prosthesis, Design and Production of Medical Devices, Forensic Science and Anthropology, Visualization of Biomolecules. Biopolymers, Packaging, Disaster Management, Entertainment and Sports industry.

Suggested Readings:

1. "3D Printing and Additive Manufacturing Principles and Applications", Chee Kai Chua and Kah Fai Leong, Fifth Edition, World scientific
2. "Additive Manufacturing Technologies: 3D Printing", Rapid Prototyping, and Direct Digital Manufacturing- Ian Gibson, David W Rosen, Brent Stucker, Springer, Second Edition, 2010.
3. "Rapid Prototyping & Engineering Applications", Frank W.Liou, CRC Press, Taylor & Francis Group, 2011.
4. "Rapid Prototyping: Principles and Applications in Manufacturing", Rafiq Noorani, John Wiley & Sons, 2006.

Course Code	Course Title						Core / Elective
U21ME609	OPTIMIZATION METHODS FOR ENGINEERS						OEC-2
Prerequisite	Contact Hours Per Week				CIE	SEE	Credits
Mathematics-III	L	T	D	P	40	60	3
	3	-	-	-			

Course Objectives:

The objective of the course is to:

1. Understand the need and basic concepts of operations research and classify the optimization problems.
2. Study about the linear programming and non-linear programming concepts and their applications.
3. Use the stochastic models for discrete and continuous variables to control inventory and simulation of manufacturing models for the production decision making.
4. Evaluate the formulation of mathematical models for quantitative analysis of managerial problems in industry.
5. Study the concepts of Met heuristics Optimization techniques.

Course Outcomes:

After completing the course, the student will be able to:

1. Analyze any problem of optimization in an engineering system and able to formulate a mathematical model to the problem and solving it by the techniques that are presented.
2. Solve problems of L.P. by graphical and simplex methods.
3. Apply the knowledge of game theory concepts to articulate real-world competitive situations to identify strategic decisions to counter the consequences.
4. Demonstrate the various selective inventory control models to analyse and optimize inventory systems
5. Explain the theoretical workings of dynamic programming method to find shortest path for given network and understands the concepts to use the Metaheuristics Optimization techniques

Unit-I

Introduction: Definitions, Characteristics, Objective function, Classification of optimization problems, Engineering applications and limitations. Single-Variable Optimization, Multivariable Optimization with No Constraints, Multivariable Optimization with Equality Constraints and Multivariable Optimization with Inequality Constraints: Kuhn–Tucker Condition.

Unit-II

Linear Programming: Definitions and Formulation of the LPP, Construction of L.P. Models, Slack and surplus variables, Standard form, Canonical form and matrix form of LP Problems. Artificial Variables, solution by the Big-M method, Duality principle, Dual problems and numerical problems.

Unit-III

Theory of Games: Introduction – Terminology, Solution of games with saddle points and without saddle points, 2×2 games, dominance principle, m X 2 & 2 X n games, Graphical method.

Inventory: Introduction, Single item, Deterministic models, Purchase inventory models with one price break and multiple price breaks, Stochastic models, demand may be discrete variable or continuous variable, Single period model and no setup cost.

Unit-IV

Dynamic Programming: Introduction, Terminology, Bellman"s Principle of optimality, Applications of dynamic programming, shortest path problem, linear programming problem. Simulation: Introduction, Definition, types of simulation models, steps involved in the simulation process - Advantages and Disadvantages, Application of Simulation to queuing and inventory.

Unit-V

Waiting Lines: Introduction, Terminology, Single Channel, Poisson arrivals and exponential service times with infinite population and finite population models,

Metaheuristics Optimization: Concepts of Simulated Annealing, Theoretical approaches, Advantages and disadvantages, applications, Ant Colony Algorithms - Introduction, Collective behavior of social insects, Formalization and properties of ant colony optimization.

Suggested Readings:

1. "Engineering Optimization: Theory and Practice", Rao, S.S., John Wiley & Sons, Inc., 2009
2. "Operations Research, Pearson Education India", Taha, H.A., New Delhi, India, 2008.
3. "Operations Research", A. M. Natarajan, P. Balasubramani, A. Tamilarasi, Pearson Education, 2013.
4. "Operation Research: Theory and Applications", Sharma J.K., Fifth Edition, Macmillan Publishers, New Delhi, India, 2013.
5. "Met heuristics for Hard Optimization" J. Dreo A. Petrowski, P. Siarry E. Taillard, Springer.

Course Code	Course Title						Core/ Elective
U21CE608	CONSTRUCTION MATERIALS						OEC-2
Prerequisite	Contact Hours Per Week				CIE	SEE	Credits
	L	T	D	P			
Building Materials and Construction Practices	3	-	-	3	40	60	3

Course Objectives:
1. Understand the classification, manufacturing and testing methods involving stones, bricks and concrete blocks in construction.
2. To study the field applications and concepts of lime, cement, aggregates and mortar lime in construction.
3. Understand the properties of the manufacturing process of concrete in construction.
4. Study the basics of timber and other materials.
5. To introduce students to various modern materials commonly used in civil engineering construction and their properties.

Course Outcomes:
1. Compare the properties of most common and advanced building materials.
2. Understand the typical and potential applications of lime, cement and aggregates
3. Know the Manufacturing Process of concrete
4. Understand the method of placing concrete elements.
5. Understand the applications of timbers and other materials
6. Understand the importance of modern material for construction.

UNIT- I
Stones – Bricks – Concrete Blocks- Stone as building material – Criteria for selection – Tests on stones – Deterioration and Preservation of stone work – Bricks – Classification – Manufacturing of clay bricks – Tests on bricks – Compressive Strength – Water Absorption – Efflorescence – Bricks for special use – Refractory bricks – Concrete blocks – Lightweight concrete blocks

UNIT-II
Lime – Cement – Aggregates – Mortar Lime – Preparation of lime mortar – Cement – Ingredients – Manufacturing process – Types and Grades – Properties of cement and Cement mortar – Hydration – Compressive strength – Tensile strength – Fineness– Soundness and consistency – Setting time – fine aggregates – river sand – crushed stone sand – properties – coarse Aggregates – Crushing strength – Impact strength – Flakiness Index – Elongation Index – Abrasion Resistance – Grading

UNIT-III
Concrete-Concrete – Ingredients – Manufacturing Process – Batching plants –mixing – transporting – placing – compaction of concrete –curing and finishing – Ready mix Concrete – Mix specification.

UNIT-IV
Timber and Other Materials-Timber – Market forms – Industrial timber– Plywood –

Veneer – Thermocol – Panels of laminates – Steel – Aluminum and Other Metallic Materials – Composition – Aluminum composite panel – Market forms – Mechanical treatment – Paints – Varnishes – Distempers – Bitumen's.

UNIT-V

Modern Materials-Glass – Ceramics – Sealants for joints – Fabre glass reinforced plastic – Clay products – Refractories – Composite materials – Types – Applications of laminar composites – Fabre textiles– Geo-membranes and Geotextiles for earth reinforcement

Suggested Readings:

1. Building Materials, Varghese.P.C, PHI Learning Pvt. Ltd, New Delhi, 2015.
2. Engineering Materials, Rajput. R.K., S. Chand and Company Ltd., 2008.
3. Concrete Technology, Gambhir.M.L., 3rd Edition, Tata McGraw Hill Education, 2004
4. Building Materials, Duggal.S.K., 4th Edition, New Age International, 2008.
5. Alternative Building Materials Technology, Jagadish.K.S, New Age International, 2007.
6. Building Materials, products, properties and systems, Gambhir. M.L., & Neha Jamwal., Tata McGraw Hill Educations Pvt. Ltd, New Delhi, 2012.

Course Code	Course Title						Core/Elective
U21CE609	ROAD SAFETY ENGINEERING						OEC-2
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	-	-	-	40	60	3

Course Objectives

1. Introduction to various factors considered for road safety and management
2. Explain the road safety appurtenances and design elements
3. Know the Cause of accidents and accident data
4. Learn crash reduction techniques
5. Discuss the various traffic management techniques

Course Outcomes

After completing this course, the student will be able to:

1. Understand the fundamentals of traffic safety analysis
2. Analyze Accident data
3. Remember the concepts of road safety in urban transport
4. Apply crash reduction techniques
5. Design of urban Infrastructure considering safety aspects.

UNIT I

Introduction: Road Safety scenario in India and World, Road Accident Characteristics. Traffic Safety Analysis: Fundamentals of Traffic Engineering - Basic Characteristics of Motor-Vehicle Traffic, Highway Capacity, Applications of Traffic Control Devices, Design of Parking Facilities, Traffic Engineering Studies; Statistical Methods in Traffic Safety Analysis Regression Methods, Poisson Distribution, Chi- Squared Distribution, Statistical Comparisons.

UNIT II

Accident Analysis: Accident Investigations and Risk Management, Collection and Analysis of Accident Data, Condition and Collision Diagram, Causes and Remedies, Traffic Management Measures and Their Influence on Accident Prevention, Assessment of Road Safety, Methods to Identify and Prioritize Hazardous Locations and Elements, Determine Possible Causes of Crashes, Crash Reduction Capabilities and Countermeasures, Effectiveness of Safety Design Features, Accident Reconstruction. Application of computer analysis of accident data.

UNIT III

Road Safety in planning and Geometric Design: Vehicle And Human Characteristics, Road Design and Road Equipment's, Redesigning Junctions, Cross Section Improvements, Reconstruction and Rehabilitation of Roads, Road Maintenance, Traffic Control, Vehicle Design and Protective Devices, Post Accident Care.

UNIT IV

Traffic Signals & Road signs: Traffic Signals, Factors affecting signal design, street lighting, Provisions for NMT Vehicles in India, Safety Provisions for Pedestrians & Cyclists,

Road Signs and Pavement Markings. Safety at Construction Site: Safety provisions for workers at construction site, Construction Zone markings, signs.

UNIT V

Traffic Management safety audit: Traffic Management Systems for Safety, Road Safety Audits and Tools for Safety Management Systems, Road Safety Audit Process, Approach to Safety, Road Safety Improvement Strategies, ITS and Safety.

Suggested Readings:

1. Kadiyali L.R,. Traffic Engineering and Transport planning, 9th Edition, Khanna Tech Publishers, 2013.
2. C.E.G. Justo, A. Veeraragavan and S. K. Khanna, Highway Engineering, 10th Edition, Nem Chand Publishers, 2017.
3. Donald Drew, Traffic Flow Theory Chapter 14 in Differential Equation Models, Springer, 1983
4. C. Jotinkhisty and B. Kent Lall, Transportation Engineering An Introduction, 3rd Edition, Pearson publications, 2017
5. Elvik, Alena Hoye, TrulsVaa, Michael Sorenson, Handbook of Road Safety measures, second Edition, Emerald Publishing, 2009.
6. Highway Research Programme (NCHRP) Synthesis 336.A synthesis of Highway Research Board, Washington D.C, 2016.

Course Code	Course Title						Core / Elective
U21EC607	PRINCIPLES OF DATA COMMUNICATION AND NETWORKS						Open Elective-2
Prerequisite	Contact Hours Per Week				CIE	SEE	Credits
Programming for Problem Solving	L	T	D	P	40	60	3
	3	-	-	-			

Course Objectives:

1 To familiarize the concepts of switched communication networks of OSI model for layered architecture and introduce TCP/IP suite of protocols.

2 To learn the concepts of functions of each layer of OSI model for layered architecture and introduce TCP/IP suite of protocols.

3 To understand performance of data link layer protocol for flow and Error control.

4 To analyze different routing protocols.

5 To familiarize various networked applications such a DNS, FTP, www architecture and network security.

Course Outcomes:

On completion of this course, students are able to:

1. Interpret the functions of layers in OSI model and various network topologies.

2. Demonstrate the network layer protocols, IP addressing and inter-networking.

3. Apply transport layer working with TCP and UDP.

4. Elaborate the application layer and its protocols.

5. Demonstrate the importance of network security principles and its applications.

UNIT-I

Introduction to Data communication: A Communication Model, Data representation and its flow, Network Types: LAN, WAN, MAN. Network Topologies: Bus, Star, Ring, Hybrid, Line configurations. Reference Models: OSI, TCP/IP. Transmission modes.

UNIT-II

Data Link Layer: Need for Data Link Control, Design issues, Framing, Error Detection and Correction, Flow control Protocols: Stop and Wait, Sliding Window, ARQ Protocols, HDLC. MAC Sub Layer: Multiple Access Protocols: ALOHA, CSMA, LAN- IEEE 802.2, 802.3, Wireless LAN- 802.11standard.

UNIT-III

Network Layer: Network layer Services, Routing algorithms: Shortest Path Routing, Flooding, Hierarchical routing, Broadcast, Multicast, Distance Vector Routing, and Congestion Control Algorithms. Internet Working: The Network Layer in Internet: IPV4, IPV6, Comparison of IPV4 and IPV6, IP Addressing

UNIT-IV

Transport Layer: Transport layer Services, Elements of Transport Layer, Checksum Congestion Control Connection management, TCP and UDP protocols, TCP congestion control, Packet format and flow & error control.

UNIT-V
Application Layer: Domain Name System, SNMP, Electronic Mail, World Wide Web, HTTP, FTP.
Network Security: Cryptography Symmetric Key and Public Key Cipher algorithms, Digital Signatures, Authentication Protocols.

Suggested Readings:

1   "Data Communication and Networking,"Behrouz A. Forouzan, 3/e,TMH, 2008.
2   "Data and Computer Communications," William Stallings, 8/e,PHI, 2004.
3   "Computer Networks," Andrew S Tanenbaum, 5/e, PearsonEducation, 2011.
4   "Computer Networks and Internet", Douglas E Comer, 5/e, Pearson Education Asia, 2009.
5   "Data Communications and Computer Networks", Prakash   C. Gupta, 2/e, PHI learning, 2013.

Course Code	Course Title					Core/Elective
U21EC608	EMBEDDED SYSTEMS					Open elective-II
Prerequisite	Contact Hours Per Week				CIE	SEE	Credits

Prerequisite	Contact Hours Per Week				CIE	SEE	Credits
	L	T	0	P			
Computer Organization Microprocessor	3	-	-	-	40	60	3

Course Objectives:
1. To understand the architecture of 8051 micro-controllers.
2. To understand the various applications of Embedded Systems using the concepts of Interfacing.
3. To familiarize with smart sensors and understand various sensor applications.
4. To learn the concepts of RTOS and the design process using RTOS.
5. To familiarize with the design principles of SOC.

Course Outcomes: students will be able to learn
1. Study and analysis of embedded systems.
2. Design and develop embedded systems (hardware, software and firmware)
3. Analyze, real time systems using RTOS and develop applications.
4. Apply knowledge to interface various sensors and its applications in embedded systems.
5. Elaborate the principles of SOC design.

UNIT-I
Embedded Computing Introduction: Complex Systems and Microprocessor Embedded System Design Process, Formalisms for System Design, Design Examples. Microprocessors and Microcontrollers: Microprocessors and Microcontrollers, The 8051 Architecture: Introduction, 8051 Microcontroller Hardware, Input/output Ports and Circuits, External Memory.

UNIT-II
Introduction to 8051: Data Transfer and Logical Instructions. Arithmetic Operations, Decimal Arithmetic. Jump and Call Instructions, Applications: Interfacing with Keyboards, Displays, D/A and A/D Conversions, Multiple Interrupts, Serial Data Communication. Bus protocols: I2Cbus and CAN bus.

UNIT-III
Smart Sensors Introduction: Primary Sensors – Excitation – Amplification – Filters – Converters –Compensation– Information Coding/Processing - Data Communication – Standards for Smart Sensor Interface–The Automation. Sensors–Applications Introduction– On-board Automobile Sensors (Automotives Sensors)– Home Appliance Sensors–Aerospace Sensors—Sensors form Manufacturing–Sensors for environmental Monitoring

UNIT-IV
Introduction to Real-Time Operating Systems: Tasks and task states, tasks and data, semaphores, and shared data; message queues, mail boxes and pipes, timer functions, events, memory management, interrupt routines in an RTOS environment. Basic Design Using Real Time Operating System

UNIT-V

Introduction to the System Approach System Architecture: Components of the system, Hardware &Software, Processor Architectures, Memory and Addressing. System level inter connection, An approach for SOC Design, System Architecture and Complexity.

Suggested Readings:

1.   The8051Microcontroller and Embedded Systems using Assembly and C Muhammad Ali Mazidi Janice Gillespie Mazidi, Rolin D. McKinlay, ,Prentice Hall India,2ndEdition.

2.   Sensors and Transducers, D. Patranabis, PHI Learning Private Limited.

3.   " Computers and Components" Wayne Wolf, Elsevier, Second Edition. Donald L Schilling & Charles Belove. Electronics Circuits. Discrete &integrated, McGraw Ifill Education (India) Private Limited. 2002.

4.   "The8051Microcontroller", KennethJ.Ayala, Third Edition Thomson

5.   "An Embedded Software Primer" David E. Simon, Pearson Education

Course-Code	Course Title					Core/ Elective
U21MB603	**INNOVATION MANAGEMENT**					Elective
Prerequisites	Contact Hour per Week			CIE	SEE	Credit
	L	T	P			
	5	-	-	40	60	5

Course Objectives: Student will be able to

1. Provides an overview of concepts relating to R & D and Innovation Management.

2. Provides an understanding of concepts like R & D Investment, Evaluation of R & D.

3. Brings out the differences between innovation and Invention.

4. Provides an understanding of Innovation management in an organization.

Course Outcomes: Student will be able to

1. Design in formulating R&D policy and strategy for an organization.

2. Helps in making budget allocations for R & D projects in organization.

3. Understand R&D Investments and Scientific Methods

4. Able to Study Innovation and Inventions

3. Helps in managing Innovation in Organization.

5. Study IT Systems and their Impact on Innovation.

Unit - I: Introduction to Management of Research and Development

Introduction about R&D, Traditional view of R&D, R&D Management and the industrial context, R&D investment and company success, Classifying R&D, Operations that make up R&D, Integration of R&D, Strategic pressures on R&D, Technology Leverage and R&D strategies .

Unit - II: Managing R & D Projects

Allocation of Funds to R&D projects, Setting R & D budgets, levels of Expenditure. Changing nature of R&D management, organizing industrial R &D, Acquisition of external technology, Forms of External R&D.

Unit - III: Effective Research & Development Management

Managing scientific freedom, Link with product innovation process, effect of R&D investment on products, Evaluating R&D progress, evaluation criteria.

Unit - IV: Innovation Management

Importance of Innovation, Innovation & Invention, Successful & Un-Successful innovations, Types of innovations, Innovation a Management process.

Unit - V: Managing Innovation within Organizations

Organizations and Innovation, Organizational Characteristics that Facilitate Innovation, Organizational Structures and innovation, Role of Individual in Innovation, IT Systems and their Impact on Innovation.

Suggested Readings :

1. Paul Trott, Innovation Management and New Product Development, Pearson, 4th Edition.
2. Shlome Mittal, D.V.R. Seshadri, Innovation Management: Strategies, Concepts and tools for growth and profit, Sage Publications.
3. V.K. Narayanan, Managing Technology and Innovation for Competitive Advantage, Pearson Education, Paper Back.
4. William L.Miller& Langdon Morris, Fourth Generation R&D, Managing Knowledge, Technology and Innovation, Wiley India Edition.
5. V.K Narayana, Gina Colarelli, Encyclopedia of Technology and innovation Management, John Wiley & Sons Publication.

Course Code	Course Title					Core/Elective
U21IT6L2	**COMPUTER NETWORKS LAB**					Core
Prerequisite	**Contact Hours Per Week**					
Operating Systems	**L**	**T**	**D**	**P**	**CIE**	**SEE**	**Credits**
	-	-	-	3	25	50	1.5

Course Objectives

The Objectives of this Course are:
1. Understand the use of client/server architecture in application development.
2. Understand and use elementary socket system calls in TCP & UDP based sockets.
3. Implement and use advanced socket system calls and TCP and UDP based sockets.
4. Work with the use of concurrent server services.
5. Simulate chat applications using TCP & UDP.

Course Outcomes

At the end of this course, student would be able to
1. Understand the usage of basic commands ipconig, ifconfig, netstat, ping, arp, telnet, ftp, finger, trace route, who is of LINUX platform.
2. Develop and Implement Client-Server Socket based programs using TCP, and UDP sockets.
3. Make a client server communication through TCP and UDP protocols.
4. Expose on advanced socket programming in LINUX environment.
5. Understand transport layer protocols, connection oriented & connectionless models.

List of Programs

1. Familiarization of Network Environment, Understanding and using network utilities: ipconig, ifconfig, netstat, ping,arp,telnet, ftp,finger, traceroute,whois.
2. Implementation of connection oriented and connection less client and server for well-known services i.e., standard ports.
3. Implementation of concurrent server service using connection-oriented socket system calls(Service: Daytime)
4. Implementation of concurrent server using connection less socket system calls.(Service: Echo server)
5. Implementation of Client Communication with TCP chat server
6. Implementation of Client Communication with UDP chat server
7. Program to demonstrate the use of advanced socket system calls: readv(), writev(), getsockname(), setsockname(), getpeername().

Suggested Readings:
1. Unix Network Programming, W.Richard Stevens,Prentice Hall, Pearson education,2009.
2. Handson Networking with Internet Technologies, Douglas E.Comer,Pearson Education.

Course Code	Course Title						Core/Elective
U21CS6L1	COMPILER DESIGN LAB						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
C and Linux	-	-	-	3	25	50	1.5

Course Objectives:

The objectives of this Course are:

1. To implement Lexical Analyzer using Lex tool & Syntax Analyzer orparser using YACC Tool
2. To implement NFA and DFA from a given regular expression
3. To implement front end of the compiler by means of generatingIntermediate codes.
4. To implement code optimization techniques.
5. To implement Parsers

Course Outcomes:

At the end of this course, the student will able to:

1. Design Lexical analyzer for given language using C and LEX tools.
2. Design and generate various parser for the given CFG
3. Generate machine code from the intermediate code forms
4. Implement Symbol table.
5. Implement Code Optimization

List of Programs:

1. Implement a sample program using Lex
2. Implement a Scanner Generation using LEX.
3. Implement Elimination of Left Rescursion in a Grammer
4. Implement Left factoring of a Grammer.
5. Implement Top-Down Parsers
6. Implement Bottom-Up Parsers
7. Implement Parser Generation using YACC
8. Implement Intermediate Code Generation.
9. Implement Target code generation.
10. Implement Code Optimization.

Suggested Readings:

1. "Compilers: Principles, Techniques and Tools: Implement", Alfred V. Aho, Monica S.Lam, Ravi Sethi, Jeffrey D. Ulman; 2nd Edition, Pearson Education.

Course Code	Course Title						Core/Elective
U21CS6L2	SCRIPTING LANGUAGES LAB						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Programming for Problem Solving	-	-	-	2	50	-	1

Course Objectives:

The objectives of this course are:

1. To develop an ability to design and implement static and dynamic website
2. Create conforming web pages
3. Use JavaScript for dynamic effects
4. Understand, analyze and create XML documents and XML Schema
5. Use appropriate client-side or Server-side applications.

Course Outcomes:

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

1. Understand, analyze and apply the role of languages like HTML, CSS, XML, JavaScript, PHP, SERVLETS, JSP and protocols in the workings of the web and web applications
2. Design and implement dynamic websites with good aesthetic sense of designing
3. Create web pages using HTML and Cascading Styles sheets
4. Analyze a web page and identify its elements and attributes.
5. Develop JSP applications implementing Session management and Data base Connectivity.

List of Experiments

1) Design the following static web pages required for an online book store web site.
   a) HOME PAGE: The static home page must contain three frames.
   b) LOGIN PAGE
   c) CATOLOGUE PAGE: The catalogue page should contain the details of all the books available in the web site in a table.
   d) REGISTRATION PAGE.
2) Write JavaScript to validate the following fields of the Registration page.
   1. First Name (Name should contains alphabets and the length should not be less than 6 characters).
   2. Password (Password should not be less than 6 characters length).
   3. E-mail id (should not contain any invalid and must follow the standard pattern name@domain.com)
   4. Mobile Number (Phone number should contain 10 digits only).
   5. Last Name and Address (should not be Empty).
3) Develop and demonstrate the usage of inline, internal and external style sheet using CSS
4) Develop and demonstrate JavaScript with POP-UP boxes and functions for the following problems:
   a) Input: Click on Display Date button using onclick( ) function Output: Display date in the textbox
   b) Input: A number n obtained using prompt Output: Factorial of n number using alert
   c) Input: A number n obtained using prompt Output: A multiplication table of numbers from 1 to 10 of n using alert
   d) Input: A number n obtained using prompt and add another number using confirm

Output: Sum of the entire n numbers using alert.

5) Write an HTML page that contains a selection box with a list of 5 countries. When the user selects a country, its capital should be printed next in the list. Add CSS to customize the properties of the font of the capital (color, bold and font size)

6) Write an HTML page including any required JavaScript that takes a number from text field in the range of 0 to 999 and shows it in words. It should not accept four and above digits, alphabets and special characters.

7) Develop and demonstrate PHP Script for the following problems:

   a) Write a PHP Script to find out the Sum of the Individual Digits.

   b) Write a PHP Script to check whether the given number is Palindrome or not.

8) Create an XML document that contains 10 users information. Write a Java Program, which takes User Id as input and returns the user details by taking the user information from XML document using DOM parser or SAX parser.

9) Implement the following web applications using (a) PHP (b) JSP

   a) A web application that takes a name as input and on submit it shows a hello page where name is taken from the request. It shows the start time at the right top corner of the page and provides a logout button. On clicking this button, it should show a logout page with Thank You message with the duration of usage (hint: Use session to store name and time).

   b) Write a PHP Program to display current Date, Time and Day.

10) Implement the following web applications using (a) PHP (b) JSP

   a) A web application that takes name and age from an HTML page. If the age is less than 18, it should send a page with "Hello, you are not authorized to visit the site" message, where should be replaced with the entered name. Otherwise, it should send "Welcome to this site" message.

   b) A web application that lists all cookies stored in the browser on clicking "List Cookies" button. Add cookies if necessary.

11) Implement the web applications with Database using (a) PHP, JSP

12) Write a program to design a simple calculator using (a) JavaScript (b) PHP (c) JSP.

Suggested Readings:
1. "The Complete Reference PHPl, Tata McGraw-Hill", Steven Holzner, 1st Edition, 2007
2. "Web Technologiesl, Oxford University Press", Uttam K Roy, 1st Edition, 2010.
3. "JavaScript: The Definitive Guide", David Flanagan O'Reilly, 6th Edition

Course Code	Course Title						Core/Elective
U21CS5P1	TECHNICAL SEMINAR						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	-	-	-	2	50	-	1

Course Objectives

This course enable students to:

1. Prepare and present a topic on engineering/ technology, for a duration of about 8 to 10 minutes.
2. Gain confidence in facing the placement interviews.
3. Enrich the communication skills of the student and presentations of technical topics of interest, this course are introduced.
4. Use various teaching aids such as overhead projectors, power point presentation and demonstrative models.
5. Encourage and motivate the students to read and collect recent and reliable information about their area of interest confined to the relevant discipline, from technical publications.

Course Outcomes

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

1. Develop the habit of referring the journals for literature review.
2. Understand the gist of the research paper.
3. Identify the potential for further scope.
4. Present the work in an efficient manner.
5. Write the documentation in standard format.

Seminar topics may be chosen by the students with advice from the faculty members and the student shallread further relevant articles in the domain.

The seminar must be clearly structured and the power point presentation shall include followingaspects:

1. Introduction to the field
2. Literature survey
3. Consolidation of available information
4. Summary and Conclusions
5. References

Each student is required to:

1. Deliver the seminar for a maximum duration of 30 minutes, where the presentation should be for 20minutes in PowerPoint, followed by Question and Answers session for 10 minutes.
2. Submit the detailed report of the seminar in spiral bound in a precised format as suggested by theDepartment.

Guidelines for awarding marks		
S. No.	Description	Max. Marks
1	Contents and relevance	10
2	Presentation skills	10
3	Preparation of PPT slides	05
4	Questions and answers	05
5	Report in a prescribed format	20

Note:

1. The seminar presentation should be a gist of at least five research papers from **Peer-reviewed** or **UGC recognized** journals.

2. **The seminar report should be in the following order:** Background of work, literature review, techniques used, prospective deliverable, discussion on results, conclusions, critical appraisal and reference.

3. At least two faculty members will be associated with the seminar presentation to evaluate and award marks.

4. Attendance of all the students for weekly seminar presentations is compulsory. If the student fails to secure minimum attendance as per O.U. rules, the marks awarded in the seminar presentation shall remain void.

Course Code	Course Title					Core/ Elective
U21MA6L1	APTITUDE AND REASONING SKILLS LAB					Core
Prerequisite	Contact Hours Per Week					Credits
	L	T	D	P	CIE	SEE
--	-	-	-	2	25	50

(The Credits column value is **1**.)

Course Objectives

The objective of the course is to
1. Acquire the concepts of mathematical aptitude and reasoning.
2. Develop the innovative and creative thinking through basic mathematical concepts.
3. Improve analytical and problems solving skills.
4. Enhance logical thinking and mathematical ability.
5. Empower with the basic tools of mathematical aptitude.

Course Outcomes

After completing this course, the student will be able to:
1. Build proficiency in quantitative reasoning
2. Improve critical thinking skills
3. Enhance analytical skills
4. Demonstrate quantitative aptitude concepts
5. Adapt principles of quantitative aptitude to achieve qualitative results.

Guidelines

1) Basic concepts: combined mean, average principles, wrong values taken, number added or deleted, average speed.

2) Percentages -Basic Concepts, conversions, finding percentages from given numbers, quantity increases or decreases by given percentage, population increase by given percentage, comparisons, consumption when a commodity price increase or decrease and applications.

3) Data Interpretation - Introduction to Data Interpretation, quantitative and qualitative data, Tabular Data, Line Graphs, Bar Chart, Pie Charts, X-Y Charts.

4) Number Series, Letter Series, Series completion and correction, Coding and Decoding. Word analogy-Applied analogy, Classifications, verbal classification.

5) Reasoning Logical Diagrams - Simple diagrammatic relationship, Multi diagrammatic relationship, Venn-diagrams, Analytical reasoning.

Reasoning Ability - Blood Relations, Seating arrangements, Directions, Decision making. Number Systems: Basic Concepts,

6)   Number Systems: Natural numbers, whole numbers, integers, fractions, Rational Numbers, Irrational Numbers, Real Numbers, Divisibility Rules, Logic Equations, Remainder theorem, Unit digit calculation.

Progressions & Inequalities: Basic Concepts, Types: arithmetic, geometric, harmonic progression and applications.

7) Profit and Loss: Basic Concepts, discounts, marked price and list price, dishonest shopkeeper with manipulated weights, successive discounts etc. Interest (Simple and Compound): Basic Concepts, Yearly, Half-yearly, and quarterly calculations, multiples, differences between simple and compound interest.

8) Ratio and Proportion: Basic Concepts of ratio and proportion, continued or equal proportions, mean proportions, invest proportion, alternative proportion, division proportion, compound proportion, duplication of ratio, finding values, coins and currencies, etc.

9) Speed, Time and Distance: Basic Concepts, Single train problems, two train problems: some point same side, some point opposite sides, relative speed, different points meeting at common points, different points same side (different timings vs. same timings), ratios, number of stoppages, average speed, etc.

10) Time and Work: Basic Concepts, comparative work, mixed work, alternative work, middle leave and middle join, ratio efficiency.

11) Permutations and combinations: Basic Concepts, differences between permutations and combinations, alternative arrangement, fixed positions, items drawing from a single group, items drawing from a multiple group, total ways of arrangement with repetitions and without repetitions, handshakes or line joining between two points or number of matches, sides and diagonals, etc.

12) Clocks and Calendars: Basic Concepts, Angle between minute hand and hour hand, reflex angle, hours hand angle, time gap between minute hand and hour hand, relative time: coincide, opposite sides and right angle, mirror images, faulty clock (slow/fast), miscellaneous, calendar.

13) Geometry and Mensuration: Basic concepts, types of angles.
Plane figures: rectangles, squares, triangles, quadrilateral, areas, perimeters, etc.
Solid figures: cubes, cuboids, cylinders-area (total surface area and lateral surface area), volumes, perimeters.
Others: Parallelogram, Rhombus, Trapezium, Circle, Sector, Segment, Cone, Sphere, Hemisphere, etc.

Suggested Readings:
1. Aptitude and reasoning skills lab Manual, LIET, HYD.