SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
CSE (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE)

CSE

CSE (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE)

R23 Regulation

B. TECH. I, II, III year
COURSE STRUCTURE
AND SYLLABUS

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)

INSTITUTE VISION

To emerge as one of the premier institutions through excellence in education and research, producing globally competent and ethically strong professionals and entrepreneurs.

INSTITUTE MISSION

M1: Imparting high-quality technical and management education through the state-of-the- art resources.

M2: Creating an eco-system to conduct independent and collaborative research for the betterment of the society

M3: Promoting entrepreneurial skills and inculcating ethics for the socio-economic development of the nation.

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

DEPARTMENT VISION

To impart quality education and research in Computer Science and Engineering for producing technically competent and ethically strong IT professionals with contemporary knowledge

DEPARTMENT MISSION

M1: Achieving academic excellence in computer science through effective pedagogy, modern curriculum and state-of-art computing facilities.

M2: Encouraging innovative research in Computer Science and Engineering by collaborating with Industry and Premier Institutions to serve the nation.

M3: Empowering the students by inculcating professional behavior, strong ethical values and leadership abilities

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1: To provide software solutions for arising problems in diverse areas with strong knowledge in innovative technologies of Computer Science

PEO2: To serve as globally competent computer professionals and entrepreneurs or in pursuit of higher education and research, developing innovative solutions in multidisciplinary domains.

PEO3: To attain the professional etiquette, soft skills, leadership, teamwork, ethical values in computer science with a commitment for lifelong learning to serve for the society and environment

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1: **Analysis & Design:**

Ability to design, develop and deploy customized applications in all applicable domains using various algorithms and programming languages.

PSO2: **Computational Logic:**

Ability to visualize and configure computational need in terms of hardware and software to provide solutions for various complex applications.

PSO3: **Software Development:**

Ability to apply standard procedures, tools and strategies for software development.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CSE (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE)

INDUCTION PROGRAMME

S.No.	Course Name	Category	L-T-P-C
1	Physical Activities -- Sports, Yoga And Meditation, Plantation	MC	0-0-6-0
2	Career Counseling	MC	2-0-2-0
3	Orientation To All Branches -- Career Options, Tools, Etc.	MC	3-0-0-0
4	Orientation On Admitted Branch -- Corresponding Labs, Tools And Platforms	EC	2-0-3-0
5	Proficiency Modules & Productivity Tools	ES	2-1-2-0
6	Assessment On Basic Aptitude And Mathematical Skills	MC	2-0-3-0
7	Remedial Training In Foundation Courses	MC	2-1-2-0
8	Human Values & Professional Ethics	MC	3-0-0-0
9	Communication Skills -- Focus On Listening, Speaking, Reading, Writing Skills	BS	2-1-2-0
10	Concepts of Programming	ES	2-0-2-0

I B. Tech. – I Semester (CAD)

S.No.	Course Code	Subject	L	T	P	Credits
1	23HS0810	Communicative English	2	0	0	2
2	23HS0801	Chemistry	3	0	0	3
3	23HS0830	Linear Algebra & Calculus	3	0	0	3
4	23CE0101	Basic Civil & Mechanical Engineering	3	0	0	3
5	23CS0501	Introduction to Programming	3	0	0	3
6	23HS0811	Communicative English Lab	0	0	2	1
7	23HS0802	Chemistry Lab	0	0	2	1
8	23ME0301	Engineering Workshop	0	0	3	1.5
9	23CS0502	Computer Programming Lab	0	0	3	1.5
10	23HS0813	Health and wellness, Yoga and Sports	0	0	1	0.5
Total			**14**	**0**	**11**	**19.5**

I B. Tech. – II Semester (CAD)

S.No.	Course Code	Subject	L	T	P/ Drg	Credits
1	23HS0840	Engineering Physics	3	0	0	3
2	23HS0831	Differential Equations & Vector Calculus	3	0	0	3
3	23EE0201	Basic Electrical and Electronics Engineering	3	0	0	3
4	23ME0302	Engineering Graphics	1	0	4	3
5	23CS0503	IT Workshop	0	0	2	1
6	23CS0504	Data Structures	3	0	0	3
7	23HS0841	Engineering Physics Lab	0	0	2	1
8	23EE0202	Electrical and Electronics Engineering Workshop	0	0	3	1.5
9	23CS0505	Data Structures Lab	0	0	3	1.5
10	23HS0812	NSS/NCC/Scouts & Guides/Community Service	0	0	1	0.5
Total			**13**	**0**	**15**	**20.5**

II B. Tech. – I Semester (CAD)

S.No.	Course Code	Subject	L	T	P	Credits
1	23HS0836	Discrete Mathematics & Graph Theory	3	0	0	3
2	23HS0814	Universal Human Values – Understanding Harmony and Ethical Human Conduct	2	1	0	3
3	23CS0901	Principles of Artificial Intelligence	3	0	0	3
4	23CS0507	Advanced Data Structures & Algorithm Analysis	3	0	0	3
5	23CS0508	Object Oriented Programming Through Java	3	0	0	3
6	23CS0509	Advanced Data Structures and Algorithm Analysis Lab	0	0	3	1.5
7	23CS0510	Object Oriented Programming through Java Lab	0	0	3	1.5
8	23CS0549	Python Programming	0	1	2	2
9	23HS0805	Environmental Science	2	0	0	0
Total			**16**	**2**	**8**	**20**

II B. Tech. – II Semester (CAD)

S.No.	Course Code	Subject	L	T	P	Credits
1	23HS0848	Managerial Economics and Financial Analysis	2	0	0	2
2	23HS0839	Statistical Methods For Data Science	3	0	0	3
3	23CS0902	Machine Learning	3	0	0	3
4	23CS0512	Database Management Systems	3	0	0	3
5	23CS0506	Digital Logic and Computer Organization	3	0	0	3
6	23CS0903	Artificial Intelligence & Machine Learning Lab	0	0	3	1.5
7	23CS0515	Database Management Systems Lab	0	0	3	1.5
8	23CS0550	Full Stack Development-1	0	1	2	2
9	23HS0815	Design Thinking & Innovation	1	0	2	2
Total			**15**	**1**	**10**	**21**
Mandatory Community Service Project / Internship of 08 weeks duration during summer vacation						

III B. Tech. – I Semester (CAD)

S.No.	Course Code	Subject	L	T	P	Credits
1	23CS1101	Data Science	3	0	0	3
2	23CS0517	Computer Networks & Internet Protocols	3	0	0	3
3	23CS0511	Operating Systems	3	0	0	3
4	23CS0519	Introduction to Quantum Technologies and Applications	3	0	0	3
	Professional Elective course (PEC) –I					
5	23CS0518	Automata Theory & Compiler Design	3	0	0	3
	23CS0532	Object Oriented Analysis and Design				
	23CS1110	Information Retrieval Systems				
	23CS0545	Internet of Things				
Open Elective (OE) –I						
6	23CE0150	Green Buildings	3	0	0	3
	23CE0151	Construction Technology and Management				
	23EE0261	Electrical Safety Practices and Standards				
	23ME0356	Sustainable Energy Technologies				
	23EC0406	Electronic Circuits				
	23HS0855	Mathematics for Machine Learning and AI				
	23HS0842	Materials Characterization Techniques				
	23HS0846	Introduction To Quantum Mechanics				
	23HS0806	Chemistry of Energy Systems				
	23HS0821	English for Competitive Examinations				
	23HS0822	Entrepreneurship and New Venture Creation				
7	23CS1102	Data Science Lab	0	0	3	1.5
8	23CS1002	Computer Networks & Operating Systems Lab	0	0	3	1.5
9	23CS0551	**Skill Enhancement Course**: Full Stack Development- 2	0	1	2	2
10	23EC0417	Tinkering Lab	0	0	2	1
11	23CS1103	Evaluation of Community Service Internship	0	0	0	2
Total			**15**	**1**	**10**	**26**

III B. Tech. – II Semester (CAD)

S.No.	Course Code	Subject	L	T	P	Credits
1	23CS1104	Big Data Analytics	3	0	0	3
2	23CS0918	Data Visualization	3	0	0	3
3	23CS0524	Cloud Computing	3	0	0	3
Professional Elective course (PEC) –II						
4	23CS0535	Software Testing Methodologies	3	0	0	3
	23CS0525	Cryptography & Network Security				
	23CS1111	Neural Networks				
	23CS0906	Computer Vision and Image Processing				
Professional Elective course (PEC) –III						
5	23CS0538	Software Project Management	3	0	0	3
	23CS1112	Recommendation Systems				
	23CS1113	Social Network Analysis and Applications				
	23CS1114	R Programming				
Open Elective (OE) –II						
6	23CE0152	Disaster Management	3	0	0	3
	23CE0153	Sustainability in Engineering Practices				
	23EE0262	Renewable Energy Sources				
	23ME0349	Automation and Robotics				
	23EC0441	Digital Electronics				
	23HS0853	Optimization Techniques for Engineers				
	23HS0858	Mathematical Foundation of Quantum Technologies				
	23HS0843	Physics of Electronic Materials And Devices				
	23HS0807	Chemistry of Polymers And Applications				
	23HS0823	Academic Writing and Public Speaking				
7	23CS1105	Big Data Analytics Lab	0	0	3	1.5
8	23CS1106	Data Visualization Lab	0	0	3	1.5
9	23HS0818	**Skill Enhancement course:** Soft skills OR IELTS	0	1	2	2
10	23HS0816	**Audit Course :**Technical Paper Writing & IPR	2	0	0	-
Total			**20**	**1**	**8**	**23**
Mandatory Industry Internship of 08 weeks duration during summer vacation						

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I B.Tech – I Sem.

L	T	P	C
2	0	0	2

(23HS0810) COMMUNICATIVE ENGLISH
(Common to all branches of Engineering)

COURSE OBJECTIVES

The objectives of this course

The main objective of introducing this course, Communicative English, is to facilitate effective listening, Reading, Speaking and Writing skills among the students. It enhances the same in their comprehending abilities, oral presentations, reporting useful information and providing knowledge of grammatical structures and vocabulary. This course helps the students to make them effective in speaking and writing skills and to make them industry ready.

COURSE OUTCOMES (COs)

After the completion of the course student should be able to

1. *Understand the context, topic, and pieces of specific information from social or Transactional dialogues.*
2. *Apply grammatical structures to formulate sentences and correct word forms.*
3. *Analyze discourse markers to speak clearly on a specific topic in informal discussions.*
4. *Evaluate reading/listening texts and to write summaries based on global comprehension of these texts.*
5. *Create a coherent paragraph, essay, and resume.*
6. *Demonstrate the skills needed to participate in a conversation that builds knowledge collaboratively.*

UNIT – I

Lesson: HUMAN VALUES: Gift of Magi **(Short Story)**

Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions.

Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.

Reading: Skimming to get the main idea of a text; scanning to look for specific pieces of information.

Writing: Mechanics of Writing-Capitalization, Spellings, Punctuation-Parts of Sentences.

Grammar: Parts of Speech, Basic Sentence Structures-forming questions

Vocabulary: Synonyms, Antonyms, Affixes (Prefixes/Suffixes), Root words.

UNIT – II

Lesson: NATURE: The Brook by Alfred Tennyson (Poem)

Listening: Answering a series of questions about main ideas and supporting ideas after listening to audio texts.

Speaking: Discussion in pairs/small groups on specific topics followed by short structure talks.

Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.
Writing: Structure of a paragraph - Paragraph writing (specific topics)
Grammar: Cohesive devices - linkers, use of articles and zero article; prepositions.
Vocabulary: Homonyms, Homophones, Homographs.

UNIT – III
Lesson: BIOGRAPHY: Elon Musk
Listening: Listening for global comprehension and summarizing what is listened to.
Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed
Reading: Reading a text in detail by making basic inferences -recognizing and interpreting specific context clues; strategies to use text clues for comprehension.
Writing: Summarizing, Note-making, paraphrasing
Grammar: Verbs - tenses; subject-verb agreement; Compound words,
Vocabulary: Collocations

UNIT – IV
Lesson: INSPIRATION: The Toys of Peace by Saki
Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video.
Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.
Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data.
Writing: Letter Writing: Official Letters, Resumes.
Grammar: Reporting verbs, Direct & Indirect speech, Active & Passive Voice
Vocabulary: Words often confused, Jargons

UNIT – V
Lesson: MOTIVATION: The Power of Intrapersonal Communication (An Essay)
Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.
Speaking: Formal oral presentations on topics from academic contexts
Reading: Reading comprehension.
Writing: Writing structured essays on specific topics.
Grammar: Editing short texts –identifying and correcting common errors in grammar andusage (articles, prepositions, tenses, subject verb agreement)
Vocabulary: Technical Jargons

TEXTBOOKS
1. *Pathfinder: Communicative English for Undergraduate Students*, 1st Edition, Orient Black Swan, 2023 (Units 1,2 & 3).
2. *Empowering with Language* by Cengage Publications, 2023 (Units 4 & 5).

REFERENCES

1. Dubey, Sham Ji & Co. *English for Engineers*, Vikas Publishers, 2020.
2. Bailey, Stephen. *Academic writing: A Handbook for International Students*., Routledge, 2014.
3. Murphy, Raymond, *English Grammar in Use*, Fourth Edition, Cambridge University Press, 2019.
4. Lewis, Norman, *Word Power Made Easy- The Complete Handbook for Building a Superior Vocabulary*, Anchor, 2014.

ONLINE LEARNING RESOURCES

GRAMMAR:

1. www.bbc.co.uk/learningenglish.
2. https://dictionary.cambridge.org/grammar/british-grammar/
3. www.eslpod.com/index.html
4. https://www.learngrammar.net/
5. https://english4today.com/english-grammar-online-with-quizzes/
6. https://www.talkenglish.com/grammar/grammar.aspx

VOCABULARY

1. https://www.youtube.com/c/DailyVideoVocabulary/videos
2. https://www.youtube.com/channel/UC4cmBAit8i_NJZE8qK8sfpA

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I B.Tech – I Sem.

L	T	P	C
3	0	0	3

(23HS0801) CHEMISTRY
(Common to EEE, ECE, CSE, CSIT, CSM, CIC, CAD, CCC & CAI branches)

COURSE OBJECTIVES

The objectives of this course

1. *To familiarize engineering chemistry and its applications*
2. *To train the students on the principles and applications of electrochemistry and polymers*
3. *To introduce instrumental methods, molecular machines and switches.*

COURSE OUTCOMES (COs)

After the completion of the course student should be able to

1. *Acquire the knowledge on the behaviour and interactions between matter and energy at both the atomic and molecular levels.*
2. *Analyze and demonstrate the applications of modern engineering materials in real world.*
3. *Impart the knowledge on the essential aspects of electrochemical cells, emf and applications of emf measurements*
4. *Gain the knowledge about construction and applications of batteries and sensors,*
5. *Impart knowledge on the essential aspects of Principles and comprehend idea about the synthesis and engineering applications of polymers.*
6. *Analyse the molecular transitions of Electromagnetic radiation (EMR) with matter in various spectroscopic techniques.*

UNIT – I Structure and Bonding Models:

Fundamentals of Quantum mechanics, Schrodinger Wave equation, significance of and Ψ^2, particle in one dimensional box, molecular orbital theory – bonding in homo- and heteronuclear diatomic molecules – energy level diagrams of O2 and CO, etc. π-molecular orbitals of butadiene and benzene, calculation of bond order.

UNIT- II Modern Engineering Materials

Semiconductors – Introduction, basic concept, application.

Super Conductors - Introduction basic concept, applications.

Super Capacitors - Introduction, Basic Concept, Classification – Applications.

Nano Materials - Introduction, classification, properties and applications of Fullerenes, Carbon nano tubes and Graphines nano particles.

UNIT- III Electrochemistry and Applications

Electrochemical cell, Nernst equation, cell potential calculations and numerical problems, potentiometry- potentiometric titrations (redox titrations), concept of conductivity, conductivity cell, conductometric titrations (acid-base titrations).

Electrochemical sensors – potentiometric sensors with examples, amperometric sensors with examples. Primary cells – Zinc-air battery, Secondary cells – lithium-ion batteries- working of the batteries including cell reactions; Fuel cells, hydrogen-oxygenfuel cell– working of the cells. Polymer Electrolyte Membrane Fuel cells (PEMFC).

UNIT - IV Polymer Chemistry

Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, with specific examples and mechanisms of polymer formation.

Plastics –Thermo and Thermosetting plastics, Preparation, properties and applications of – PVC, Teflon, Bakelite, Nylon-6,6, carbon fibres.

Elastomers–Buna-S, Buna-N–preparation, properties and applications.

Conducting Polymers – polyacetylene, polyaniline, – mechanism of conduction and applications. Bio-Degradable polymers - Poly Glycolic Acid (PGA), Polyl Lactic Acid (PLA).

UNIT - V Instrumental Methods and Applications

Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law. UV-Visible Spectroscopy, electronic transition, Instrumentation, IR spectroscopies, fundamental modes and selection rules, Instrumentation. High pressure Liquid Chromatography (HPLC) Classification, Principle, Instrumentation and Applications.

TEXTBOOKS

1. Jain and Jain, *Engineering Chemistry*, 16/e, DhanpatRai, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, *Atkins' Physical Chemistry*, 10/e,Oxford University Press, 2010.

REFERENCES

1. S koog and West, *Principles of Instrumental Analysis*, 6/e, Thomson, 2007.
2. J .D. Lee, *Concise Inorganic Chemistry*, 5th Edition, Wiley Publications, Feb.2008
3. Fred W. Billmayer Jr, *Textbook of Polymer Science*, 3rd Edition.

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I B.Tech – I Sem.

L	T	P	C
3	0	0	3

(23HS0830) LINEAR ALGEBRA & CALCULUS
(Common to all branches of Engineering)

COURSE OBJECTIVES

The objectives of this course

To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real-world problems and their applications.

COURSE OUTCOMES (COs)

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

1. *Develop and use of matrix algebra techniques that are needed by engineers for practical applications.*
2. *Identify different matrix techniques to find the inverse and powers of the matrix.*
3. *Understanding the concepts of continuity and differentiability of functions defined on intervals*
4. *Estimate the series expansions of algebraic and transcendental functions.*
5. *Analyze the functions of several variables which is useful in optimization.*
6. *Familiarize with double and triple integrals of functions of several variables in two dimensions using Cartesian and polar coordinates and in three dimensions using cylindrical and spherical coordinates.*

UNIT I
Matrices

Rank of a matrix by echelon form, normal form. Cauchy–Binet formulae (without proof). Inverse of Non- singular matrices by Gauss-Jordan method, System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method, Jacobi and Gauss Seidel Iteration Methods.

UNIT II
Eigen values, Eigenvectors and Orthogonal Transformation

Eigen values, Eigenvectors and their properties, Diagonalization of a matrix, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem, Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

UNIT III
Calculus

Mean Value Theorems: Rolle's Theorem, Lagrange's mean value theorem with their geometrical interpretation, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof), Problems and applications on the above theorems.

UNIT IV

Partial differentiation and Applications (Multi variable calculus)

Functions of several variables: Continuity and Differentiability, Partial derivatives, total derivatives, chain rule, Directional derivative, Taylor's and Maclaurin's series expansion of functions of two variables. Jacobians, Functional dependence, maxima and minima of functions of two variables, method of Lagrange multipliers.

UNIT V

Multiple Integrals (Multi variable Calculus)

Double integrals, triple integrals, change of order of integration, change of variables to polar, cylindrical and spherical coordinates. Finding areas (by double integrals) and volumes (by double integrals and triple integrals).

TEXT BOOKS

1. B. S. Grewal, *Higher Engineering Mathematics*, Khanna Publishers, 2017, 44th Edition
2. Erwin Kreyszig, *Advanced Engineering Mathematics*, John Wiley & Sons, 2018, 10th Edition.

REFERENCES

1. George B. Thomas, Maurice D. Weir and Joel Hass, *Thomas Calculus*, Pearson Publishers, 2018, 14th Edition.
2. R. K. Jain and S. R. K. Iyengar, *Advanced Engineering Mathematics*, Alpha Science International Ltd., 2021 5th Edition(9th reprint).
3. Glyn James, *Advanced Modern Engineering Mathematics*, Pearson publishers, 2018, 5th Edition.
4. Micheael Greenberg, *Advanced Engineering Mathematics*, Pearson publishers, 9th edition
5. H. K Das, Er. Rajnish Verma, *Higher Engineering Mathematics*, S. Chand Publications,2014, Third Edition (Reprint 2021)

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I B.Tech – I Sem.

L	T	P	C
3	0	0	3

(23CE0101) BASIC CIVIL & MECHANICAL ENGINEERING
(Common to all branches of Engineering)

PART A: BASIC CIVIL ENGINEERING

COURSE OBJECTIVES

The objectives of this course

1. *Get familiarized with the scope and importance of Civil Engineering sub-divisions.*
2. *Introduce the preliminary concepts of surveying.*
3. *Acquire preliminary knowledge on Transportation and its importance in nation's economy.*
4. *Get familiarized with the importance of quality, conveyance and storage of water*
5. *Introduction to basic civil engineering materials and construction techniques.*

COURSE OUTCOMES (COs)

After the completion of the course, student should be able to

1. *Understand various sub-divisions of Civil Engineering and to appreciate their role in ensuring better society.*
2. *Know the concepts of surveying and to understand the measurement of distances, angles and levels through surveying.*
3. *Realize the importance of Transportation in nation's economy and the engineering measures related to Transportation and understand the process of water storage and its supply to the public.*

UNIT I

Basics of Civil Engineering: Role of Civil Engineers in Society - Various Disciplines of Civil Engineering - Structural Engineering - Geo-technical Engineering - Transportation Engineering - Hydraulics and Water Resources Engineering - Environmental Engineering - Scope of each discipline - Building Construction and Planning - Construction Materials - Cement - Aggregate - Bricks - Cement concrete - Steel. Introduction to Prefabricated construction Techniques

UNIT II

Surveying: Objectives of Surveying - Horizontal Measurements - Angular Measurements - Introduction to Bearings - Levelling instruments used for levelling - Simple problems on levelling and bearings - Contour mapping.

UNIT III

Transportation Engineering: Importance of Transportation in Nation's economic development - Types of Highway Pavements - Flexible Pavements and Rigid Pavements - Simple Differences. Basics of Harbour, Tunnel, Airport, and Railway Engineering

Water Resources and Environmental Engineering: Introduction, Sources of water - Quality of water - Specifications - Introduction to Hydrology – Rainwater Harvesting - Water Storage and Conveyance Structures (Simple introduction to Dams and Reservoirs).

TEXT BOOKS

1. M.S.Palanisamy, *Basic Civil Engineering*, Tata McGraw Hill publications (India) Pvt. Ltd. Fourth Edition, 2011.
2. S.S. Bhavikatti, *Introduction to Civil Engineering*, New Age International Publishers, First Edition, 2022.
3. Satheesh Gopi, *Basic Civil Engineering*, Pearson Publications, First Edition, 2009

REFERENCES

1. S.K. Duggal, *Surveying, Vol- I and Vol-II*, Tata McGraw Hill Publishers, Fifth Edition, 2019
2. Santosh Kumar Garg, *Hydrology and Water Resources Engineering*, Khanna Publishers, Delhi, 2016
3. Santosh Kumar Garg, *Irrigation Engineering and Hydraulic Structures*, Khanna Publishers, Delhi, 38th Edition, 2023
4. S.K.Khanna, C.E.G. Justo and Veeraraghavan, *Highway Engineering*, Nemchand and Brothers Publications, 10th Edition, 2019
5. Indian Standard DRINKING WATER — SPECIFICATION IS 10500-2012.

PART B: BASIC MECHANICAL ENGINEERING

COURSE OBJECTIVES

The objectives of this course

1. *Get familiarized with the scope and importance of Mechanical Engineering in different sectors and industries.*
2. *Explain different engineering materials and different manufacturing processes.*
3. *Provide an overview of different thermal and mechanical transmission systems and introduce basics of robotics and its applications.*

COURSE OUTCOMES

After the completion of the course, student should be able to

1. *Understand the role of mechanical engineering and materials in the manufacturing and automotive industries*
2. *Explain the basics of manufacturing processes and thermal engineering and its applications.*
3. *Describe the working of different power plants. Mechanical power transmission systems and the applications of robotics in industrial sector.*

UNIT I

Introduction to Mechanical Engineering: Role of Mechanical Engineering in Industries and Society- Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors.

Engineering Materials - Metals-Ferrous and Non-ferrous, Ceramics, Composites, Smart materials.

UNIT II

Manufacturing Processes: Principles of Casting**,** Forming, joining processes, Machining, Introduction to CNC machines, 3D printing, and Smart manufacturing.

Thermal Engineering – working principle of Boilers, Otto cycle, Diesel cycle, Refrigeration and air-conditioning cycles, IC engines, 2-Stroke and 4-Stroke engines, SI/CI Engines, Components of Electric and Hybrid Vehicles.

UNIT III

Power plants – working principle of Steam, Diesel, Hydro, Nuclear power plants.
Mechanical Power Transmission - Belt Drives, Chain, Rope drives, Gear Drives and their applications.

Introduction to Robotics - Joints & links, configurations, and applications of robotics.

(Note: The subject covers only the basic principles of Civil and Mechanical Engineering systems. The evaluation shall be intended to test only the fundamentals of the subject)

TEXTBOOKS

1. V.Ganesan, *Internal Combustion Engines*, Tata McGraw Hill publications (India) Pvt. Ltd.
2. S.S. Rattan, *A Tear book of Theory of Machines* Tata McGraw Hill Publications, (India) Pvt. Ltd.
3. Jonathan Wicker and Kemper Lewis, *An introduction to Mechanical Engineering,* Cengagelearning India Pvt. Ltd.

REFERENCE BOOKS

1. Appuu Kuttan KK, *Robotics*, I.K. International Publishing House Pvt. Ltd. Volume-I
2. L. Jyothish Kumar, Pulak M Pandey, *3D printing & Additive Manufacturing Technology*, Springer publications
3. Mahesh M Rathore, *Thermal Engineering*, Tata McGraw Hill publications (India) Pvt. Ltd.
4. G. Shanmugam and M.S.Palanisamy, *Basic Civil and the Mechanical Engineering*, TataMcGraw Hill publications (India) Pvt. Ltd.

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I B.Tech – I Sem.

L	T	P	C
3	0	0	3

(23CS0501) INTRODUCTION TO PROGRAMMING
(Common to all branches of Engineering)

COURSE OBJECTIVES

The objectives of this course

1. *To introduce students to the fundamentals of computer programming.*
2. *To provide hands-on experience with coding and debugging.*
3. *To foster logical thinking and problem-solving skills using programming.*
4. *To familiarize students with programming concepts such as data types, control structures, functions, and arrays.*
5. *To encourage collaborative learning and teamwork in coding projects.*

COURSE OUTCOMES (COs)

After the completion of the course student should be able to

1. *Understand basics of computers, the concept of algorithm and algorithmic thinking.*
2. *Analyse a problem and develop an algorithm using control structures & arrays*
3. *Analyse a problem and develop an algorithm to solve it using strings*
4. *Understand and implement the problems using pointers*
5. *Apply modular approach for solving the problem*
6. *Design and implement problem-solving using structures, unions and files.*

UNIT - I

Introduction to Programming and Problem Solving: History of Computers, Basic organization of a computer: ALU, input-output units, memory, program counter, Introduction to Programming Languages, Basics of a Computer Program Algorithms, flowcharts (Using Dia Tool), pseudo code. Introduction to Compilation and Execution, Primitive Data Types, Variables, and Constants, Basic Input and Output, Operations, Type Conversion, and Casting. Problem solving techniques: Algorithmic approach, characteristics of algorithm, Problem solving strategies: Top-down approach, Bottom-up approach, Time and space complexities of algorithms.

UNIT - II

Control Structures: Simple sequential programs Conditional Statements (if, if-else, switch), Loops (for, while, do-while) Break and Continue.

UNIT - III

Arrays and Strings: Arrays indexing, memory model, programs with array of integers, two dimensional arrays, Introduction to Strings.

UNIT - IV

Pointers & User Defined Data types: Pointers, dereferencing and address operators, pointer and address arithmetic, array manipulation using pointers, User-defined data types-Structures and Unions.

UNIT - V

Functions & File Handling: Introduction to Functions, Function Declaration and Definition, Function call Return Types and Arguments, modifying parameters inside functions using pointers, arrays as parameters. Scope and Lifetime of Variables, Basics of File Handling.

Note: The syllabus is designed with C Language as the fundamental language of implementation.

TEXTBOOKS

1. Brian W. Kernighan and Dennis M. Ritchie, *The C Programming Language, 2nd edition, 2015*.
2. Pradip Dey Manas Ghosh‖ Programming in C –First edition, Oxford University Press, 2018.

REFERENCES

1. Balagurusamy, E, *Computing fundamentals and C Programming*, McGraw-Hill Education, 2019.
2. Rema Theraja, *Programming in C*, Oxford, 2016, 2nd edition
3. Forouzan, Gilberg, Prasad, *C Programming, A Problem Solving Approach*, CENGAGE, 3rd edition

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I B.Tech – I Sem.

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(23HS0811) COMMUNICATIVE ENGLISH LAB
(Common to all branches of Engineering)

COURSE OBJECTIVES

The objectives of this course

The main objective of introducing this course, Communicative English Laboratory, is to expose the students to a variety of self-instructional, learner friendly modes of language learning. The students will get trained in basic communication skills and also make them ready to face job interviews.

COURSE OUTCOMES (COs)

After the completion of the course student should be able to

1. *Understand the different aspects of the English language proficiency with emphasis on LSRW skills.*
2. *Apply communication skills through various language learning activities.*
3. *Analyze the English speech sounds, stress, rhythm, and syllable division for better listening and speaking comprehension.*
4. *Evaluate and exhibit professionalism in participating in debates and group discussions.*
5. *Become active participants in the learning process and acquire proficiency in spoken English.*
6. *Speak with clarity and confidence thereby enhances employability skills.*

List of Topics:

1. Vowels & Consonants
2. Neutralization/Accent Rules
3. Communication Skills & JAM
4. Role Play or Conversational Practice
5. E-mail Writing
6. Resume Writing, Cover letter, SOP
7. Group Discussions-methods & practice
8. Debates - Methods & Practice
9. PPT Presentations/ Poster Presentation
10. Interviews Skills

Suggested Software:

1.Walden Infotech 2.Young India Films

REFERENCES

1. Raman Meenakshi, Sangeeta-Sharma. *Technical Communication.* Oxford Press.2018.
2. Taylor Grant: *English Conversation Practice,* Tata McGraw-Hill Education India,2016
3. Hewing's, Martin. Cambridge *Academic English* (B2). CUP, 2012.
4. J. Sethi & P.V. Dhamija. A Course in Phonetics and Spoken English, (2nd Ed), Kindle, 2013.

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I B.Tech – I Sem.

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(23HS0802) CHEMISTRY LAB
(Common to EEE, ECE, CSE, CSIT, CSM, CIC, CAD, CCC & CAI branches)

COURSE OBJECTIVES

The objectives of this course

1. *Verify the fundamental concepts with experiments.*

COURSE OUTCOMES (COs)

After the completion of the course student should be able to

1. *Determine the cell constant and conductance of solutions.*
2. *Prepare advanced polymer Bakelite materials.*
3. *Measure the strength of an acid present in secondary batteries.*
4. *Analyse the IR spectra of some organic compounds.*
5. *Able to understand about the fundamental concepts of analytical instruments*
6. *Calculate strength of acid in Pb-Acid battery.*

LIST OF EXPERIMENTS

1. Measurement of 10Dq by spectro photometric method
2. Conduct ometric titration of strong acid vs. strong base
3. Conduct ometric titration of weak acid vs. strong base
4. Determination of cell constant and conductance of solutions
5. Potentiometry - determination of redox potentials and emfs
6. Determination of Strength of an acid in Pb-Acid battery
7. Preparation of a Bakelite
8. Verify Lambert-Beer's law
9. Wavelength measurement of sample through UV-Visible Spectroscopy
10. Identification of simple organic compounds by IR
11. Preparation of nanomaterials by precipitation method
12. Estimation of Ferrous Iron by Dichrometry

Note: Any Ten experiments may be conducted

REFERENCE

1. J. Mendham, R.C.Denney, J.D.Barnes and B. Sivasankar, *Vogel's Quantitative Chemical Analysis 6th Edition 6th Edition,* Pearson Publications

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I B.Tech – I Sem.

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(23ME0301) ENGINEERING WORKSHOP
(Common to all branches of Engineering)

COURSE OBJECTIVES

The objectives of this course is

1. *Familiarize with the different types of wood and carpentry joints.*
2. *Develop Tapered Tray and Conical funnel using sheet metal.*
3. *Acquire practical knowledge on different types of fittings.*
4. *Provides hands-on training in the trades of House-Wiring .*
5. *Overview of metal cutting processes, foundry, Welding and plumbing, is provided through live demonstrations.*
6. *Acquire practical skills by performing the experiments in different shops of workshop.*

COURSE OUTCOMES

On successful completion of the course, the students will be able to

1. *Describe the different types of wood and carpentry joints.*
2. *Produce Tapered Tray and Conical funnel using sheet metal.*
3. *Understands about Fitting and their types.*
4. *Explain the method of preparation of various House-Wiring.*
5. *Apply basic techniques in foundry, Welding and plumbing.*
6. *Estimate the amount of material required for various models.*

SYLLABUS

1. **Demonstration**: Safety practices and precautions to be observed in workshop.
2. **Wood Working:** Familiarity with different types of woods and tools used in wood working and make following joints.
   a) Half – Lap joint b) Mortise and Tenon joint c) Corner Dovetail joint or Bridle joint
3. **Sheet Metal Working**: Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets.
   a) Tapered tray b) Conical funnel c) Elbow pipe d) Brazing
4. **Fitting:** Familiarity with different types of tools used in fitting and do the following fitting exercises.
   a) V-fit b) Dovetail fit c) Semi-circular fit d) Bicycle tire puncture and change of two-wheeler tyre
5. **Electrical Wiring**: Familiarity with different types of basic electrical circuits and make the following connections.
   a) Parallel and series b) Two-way switch c) Godown lighting d) Tube light e) Three phase motor f) Soldering of wires
6. **Foundry Trade:** Demonstration and practice on Moulding tools and processes, Preparation of Green Sand Moulds for given Patterns.

7. **Welding Shop**: Demonstration and practice on Arc Welding and Gas welding. Preparation of Lap joint and Butt joint.
8. **Plumbing:** Demonstration and practice of Plumbing tools, Preparation of Pipe joints with coupling for same diameter and with reducer for different diameters.

TEXT BOOKS

1. Felix W, *Basic Workshop Technology: Manufacturing Process,* Independently Published, 2019.
2. Bruce J. Black, *Workshop Processes, Practices and Materials*; Routledge publishers, 5th Edn. 2015.
3. B.S. Raghuwanshi, *A Course in Workshop Technology Vol I. & II*, Dhanpath Rai & Co., 2015 & 2017.

REFERENCES

1. S. K. Hajra Choudhury & Others, *Elements of Workshop Technology, Vol. I* , Media Promoters and Publishers, Mumbai. 2007, 14th edition
2. H. S. Bawa, Workshop Practice, Tata-McGraw Hill, 2004.
3. Soni P.M. & Upadhyay P.A., Wiring Estimating, Costing and Contracting; Atul Prakashan, 2021-22

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I B.Tech – I Sem.

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(23CS0502) COMPUTER PROGRAMMING LAB
(Common to all branches of Engineering)

COURSE OBJECTIVES

The objectives of this course

1. *The course aims to give students hands – on experience and train them on the concepts of the C- programming language.*

COURSE OUTCOMES (COs)

1. *Read, understand, and trace the execution of programs written in C language.*
2. *Select the right control structure for solving the problem.*
3. *Develop C programs which utilize memory efficiently using programming constructs like pointers.*
4. *Develop Debug and Execute programs to demonstrate the applications of arrays in C.*
5. *Develop Debug and Execute programs to demonstrate the applications of functions in C.*
6. *Implement the C programs using File handling Concepts.*

UNIT I

WEEK 1 - Objective: Getting familiar with the programming environment on the computer and writing the first program.

Suggested Experiments/Activities:

Tutorial 1: Problem-solving using Computers.

Lab1: Familiarization with programming environment

- **i)** Basic Linux environment and its editors like Vi, Vim & Emacs etc.
- **ii)** Exposure to Turbo C, gcc
- **iii)** Writing simple programs using printf(), scanf()

WEEK 2 - Objective: Getting familiar with how to formally describe a solution to a problem in a series of finite steps both using textual notation and graphic notation.

Suggested Experiments /Activities:

Tutorial 2: Problem-solving using Algorithms and Flow charts.

Lab 1: Converting algorithms/flow charts into C Source code. Developing the algorithms/flowcharts for the following sample programs

- **i)** Sum and average of 3 numbers
- **ii)** Conversion of Fahrenheit to Celsius and vice versa
- **iii)** Simple interest calculation

WEEK 3 - Objective: Learn how to define variables with the desired data-type, initialize them with appropriate values and how arithmetic operators can be used with variables and constants.

Suggested Experiments/Activities:

Tutorial 3: Variable types and type conversions:

Lab 3: Simple computational problems using arithmetic expressions.

- **i)** Finding the square root of a given number
- **ii)** Finding compound interest
- **iii)** Area of a triangle using heron's formulae
- **iv)** Distance travelled by an object

UNIT II

WEEK 4 - Objective: Explore the full scope of expressions, type-compatibility of variables & constants and operators used in the expression and how operator precedence works.

Suggested Experiments/Activities:

Tutorial 4: Operators and the precedence and as associativity:

Lab 4: Simple computational problems using the operator' precedence and associativity

- **i)** Evaluate the following expressions. a. A+B*C+(D*E) + F*G b. A/B*C-B+A*D/3 c. A+++B---A d. J= (i++) + (++i)
- **ii)** Find the maximum of three numbers using conditional operator
- **iii)** Take marks of 5 subjects in integers, and find the total, average in float

WEEK 5 - Objective: Explore the full scope of different variants of ―if construct‖ namely if-else, nullelse, if-else if*-else, switch and nested-if including in what scenario each one of them can be used and how to use them. Explore all relational and logical operators while writing conditionals for ―if construct‖.

Suggested Experiments/Activities:

Tutorial 5: Branching and logical expressions:

Lab 5: Problems involving if-then-else structures.

- **i)** Write a C program to find the max and min of four numbers using if-else.
- **ii)** Write a C program to generate electricity bill.
- **iii)** Find the roots of the quadratic equation.
- **iv)** Write a C program to simulate a calculator using switch case.
- **v)** Write a C program to find the given year is a leap year or not.

WEEK 6 - Objective: Explore the full scope of iterative constructs namely while loop, do-while loop and for loop in addition to structured jump constructs like break and continue including when each of these statements is more appropriate to use.

Suggested Experiments/Activities:

Tutorial 6: Loops, while and for loops

Lab 6: Iterative problems e.g., the sum of series

- **i)** Find the factorial of given number using any loop.
- **ii)** Find the given number is a prime or not.
- **iii)** Compute sine and cos series
- **iv)** Checking a number palindrome
- **v)** Construct a pyramid of numbers.

UNIT III

WEEK 7 - Objective: Explore the full scope of Arrays construct namely defining and initializing 1-D and 2-D and more generically n-D arrays and referencing individual array elements from the defined array. Using integer 1-D arrays, explore search solution linear search.

Suggested Experiments/Activities:

Tutorial 7: 1 D Arrays: searching.

Lab 7: 1D Array manipulation, linear search

- **i)** Find the min and max of a 1-D integer array.
- **ii)** Perform linear search on1D array.
- **iii)** The reverse of a 1D integer array
- **iv)** Find 2's complement of the given binary number.
- **v)** Eliminate duplicate elements in an array.

WEEK 8 - Objective: Explore the difference between other arrays and character arrays that can be used as Strings by using null character and get comfortable with string by doing experiments that will reverse a string and concatenate two strings. Explore sorting solution bubble sort using integer arrays.

Suggested Experiments/Activities:

Tutorial 8: 2D arrays, sorting and Strings.

Lab 8: Matrix problems, String operations, Bubble sort

- **i)** Addition of two matrices
- **ii)** Multiplication two matrices
- **iii)** Sort array elements using bubble sort
- **iv)** Concatenate two strings without built-in functions
- **v)** Reverse a string using built-in and without built-in string functions

UNIT IV

WEEK 9 - Objective: Explore pointers to manage a dynamic array of integers, including memory allocation & value initialization, resizing changing and reordering the contents of an array and memory de-allocation using malloc (), calloc (), realloc () and free () functions. Gain experience processing command-line arguments received by C

Suggested Experiments/Activities:

Tutorial 9: Pointers, structures and dynamic memory allocation

Lab 9: Pointers and structures, memory dereferences.

- **i)** Write a C program to find the sum of a 1D array using malloc()
- **ii)** Write a C program to find the total, average of n students using structures
- **iii)** Enter n students data using calloc() and display failed students list
- **iv)** Read student name and marks from the command line and display the student details along with the total.
- **v)** Write a C program to implement realloc()

WEEK 10 - Objective: Experiment with C Structures, Unions, bit fields and self-referential structures (Singly linked lists) and nested structures

Suggested Experiments/Activities:

Tutorial 10: Bit fields, Self-Referential Structures, Linked lists

Lab10: Bit fields, linked lists Read and print a date using dd/mm/yyyy format using bit-fields and differentiate the same without using bit- fields

i) Create and display a singly linked list using self-referential structure.
ii) Demonstrate the differences between structures and unions using a C program.
iii) Write a C program to shift/rotate using bit fields.
iv) Write a C program to copy one structure variable to another structure of the same type.

UNIT V

WEEK 11 - Objective: Explore the Functions, sub-routines, scope and extent of variables, doing some experiments by parameter passing using call by value. Basic methods of numerical integration.

Suggested Experiments/Activities:

Tutorial 11: Functions, call by value, scope and extent.

Lab 11: Simple functions using call by value, solving differential equations using Eulers theorem.

i) Write a C function to calculate NCR value.
ii) Write a C function to find the length of a string.
iii) Write a C function to transpose of a matrix.
iv) Write a C function to demonstrate numerical integration of differential equations using Euler's method

WEEK 12 - Objective: Explore how recursive solutions can be programmed by writing recursive functions that can be invoked from the main by programming at-least five distinct problems that have naturally recursive solutions.

Suggested Experiments/Activities:

Tutorial 12: Recursion, the structure of recursive calls

Lab 12: Recursive functions

i) Write a recursive function to generate Fibonacci series.
ii) Write a recursive function to find the LCM of two numbers.
iii) Write a recursive function to find the factorial of a number.
iv) Write a C Program to implement Ackermann function using recursion.
v) Write a recursive function to find the sum of series.

WEEK 13 - Objective: Explore the basic difference between normal and pointer variables, Arithmetic operations using pointers and passing variables to functions using pointers

Suggested Experiments/Activities:

Tutorial 13: Call by reference, dangling pointers

Lab 13: Simple functions using Call by reference, Dangling pointers.

i) Write a C program to swap two numbers using call by reference.
ii) Demonstrate Dangling pointer problem using a C program.
iii) Write a C program to copy one string into another using pointer.
iv) Write a C program to find no of lowercase, uppercase, digits and other characters using pointers.

WEEK 14 - Objective: To understand data files and file handling with various file I/O functions. Explore the differences between text and binary files.

Suggested Experiments/Activities:

Tutorial 14: File handling

Lab 14: File operations

i) Write a C program to write and read text into a file.

ii) Write a C program to write and read text into a binary file using fread() and fwrite()

iii) Copy the contents of one file to another file.

iv) Write a C program to merge two files into the third file using command-line arguments.

v) Find no. of lines, words and characters in a file

vi) Write a C program to print last n characters of a given file.

TEXTBOOKS

1. Ajay Mittal, *Programming in C: A practical approach*, Pearson.
2. Byron Gottfried, *Schaum' s Outline of Programming with C*, McGraw Hill

REFERENCES

1. Brian W. Kernighan and Dennis M. Ritchie, *The C Programming Language*, PrenticeHall of India
2. Forouzan, Gilberg, Prasad, *C Programming, A Problem-Solving Approach*, CENGAGE

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I B.Tech – I Sem.

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(23HS0813) HEALTH AND WELLNESS, YOGA AND SPORTS
(Common to all branches of Engineering)

COURSE OBJECTIVES

The main objective of introducing this course is to make the students maintain their mental and physical wellness by balancing emotions in their life. It mainly enhances the essential traits required for the development of the personality.

COURSE OUTCOMES (COs)

After the completion of the course student should be able to

1. *Understand the importance of yoga and sports for Physical fitness and sound health*
2. *Demonstrate an understanding of health-related fitness components.*
3. *Compare and contrast various activities that help enhance their health.*
4. *Assess current personal fitness levels.*
5. *Develop Positive Personality.*
6. *Apply various activities for holistic development.*

UNIT I

Concept of health and fitness, Nutrition and Balanced diet, basic concept of immunity Relationship between diet and fitness, Globalization and its impact on health, Body Mass Index(BMI) of all age groups.

Activities:

i) Organizing health awareness programmes in community
ii) Preparation of health profile
iii) Preparation of chart for balance diet for all age groups

UNIT II

Concept of yoga, need for and importance of yoga, origin and history of yoga in Indian context, classification of yoga, Physiological effects of Asanas- Pranayama and meditation, stress management and yoga, Mental health and yoga practice.

Activities:

Yoga practices – Asana, Kriya, Mudra, Bandha, Dhyana, Surya Namaskar

UNIT III

Concept of Sports and fitness, importance, fitness components, history of sports, Ancient and Modern Olympics, Asian games and Commonwealth games.

Activities:

i) Participation in one major game and one individual sport viz., Athletics, Volleyball, Basketball, Handball, Football, Badminton, Kabaddi, Kho-kho, Table tennis, Cricket etc.

Practicing general and specific warm up, aerobics

ii) Practicing cardiorespiratory fitness, treadmill, run test, 9 min walk, skipping and running.

REFERENCE BOOKS:

1. Gordon Edlin, Eric Golanty. *Health and Wellness*, 14th Edn. Jones & Bartlett Learning,2022
2. T.K.V.Desikachar. *The Heart of Yoga: Developing a Personal Practice*
3. Archie J.Bahm. *Yoga Sutras of Patanjali*, Jain Publishing Company, 1993
4. Wiseman, John Lofty, *SAS Survival Handbook: The Ultimate Guide to SurvivingAnywhere*, Third Edition, William Morrow Paperbacks, 2014
5. *The Sports Rules Book/ Human Kinetics with Thomas Hanlon.* - 3rd ed. Human Kinetics, Inc.2014

General Guidelines:

1. Institutes must assign slots in the Timetable for the activities of Health/Sports/Yoga.
2. Institutes must provide field/facility and offer the minimum of five choices of as manyas Games/Sports.
3. Institutes are required to provide sports instructor / yoga teacher to mentor the students.

Evaluation Guidelines:

- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totalling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.

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I B.Tech – II Sem.

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(23HS0840) ENGINEERING PHYSICS
(Common to all branches of Engineering)

COURSE OBJECTIVES

The objectives of this course

To bridge the gap between the Physics in school at 10+2 level and UG level engineering courses by identifying the importance of the optical phenomenon like interference, diffraction etc., enlightening the periodic arrangement of atoms in crystalline solids and concepts of quantum mechanics, introduce novel concepts of dielectric and magnetic materials, physics of semiconductors.

COURSE OUTCOMES (COs)

After the completion of the course student should be able to

1. *Analyze the intensity variation of light due to polarization, interference and diffraction.*
2. *Familiarize with the basics of crystals and their structures.*
3. *Explain fundamentals of quantum mechanics and apply it to one dimensional motion of particles.*
4. *Summarize various types of polarization of dielectrics and classify the magnetic materials.*
5. *Explain the basic concepts of Quantum Mechanics and the band theory of solids.*
6. *Identify the type of semiconductor using Hall Effect.*

UNIT – I Wave Optics

Interference: Introduction - Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) & applications - Colours in thin films- Newton's Rings, Determination of wavelength and refractive index.

Diffraction: Introduction - Fresnel and Fraunhofer diffractions - Fraunhofer diffraction due to single slit, double slit & N-slits (Qualitative) – Diffraction Grating - Dispersive power and resolving power of Grating (Qualitative).

Polarization: Introduction -Types of polarization - Polarization by reflection, refraction and Double refraction - Nicol's Prism -Half wave and Quarter wave plates.

UNIT II Crystallography and X-ray diffraction

Crystallography: Space lattice, Basis, Unit Cell and lattice parameters – Bravais Lattices – crystal systems (3D) – coordination number - packing fraction of SC, BCC & FCC - Miller indices – separation between successive (hkl) planes.

X-ray diffraction: Bragg's law - X-ray Diffractometer – crystal structure determination by Laue's and powder methods.

UNIT III Dielectric and Magnetic Materials

Dielectric Materials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility, Dielectric constant and Displacement Vector – Relation between the electric vectors - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field - Clausius- Mossotti equation - complex dielectric constant – Frequency dependence of polarization – dielectric loss

Magnetic Materials: Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability – Atomic origin of magnetism - Classification of magnetic materials: Dia, para, Ferro, anti-ferro & Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials.

UNIT IV Quantum Mechanics and Free electron Theory

Quantum Mechanics: Dual nature of matter – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent and dependent wave equations– Particle in a one-dimensional infinite potential well.

Free Electron Theory: Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory – electrical conductivity based on quantum free electron theory - Fermi-Dirac distribution - Density of states - Fermi energy

UNIT V Semiconductors

Semiconductors: Formation of energy bands – classification of crystalline solids - Intrinsic semiconductors: Density of charge carriers – Electrical conductivity – Fermi level – Extrinsic semiconductors: density of charge carriers – dependence of Fermi energy on carrier concentration and temperature - Drift and diffusion currents – Einstein's equation – Hall effect and its applications

TEXTBOOKS

1. M. N. Avadhanulu, P.G.Kshirsagar & TVS ArunMurthy, *A Text book of Engineering Physics*, S. Chand Publications, 11th Edition 2019.
2. D.K.Bhattacharya and Poonam Tandon, *Engineering Physics*, Oxford press (2015).

REFERENCES

1. B.K. Pandey and S. Chaturvedi, *Engineering Physics*, Cengage Learning 2021.
2. Shatendra Sharma, Jyotsna Sharma, *Engineering Physics*, Pearson Education, 2018.
3. M.R. Srinivasan, *Engineering Physics*, New Age international publishers (2009).

ONLINE LEARNING RESOURCES

1. https://www.loc.gov/rr/scitech/selected-internet/physics.html

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I B.Tech – II Sem.

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(23HS0831) DIFFERENTIAL EQUATIONS & VECTOR CALCULUS
(Common to all branches of Engineering)

COURSE OBJECTIVES
The objectives of this course

1. *To enlighten the learners in the concept of differential equations and multivariable calculus.*
2. *To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real-world applications.*

COURSE OUTCOMES (COs)
After the completion of the course student should be able to

1. *Solve the differential equations related to various engineering fields.*
2. *Create basic application problems described by second order linear differential equations with constant coefficients.*
3. *Understand basic properties of standard partial differential equations.*
4. *Identify solution methods for partial differential equations that model physical processes.*
5. *Interpret the physical meaning of different operators such as gradient, curl and divergence.*
6. *Estimate the work done against a field, circulation and flux using vector calculus.*

UNIT I
Differential equations of first order and first degree

Linear differential equations – Bernoulli's equations- Exact equations and equations reducible to exact form. Applications: Newton's Law of cooling – Law of natural growth and decay- Electrical circuits.

UNIT II
Linear differential equations of higher order (Constant Coefficients)

Definitions, homogenous and non-homogenous, complimentary function, general solution, particular integral, Wronskian, Method of variation of parameters. Simultaneous linear equations, Applications to L-C-R Circuit problems and Simple Harmonic motion.

UNIT III
Partial Differential Equations

Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of first order linear equations using Lagrange's method. Homogeneous Linear Partial differential equations with constant coefficients.

UNIT IV

Vector differentiation

Scalar and vector point functions, vector operator Del, Del applies to scalar point functions-Gradient, Directional derivative, del applied to vector point functions-Divergence and Curl, vector identities.

UNIT V

Vector integration

LWithoutegral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof) and related problems.

TEXT BOOKS

1. B. S. Grewal, *Higher Engineering Mathematics*, Khanna Publishers, 2017, 44th Edition
2. Erwin Kreyszig, *Advanced Engineering Mathematics*, John Wiley & Sons, 2018, 10th Edition.

REFERENCES

1. George B. Thomas, Maurice D. Weir and Joel Hass, *Thomas Calculus*, Pearson Publishers, 2018, 14th Edition.
2. Dennis G. Zill and Warren S. Wright, Jones and Bartlett, *Advanced Engineering Mathematics*, 2018.
3. Glyn James, *Advanced Modern Engineering Mathematics*, Pearson publishers, 2018, 5th Edition.
4. R. K. Jain and S. R. K. Iyengar, *Advanced Engineering Mathematics*, Alpha Science International Ltd., 2021 5th Edition (9th reprint).
5. B. V. Ramana, *Higher Engineering Mathematics*, McGraw Hill Education, 2017.

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I B.Tech –II Sem.

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(23EE0201) BASIC ELECTRICAL AND ELECTRONICS ENGINEERING
(Common to all branches of Engineering)

COURSE OBJECTIVES

The objectives of this course

1. *To expose to the field of electrical & electronics engineering, laws and principles of electrical/ electronic engineering and to acquire fundamental knowledge in the relevant field.*
2. *This course provides the student with the fundamental skills to understand the principles of digital electronics, basics of semiconductor devices like diodes & transistors, characteristics and its applications.*

COURSE OUTCOMES (COs)

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

1. *Remember the fundamental laws, operating principles of motors, generators, MC and MI instruments.*
2. *Understand the problem-solving concepts associated to AC and DC circuits, construction and operation of AC and DC machines, measuring instruments; different power generation mechanisms, Electricity billing concept and important safety measures related to electrical operations*
3. *Apply mathematical tools and fundamental concepts to derive various equations related to machines, circuits and measuring instruments; electricity bill calculations and layout representation of electrical power systems.*
4. *Demonstrate the characteristics by analyzing the behaviour of electronic devices.*
5. *Develop applications using electronic devices.*
6. *Understand the number systems, codes, Boolean algebra, logic gates, and functioning of logic circuits.*

PART A: BASIC ELECTRICAL ENGINEERING

UNIT I DC & AC Circuits

DC Circuits: Electrical circuit elements (R, L and C), Ohm's Law and its limitations, KCL & KVL, series, parallel, series-parallel circuits, Super Position theorem, Simple numerical problems.

AC Circuits: A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor, Voltage and current relationship with phasor diagrams in R, L, and C circuits, Concept of Impedance, Active power, reactive power and apparent power, Concept of power factor (Simple Numerical problems).

UNIT II Machines and Measuring Instruments

Machines: Construction, principle and operation of (i) DC Motor, (ii) DC Generator, (iii) Single Phase Transformer, (iv) Three Phase Induction Motor and (v) Alternator, Applications of electrical machines.

Measuring Instruments: Construction and working principle of Permanent Magnet Moving Coil (PMMC), Moving Iron (MI) Instruments and Wheat Stone bridge.

UNIT III Energy Resources, Electricity Bill & Safety Measures

Energy Resources: Conventional and non-conventional energy resources; Layout and operation of various Power Generation systems: Hydel, Nuclear, Solar & Wind power generation.

Electricity bill: Power rating of household appliances including air conditioners, PCs, Laptops, Printers, etc. Definition of ―unit‖ used for consumption of electrical energy, two- part electricity tariff, calculation of electricity bill for domestic consumers.

Equipment Safety Measures: Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits. Personal safety measures: Electric Shock, Earthing and its types, Safety Precautions to avoid shock.

TEXT BOOKS

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, 2013
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition

REFERENCES

1. D. P. Kothari and I. J. Nagrath, *Basic Electrical Engineering,* Mc Graw Hill, 2019, Fourth Edition
2. V.K. Mehtha, *Principles of Power Systems,* S.Chand Technical Publishers, 2020
3. T. K. Nagsarkar and M. S. Sukhija, *Basic Electrical Engineering,* Oxford University Press, 2017
4. S. K. Bhatacharya, *Basic Electrical and Electronics Engineering,* Person Publications, 2018, Second Edition.

ONLINE LEARNING RESOURCES

1. https://nptel.ac.in/courses/108105053
2. https://nptel.ac.in/courses/108108076

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I B.Tech – II Sem.

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(23ME0302) ENGINEERING GRAPHICS
(Common to all branches of Engineering)

COURSE OBJECTIVES

The objectives of this course is

1. *Enable the students with various concepts like dimensioning, conventions and standards relate to Engineering Drawing*
2. *Impart knowledge on the projection of points, lines and plane surfaces.*
3. *Improve the visualization skills for better understanding of projection of solids.*
4. *Develop the imaginative skills of the students required to understand Section of solids and Developments of surfaces.*
5. *Make the students understand the viewing perception of a solid object in Isometric and Perspective projections.*

COURSE OUTCOMES (COs)

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

1. *Understand the principles of engineering drawing, including engineering curves, scales, orthographic and isometric projections.*
2. *Draw and interpret orthographic projections of points, lines, planes and solids in front, top and side views.*
3. *Understand and draw projection of solids in various positions in first quadrant.*
4. *Elucidate the basic principles of sections of solids and true shapes*
5. *Explain principles behind development of surfaces.*
6. *Prepare isometric and perspective sections of simple solids.*

UNIT I

Introduction: Lines, Lettering and Dimensioning, Geometrical Constructions and Constructing regular polygons by general methods. Curves: construction of ellipse, parabola and hyperbola by general, Cycloids, Involutes, Normal and tangent to Curves. Scales: Plain scales, diagonal scales and vernier scales.

UNIT II

Orthographic Projections: Reference plane, importance of reference lines or Plane, Projections of a point situated in any one of the four quadrants.

Projections of Straight Lines: Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane. Projections of Straight Line Inclined to both the reference planes

Projections of Planes: regular planes Perpendicular to both reference planes, parallel to one reference plane and inclined to the other reference plane; plane inclined to both the reference planes.

UNIT III

Projections of Solids: Types of solids: Polyhedra and Solids of revolution. Projections of solids in **simple positions:** Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane and Axis parallel to both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to another plane.

UNIT IV

Sections of Solids: Perpendicular and inclined section planes, Sectional views and True shape of section, Sections of solids in simple position only.

Development of Surfaces: Methods of Development: Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone.

UNIT V

Conversion of Views: Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

Computer graphics: Creating 2D&3D drawings of objects including PCB and Transformations using Auto CAD (*Not for end examination*).

TEXT BOOK

1. N. D. Bhatt, Engineering Drawing, Charotar Publishing House, 2016.

REFERENCES

1. Engineering Drawing, K.L. Narayana and P. Kannaiah, Tata McGraw Hill, 2013.
2. Engineering Drawing, M.B.Shah and B.C. Rana, Pearson Education Inc, 2009.
3. Engineering Drawing with an Introduction to AutoCAD, Dhananjay Jolhe, Tata McGraw Hill, 2017.

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I B.Tech – II Sem.

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(23CS0503) IT WORKSHOP
(Common to all branches of Engineering)

COURSE OBJECTIVES

The objectives of this course

1. *To introduce the internal parts of a computer, peripherals, I/O ports, connecting cables*
2. *To demonstrate configuring the system as Dual boot both Windows and other Operating Systems Viz. Linux, BOSS*
3. *To teach basic command line interface commands on Linux.*
4. *To teach the usage of Internet for productivity and self-paced life-long learning*
5. *To introduce Compression, Multimedia and Antivirus tools and Office Tools such as Word processors, Spread sheets and Presentation tools.*

COURSE OUTCOMES (COs)

After the completion of the course student should be able to

1. *Perform Hardware troubleshooting.*
2. *Understand Hardware components and inter dependencies.*
3. *Safeguard computer systems from viruses/worms.*
4. *Document/ Presentation preparation.*
5. *Perform calculations using spread sheets.*
6. *Understand and Analyse the concepts of Prompt Engineering, Language Translation and Creative Writing using AI Tools*

LIST OF EXPERIMENTS

PC Hardware & Software Installation

Task 1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

Task 2: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

Task 3: Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

Task 4: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot (VMWare) with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

Task 5: Every student should install BOSS on the computer. The system should be configured as dual boot (VMWare) with both Windows and BOSS. Lab instructors should verify the installation and follow it up with a Viva

Internet & World Wide Web

Task1: Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

Task 2: Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

Task 3: Search Engines & Netiquette: Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.

Task 4: Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

LaTeX and WORD

Task 1: Word Orientation: The mentor needs to give an overview of La TeX and Microsoft (MS) office or equivalent (FOSS) tool word: Importance of La TeX and MS office or equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using La TeXand word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

Task 2: Using La TeX and Word to create a project certificate. Features to be covered:-Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both La TeX and Word.

Task 3: Creating project abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

Task 4: Creating a Newsletter: Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

EXCEL

Excel Orientation: The mentor needs to tell the importance of MS office or equivalent (FOSS) tool Excel as a Spread sheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.

Task 1: Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text

Task 2: Calculating GPA -. Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count

function,

LOOKUP/VLOOKUP

Task 3: Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

POWER POINT

Task 1: Students will be working on basic power point utilities and tools which help them create basic power point presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.

Task 2: Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

Task 3: Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.

AI TOOLS – ChatGPT

Task 1: Prompt Engineering: Experiment with different types of prompts to see how the model responds. Try asking questions, starting conversations, or even providing incomplete sentences to see how the model completes them.

- Ex: Prompt: "You are a knowledgeable AI. Please answer the following question: What is the capital of France?"

Task 2: Creative Writing: Use the model as a writing assistant. Provide the beginning of a story or a description of a scene, and let the model generate the rest of the content. This can be a fun way to brainstorm creative ideas

- Ex: Prompt: "In a world where gravity suddenly stopped working, people started floating upwards. Write a story about how society adapted to this new reality."

Task 3: Language Translation: Experiment with translation tasks by providing a sentence in one language and asking the model to translate it into another language. Compare the output to see how accurate and fluent the translations are.

- Ex: Prompt: "Translate the following English sentence to French: 'Hello, how are you doing today?'"

REFERENCES

1. Vikas Gupta, *Comdex Information Technology course tool kit*, WILEY Dream tech, 2003.
2. Cheryl A Schmidt, *The Complete Computer upgrade and repair book*, WILEY Dream tech, 2013, 3rd edition
3. *Introduction to Information Technology*, ITL Education Solutions limited, Pearson Education, 2012, 2nd edition
4. Kate J. Chase, *PC Hardware - A Handbook*, PHI (Microsoft)
5. Leslie Lamport, *LaTeX Companion*, PHI/Pearson.
6. David Anfins on and Ken Quamme, *IT Essentials PC Hardware and Software Companion Guide*, – CISCO Press, Pearson Education, 3rd edition
7. Patrick Regan, *IT Essentials PC Hardware and Software Labs and Study Guide*, CISCO Press, Pearson Education, 3rd edition.

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I B.Tech – II Sem.

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(23CS0504) DATA STRUCTURES
(Common to CSE, CSIT, CSM, CIC, CAD, CCC & CAI branches)

COURSE OBJECTIVES

1. *To provide the knowledge of basic data structures and their implementations.*
2. *To understand importance of data structures in context of writing efficient programs.*
3. *To develop skills to apply appropriate data structures in problem solving.*

COURSE OUTCOMES (COs)

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

1. *Explain the role of linear data structures in organizing and accessing data efficiently in algorithms.*
2. *Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation.*
3. *Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems.*
4. *Apply queue-based algorithms for efficient task scheduling and breadth-first traversal in graphs and distinguish between deques and priority queues, and apply them appropriately to solve data management challenges.*
5. *Devise novel solutions to small scale programming challenges involving data structures such as stacks, queues, Trees.*
6. *Recognize scenarios where hashing is advantageous, and design hash-based solutions for specific problems.*

UNIT - I

Introduction to Linear Data Structures: Definition and importance of linear data structures, Abstract data types (ADTs) and their implementation, Overview of time and space complexity analysis for linear data structures.

Searching Techniques: Linear & Binary Search.

Sorting Techniques: Bubble sort, Selection sort, Insertion Sort

UNIT - II

Linked Lists: Singly linked lists: representation and operations, doubly linked lists and circular linked lists, Comparing arrays and linked lists, Applications of linked lists.

UNIT III

Stacks: Introduction to stacks: properties and operations, implementing stacks using arrays and linked lists, Applications of stacks in expression evaluation, backtracking, reversing list etc.

UNIT IV

Queues: Introduction to queues: properties and operations, implementing queues using arrays and linked lists, Applications of queues in breadth-first search, scheduling, etc.

Deques: Introduction to deques (double-ended queues), Operations on deques and their applications.

UNIT V

Trees: Introduction to Trees, Binary Search Tree – Insertion, Deletion & Traversal, AVL Trees

Graphs: Definition – Representation of Graph – Types of graph - Breadth-first traversal - Depth-first traversal – Applications of graphs.

TEXTBOOKS

1. Mark Allen Weiss, *Data Structures and algorithm analysis in C*, Pearson, 2nd Edition.
2. Reema Thareja **–***Data Structures using C,*Third Edition,Oxford University,2023

REFERENCES

1. Kurt Mehlhorn and Peter Sanders, *Algorithms and Data Structures: The Basic Toolbox*
2. Alfred V. Aho, Jeffrey D. Ullman, and John E. Hopcroft, *C Data Structures and Algorithms.*
3. Brad Miller and David Ranum, *Problem Solving with Algorithms and Data Structures.*
4. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, *Introduction to Algorithms.,*
5. Robert Sedgewick, *Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures, Sorting, Searching, and Graph Algorithms*

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I B.Tech – II Sem.

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(23HS0841) ENGINEERING PHYSICS LAB
(Common to all branches of Engineering)

COURSE OBJECTIVES

The objectives of this course

To study the concepts of optical phenomenon like interference, diffraction etc., recognize the importance of energy gap in the study of conductivity and Hall effect in semiconductors and study the parameters and applications of dielectric and magnetic materials by conducting experiments.

COURSE OUTCOMES (COs)

After the completion of the course student should be able to

1. *Operate optical instruments like travelling microscope and spectrometer.*
2. *Estimate the wavelengths of different colours using diffraction grating.*
3. *Plot the intensity of the magnetic field of circular coil carrying current with distance.*
4. *Evaluate dielectric constant and magnetic susceptibility for dielectric and magnetic materials respectively.*
5. *Calculate the band gap of a given semiconductor*
6. *Identify the type of semiconductor using Hall Effect.*

LIST OF EXPERIMENTS

1. Determination of radius of curvature of a given Plano-convex lens by Newton's rings.
2. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
3. Verification of Brewster's law
4. Determination of dielectric constant using charging and discharging method.
5. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
6. Determination of wavelength of Laser light using diffraction grating.
7. Estimation of Planck's constant using photoelectric effect.
8. Determination of the resistivity of semiconductors by four probe methods.
9. Determination of energy gap of a semiconductor using p-n junction diode.
10. Magnetic field along the axis of a current carrying circular coil by Stewart Gee's Method.
11. Determination of Hall voltage and Hall coefficient of a given semiconductor using HallEffect.
12. Determination of temperature coefficients of a thermistor.
13. Determination of acceleration due to gravity and radius of Gyration by using a compound pendulum.
14. Determination of magnetic susceptibility by Kundt's tube method.
15. Determination of rigidity modulus of the material of the given wire using Torsional

pendulum.

16. Sonometer: Verification of laws of stretched string.
17. Determination of young's modulus for the given material of wooden scale by non-uniform bending (or double cantilever) method.
18. Determination of Frequency of electrically maintained tuning fork by Melde's experiment.

Note: Any **TEN** of the listed experiments are to be conducted. Out of which any TWO experiments may be conducted in virtual mode.

REFERENCES

1. S. Balasubramanian, M.N. Srinivasan, *A Textbook of Practical Physics*, S. Chand Publishers, 2017.

ONLINE LEARNING RESOURCES

1. www.vlab.co.in
2. https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype

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I B.Tech – II Sem.

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(23EE0202) ELECTRICAL AND ELECTRONICS ENGINEERING WORKSHOP
(Common to all branches of Engineering)

Course Objectives:

To impart knowledge on the fundamental laws & theorems of electrical circuits, functions of electrical machines and energy calculations.

Course Outcomes:

1. *Understand the Electrical circuit design concept; measurement of resistance, power, power factor; concept of wiring and operation of Electrical Machines and Transformer.* usage *of electronic measuring instruments.*
2. *Apply the theoretical concepts and operating principles to derive mathematical models for circuits, Electrical machines and measuring instruments; calculations for the measurement of resistance, power and power factor.*
3. *Apply the theoretical concepts to obtain calculations for the measurement of resistance, power and power factor.*
4. *Demonstrate knowledge of different electronic devices and measuring instruments.*
5. *Plot and discuss the characteristics and applications of various electron devices.*
6. *Verify the functions of logic gates and flip-flops.*

Activities:

1. Familiarization of commonly used Electrical & Electronic Workshop Tools: Bread board, Solder, cables, relays, switches, connectors, fuses, Cutter, plier, screwdriver set, wire stripper, flux, knife/blade, soldering iron, de-soldering pump etc.
   - Provide some exercises so that hardware tools and instruments are learned to be used by the students.

2. Familiarization of Measuring Instruments like Voltmeters, Ammeters, multimeter, LCR-Q meter, Power Supplies, CRO, DSO, Function Generator, Frequency counter.
   - Provide some exercises so that measuring instruments are learned to be used by the students.

3. Components:
   - Familiarization/Identification of components (Resistors, Capacitors, Inductors, Diodes, transistors, IC's etc.) – Functionality, type, size, colour coding package, symbol, cost etc.
   - Testing of components like Resistor, Capacitor, Diode, Transistor, ICs etc. - Compare values of components like resistors, inductors, capacitors etc with the measured values by using instruments

PART A: ELECTRICAL ENGINEERING LAB

LIST OF EXPERIMENTS

1. Verification of KCL and KVL
2. Verification of Superposition theorem
3. Measurement of Resistance using Wheat stone bridge
4. Magnetization Characteristics of DC shunt Generator
5. Measurement of Power and Power factor using Single-phase wattmeter
6. Measurement of Earth Resistance using Megger
7. Calculation of Electrical Energy for Domestic Premises

REFERENCE BOOKS

1. D. C. Kulshreshtha, *Basic Electrical Engineering*, Tata McGraw Hill, 2019, First Edition
2. P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, *Power System Engineering*, Dhanpat Rai & Co, 2013
3. Rajendra Prasad, *Fundamentals of Electrical Engineering*, PHI publishers, 2014, Third Edition

Note: Minimum Six Experiments to be performed.

PART B: ELECTRONICS ENGINEERING LAB

LIST OF EXPERIMENTS

1. Plot V-I characteristics of PN Junction diode A) Forward bias B) Reverse bias.
2. Plot V – I characteristics of Zener Diode and its application as voltage Regulator.
3. Implementation of half wave and full wave rectifiers
4. Plot Input & Output characteristics of BJT in CE and CB configurations
5. Frequency response of CE amplifier.
6. Simulation of RC coupled amplifier with the design supplied
7. Verification of Truth Table of AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gates using ICs.
8. Verification of Truth Tables of S-R, J-K& D flip flops using respective ICs.

Tools / Equipment Required: DC Power supplies, Multi meters, DC Ammeters, DC Voltmeters, AC Voltmeters, CROs, all the required active devices.

REFERENCES

1. R. L. Boylestad & Louis Nashlesky, *Electronic Devices & Circuit Theory*, Pearson Education, 2021.
2. R. P. Jain, *Modern Digital Electronics*, 4th Edition, Tata Mc Graw Hill, 2009
3. R. T. Paynter, *Introductory Electronic Devices & Circuits – Conventional Flow Version*, Pearson Education, 2009.

Note: Minimum Six Experiments to be performed. All the experiments shall be implemented using both Hardware and Software

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(23CS0505) DATA STRUCTURES LAB

COURSE OBJECTIVES

The objectives of this course

1. *The course aims to strengthen the ability of the students to identify and apply the suitable data structure for the given real-world problem.*
2. *It enables them to gain knowledge in practical applications of data structures.*

COURSE OUTCOMES (COs)

After the completion of the course student should be able to

1. *Explain the role of linear data structures in organizing and accessing data efficiently in algorithms.*
2. *Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation.*
3. *Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems.*
4. *Apply queue-based algorithms for efficient task scheduling and breadth-first traversal in graphs and distinguish between deques and priority queues and apply them appropriately to solve data management challenges.*
5. *Implement the concepts of Binary Search Trees in Linked List*
6. *Recognize scenarios where hashing is advantageous, and design hash-based solutions for specific problems.*

LIST OF EXPERIMENTS:

Exercise 1: Array Manipulation

i) Write a program to reverse an array.
ii) C Programs to implement the Searching Techniques – Linear & Binary Search
iii) C Programs to implement Sorting Techniques – Bubble, Selection and Insertion Sort

Exercise 2: Linked List Implementation

i) Implement a singly linked list and perform insertion and deletion operations.
ii) Develop a program to reverse a linked list iteratively and recursively.
iii) Solve problems involving linked list traversal and manipulation.

Exercise 3: Linked List Applications

i) Create a program to detect and remove duplicates from a linked list.
ii) Implement a linked list to represent polynomials and perform addition.
iii) Implement a double-ended queue (deque) with essential operations.

Exercise 4: Double Linked List Implementation

i) Implement a doubly linked list and perform various operations to understand its properties and applications.
ii) Implement a circular linked list and perform insertion, deletion, and traversal.

Exercise 5: Stack Operations

i) Implement a stack using arrays and linked lists.
ii) Write a program to evaluate a postfix expression using a stack.
iii) Implement a program to check for balanced parentheses using a stack.

Exercise 6: Queue Operations

i) Implement a queue using arrays and linked lists.
ii) Develop a program to simulate a simple printer queue system.
iii) Solve problems involving circular queues.

Exercise 7: Stack and Queue Applications

i) Use a stack to evaluate an infix expression and convert it to postfix.
ii) Create a program to determine whether a given string is a palindrome or not.
iii) Implement a stack or queue to perform comparison and check for symmetry.

Exercise 8: Binary Search Tree

i) Implementing a BST using Linked List.
ii) Traversing of BST.

Exercise 9: Graph

i) Write a program for finding the Depth First Search of a graph.
ii) Write a program for finding the Breadth First Search of a graph.

TEXTBOOKS

2. Mark Allen Weiss, *Data Structures and algorithm analysis in C,* Pearson, 2nd Edition.
3. Ellis Horowitz, Sartaj Sahni, Susan Anderson Freed, *Fundamentals of data structures in C*, Silicon Press, 2008

REFERENCES

1. Kurt Mehlhorn and Peter Sanders, *Algorithms and Data Structures: The Basic Toolbox,*
2. Alfred V. Aho, Jeffrey D. Ullman, and John E. Hopcroft, *C Data Structures and Algorithms.*
3. Brad Miller and David Ranum, *Problem Solving with Algorithms and Data Structures*.
4. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, *Introduction to Algorithms.,*
5. Robert Sedgewick, *Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures, Sorting, Searching, and Graph Algorithms.*

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(23HS0812) NSS/NCC/SCOUTS & GUIDES/COMMUNITY SERVICE
(Common to all branches of Engineering)

COURSE OBJECTIVES

The objective of introducing this course is to impart discipline, character, fraternity, teamwork, social consciousness among the students and engaging them in selfless service.

COURSE OUTCOMES (COs)

After the completion of the course student should be able to

1. *Understand the importance of discipline, character and service motto.*
2. *Solve some societal issues by applying acquired knowledge, facts, and techniques.*
3. *Explore human relationships by analyzing social problems.*
4. *Determine to extend their help for the fellow beings and downtrodden people.*
5. *Develop leadership skills and civic responsibilities.*
6. *Focus on awareness programmes that build community service*

UNIT I

Orientation

General Orientation on NSS/NCC/ Scouts & Guides/Community Service activities, career guidance.

Activities:

i) Conducting –ice breaking sessions-expectations from the course-knowing personal talents and skills
ii) Conducting orientations programs for the students –future plans-activities-releasing road map etc.
iii) Displaying success stories-motivational biopics- award winning movies on societal issues etc.
iv) Conducting talent show in singing patriotic songs-paintings- any other contribution.

UNIT II

Nature & Care

Activities:

i) Best out of waste competition.
ii) Poster and signs making competition to spread environmental awareness.
iii) Recycling and environmental pollution article writing competition.
iv) Organising Zero-waste day.
v) Digital Environmental awareness activity via various social media platforms.
vi) Virtual demonstration of different eco-friendly approaches for sustainable living.
vii) Write a summary on any book related to environmental issues.

UNIT III

Community Service

Activities:

i) Conducting One Day Special Camp in a village contacting village-area leaders-Survey in the village, identification of problems- helping them to solve via media-authorities-experts-etc.
ii) Conducting awareness programs on Health-related issues such as General Health, Mental health, Spiritual Health, HIV/AIDS,
iii) Conducting consumer Awareness. Explaining various legal provisions etc.
iv) Women Empowerment Programmes- Sexual Abuse, Adolescent Health and Population Education.
v) Any other programmes in collaboration with local charities, NGOs etc.

REFERENCE BOOKS

1. Nirmalya Kumar Sinha & Surajit Majumder, *A Text Book of National Service Scheme*
   Vol;.I, Vidya Kutir Publication, 2021 (ISBN 978-81-952368-8-6)
2. *Red Book - National Cadet Corps* – Standing Instructions Vol I & II, DirectorateGeneral of NCC, Ministry of Defence, New Delhi
3. Davis M. L. and Cornwell D. A., –Introduction to Environmental Engineering‖, McGraw Hill, New York 4/e 2008
4. Masters G. M., Joseph K. and Nagendran R. –Introduction to Environmental Engineering and Science‖, Pearson Education, New Delhi. 2/e 2007
5. Ram Ahuja. *Social Problems in India*, Rawat Publications, New Delhi.

General Guidelines:

1. Institutes must assign slots in the Timetable for the activities.
2. Institutes are required to provide instructor to mentor the students.

Evaluation Guidelines:

- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totalling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)

II B.Tech – I Sem.

L	T	P	C
3	0	0	3

(23HS0836) DISCRETE MATHEMATICS & GRAPH THEORY
(Common to All Branches of Engineering)

COURSE OBJECTIVES

The objectives of this course

1. *To enable students to understand the fundamentals of set, relation and recurrence relation.*
2. *To enable students to understand the fundamental concepts of graph theory and its applications in computer science.*

COURSE OUTCOMES (COs)

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

1. *Apply mathematical logic to solve problems.*
2. *Understand the concepts and perform the operations related to sets, relations and functions. Gain the conceptual background needed and identify structures of algebraic nature.*
3. *Apply basic counting techniques to solve combinatorial problems.*
4. *Formulate problems and solve Binomial, Multinomial problems*
5. *Formulate problems and solve recurrence relations.*
6. *Apply Graph Theory in solving computer science problems*

UNIT - I

Mathematical Logic:

Introduction, Statements and Notation, Connectives, Well-formed formulas, Tautology, Duality law, Equivalence, Implication, Normal Forms, Functionally complete set of connectives, Inference Theory of Statement Calculus, Predicate Calculus, Inference theory of Predicate Calculus.

UNIT - II

Set theory:

The Principle of Inclusion- Exclusion, Pigeon hole principle and its application, Functions composition of functions, Inverse Functions, Recursive Functions, Lattices and its properties. Algebraic structures: Algebraic systems-Examples and General Properties, Semi groups and Monoids, groups, sub groups, homomorphism, Isomorphism.

UNIT III

Elementary Combinatorics:

Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with Repetitions, Enumerating Permutations with Constrained Repetitions, Binomial Coefficients, The Binomial and Multinomial Theorems.

UNIT IV

Recurrence Relations

Generating Functions of Sequences, Calculating Coefficients of Generating Functions, Recurrence relations, Solving Recurrence Relations by Substitution and Generating functions, The Method of Characteristic roots, Solutions of Inhomogeneous, Recurrence Relations.

UNIT V

Graphs

Basic Concepts, Isomorphism and Subgraphs, Trees and their Properties, Spanning Trees, Directed Trees, Binary Trees, Planar Graphs, Euler's Formula, Multigraphs and Euler Circuits, Hamiltonian Graphs.

TEXTBOOKS

1. J.P. Tremblay and R. Manohar, *Discrete Mathematical Structures with Applications to Computer Science*,Tata McGrawHill,2002.
2. Kenneth H.Rosen, *Discrete Mathematics and its Applications with Combinatorics and GraphTheory*,7thEdition,McGraw Hill Education(India)Private Limited.

REFERENCES

1. JoeL.Mott, Abraham Kandel and The odore P.Baker, *Discrete Mathematics for Computer Scientists & Mathematicians*,2nd Edition, Pearson Education.
2. Narsingh Deo, *Graph Theory with Applications to Engineering and Computer Science.*

ONLINE LEARNING RESOURCES

1. http://www.cs.yale.edu/homes/aspnes/classes/202/notes.pdf

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II B.Tech – I Sem.

L	T	P	C
2	1	0	3

(23HS0814) UNIVERSAL HUMAN VALUES UNDERSTANDING HARMONY& ETHICAL HUMAN CONDUCT
(Common to All Branches of Engineering)

COURSE OBJECTIVES

The objectives of this course

1. *To help the students appreciate the essential complementary between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.*
2. *To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.*
3. *To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.*

COURSE OUTCOMES (COs)

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

1. *Define the terms like Natural Acceptance, Happiness and Prosperity*
2. *Identify oneself, and one's surroundings (family, society nature)*
3. *Apply what they have learnt to their own self in different day-to-day settings in real life*
4. *Relate human values with human relationship and human society.*
5. *Justify the need for universal human values and harmonious existence*
6. *Develop as socially and ecologically responsible engineers*

Course Topics

The course has 28 lectures and 14 tutorials in 5 modules. The lectures and tutorials are of 1-hour duration. Tutorial sessions are to be used to explore and practice what has been proposed during the lecture sessions. The Teacher's Manual provides the outline for lectures as well as practice sessions. The teacher is expected to present the issues to be discussed as propositions and encourage the students to have a dialogue.

UNIT - I

Introduction to Value Education (6 lectures and 3 tutorials for practice session)

Lecture 1: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)

Lecture 2: Understanding Value Education

Tutorial 1: Practice Session PS1 Sharing about Oneself

Lecture 3: self-exploration as the Process for Value Education

Lecture4: Continuous Happiness and Prosperity – the Basic Human Aspirations

Tutorial 2: Practice Session PS2 Exploring Human Consciousness
Lecture 5: Happiness and Prosperity – Current Scenario
Lecture 6: Method to Fulfill the Basic Human Aspirations
Tutorial 3: Practice Session PS3 Exploring Natural Acceptance

UNIT - II
Harmony in the Human Being (6 lectures and 3 tutorials for practice session)
Lecture 7: Understanding Human being as the Co-existence of the self and the body.
Lecture 8: Distinguishing between the Needs of the self and the body
Tutorial 4: Practice Session PS4 Exploring the difference of Needs of self and body.
Lecture 9: The body as an Instrument of the self
Lecture 10: Understanding Harmony in the self
Tutorial 5: Practice Session PS5 Exploring Sources of Imagination in the self
Lecture 11: Harmony of the self with the body
Lecture 12: Programme to ensure self-regulation and Health
Tutorial 6: Practice Session PS6 Exploring Harmony of self with the body

UNIT III
Harmony in the Family and Society (6 lectures and 3 tutorials for practice session)
Lecture 13: Harmony in the Family – the Basic Unit of Human Interaction
Lecture 14: 'Trust' – the Foundational Value in Relationship
Tutorial 7: Practice Session PS7 Exploring the Feeling of Trust
Lecture 15: 'Respect' – as the Right Evaluation
Tutorial 8: Practice Session PS8 Exploring the Feeling of Respect
Lecture 16: Other Feelings, Justice in Human-to-Human Relationship
Lecture 17: Understanding Harmony in the Society
Lecture 18: Vision for the Universal Human Order
Tutorial 9: Practice Session PS9 Exploring Systems to fulfil Human Goal

UNIT IV
Harmony in the Nature/Existence (4 lectures and 2 tutorials for practice session)
Lecture 19: Understanding Harmony in the Nature
Lecture 20: Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature
Tutorial 10: Practice Session PS10 Exploring the Four Orders of Nature
Lecture 21: Realizing Existence as Co-existence at All Levels
Lecture 22: The Holistic Perception of Harmony in Existence
Tutorial 11: Practice Session PS11 Exploring Co-existence in Existence

UNIT V
Implications of the Holistic Understanding – a Look at Professional Ethics (6 lectures and 3 tutorials for practice session)
Lecture 23: Natural Acceptance of Human Values
Lecture 24: Definitiveness of (Ethical) Human Conduct
Tutorial 12: Practice Session PS12 Exploring Ethical Human Conduct
Lecture 25: A Basis for Humanistic Education, Humanistic Constitution and Universal

Human Order
Lecture 26: Competence in Professional Ethics
Tutorial 13: Practice Session PS13 Exploring Humanistic Models in Education
Lecture 27: Holistic Technologies, Production Systems and Management Models-Typical Case Studies
Lecture 28: Strategies for Transition towards Value-based Life and Profession
Tutorial 14: Practice Session PS14 Exploring Steps of Transition towards Universal Human Order

Practice Sessions for UNIT I – Introduction to Value Education
PS1 Sharing about Oneself
PS2 Exploring Human Consciousness
PS3 Exploring Natural Acceptance
Practice Sessions for UNIT II – Harmony in the Human Being
PS4 Exploring the difference of Needs of self and body
PS5 Exploring Sources of Imagination in the self
PS6 Exploring Harmony of self with the body
Practice Sessions for UNIT III – Harmony in the Family and Society
PS7 Exploring the Feeling of Trust
PS8 Exploring the Feeling of Respect
PS9 Exploring Systems to fulfil Human Goal
Practice Sessions for UNIT IV – Harmony in the Nature (Existence)
PS10 Exploring the Four Orders of Nature
PS11 Exploring Co-existence in Existence
Practice Sessions for UNIT V – Implications of the Holistic Understanding – a Look at Professional Ethics
PS12 Exploring Ethical Human Conduct
PS13 Exploring Humanistic Models in Education
PS14 Exploring Steps of Transition towards Universal Human Order

TEXTBOOKS

1. R R Gaur, R Asthana, G P Bagaria, *A Foundation Course in Human Values and Professional Ethics,* 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2. R R Gaur, R Asthana, G P Bagaria,*Teachers' Manual for A Foundation Course in Human Values and Professional Ethics*, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

REFERENCES

1. *JeevanVidya: EkParichaya,* A Nagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
2. *Human Values,* A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. *The Story of Stuff (Book).*
4. *The Story of My Experiments with Truth* - by Mohandas Karamchand Gandhi
5. *Small is Beautiful* - E. F Schumacher.
6. *Slow is Beautiful* - Cecile Andrews
7. *Economy of Permanence* - J C Kumarappa

8. *Bharat Mein Angreji Raj* – PanditSunderlal
9. *Rediscovering India* - by Dharampal
10. *Hind Swaraj or Indian Home Rule* - by Mohandas K. Gandhi
11. *India Wins Freedom* - Maulana Abdul Kalam Azad
12. *Vivekananda* - Romain Rolland (English)
13. *Gandhi* - Romain Rolland (English)

Mode of Conduct:

Lecture hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them. Tutorial hours are to be used for practice sessions. While analyzing and discussing the topic, the faculty mentor's role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements. In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self-exploration.

Scenarios may be used to initiate discussion. The student is encouraged to take up "ordinary" situations rather than" extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting. Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practical are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignment and/or activity are included. The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values.

It is recommended that this content be placed before the student as it is, in the form of a basic foundation course, without including anything else or excluding any part of this content. Additional content may be offered in separate, higher courses. This course is to be taught by faculty from every teaching department, not exclusively by any one department. Teacher preparation with a minimum exposure to at least one 8-day Faculty Development Program on Universal Human Values is deemed essential.

ONLINE LEARNING RESOURCES

1. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%201-Introduction%20to%20Value%20Education.pdf
2. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%202-Harmony%20in%20the%20Human%20Being.pdf
3. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%203-Harmony%20in%20the%20Family.pdf
4. https://fdp-si.aicte-india.org/UHV%201%20Teaching%20Material/D3-S2%20Respect%20July%2023.pdf
5. https://fdp-si.aicte-india.org/UHV-

II%20Class%20Notes%20&%20Handouts/UHV%20Handout%205-Harmony%20in%20the%20Nature%20and%20Existence.pdf

6. https://fdp-si.aicte-india.org/download/FDPTeachingMaterial/3-days%20FDP-SI%20UHV%20Teaching%20Material/Day%203%20Handouts/UHV%203D%20D3-
7. S2A%20Und%20Nature-Existence.pdf
8. https://fdp-si.aicte-india.org/UHV%20II%20Teaching%20Material/UHV%20II%20Lecture%2023-25%20Ethics%20v1.pdf
9. https://www.studocu.com/in/document/kiet-group-of-institutions/universal-human-values/chapter-5-holistic-understanding-of-harmony-on-professional-ethics/62490385
10. https://onlinecourses.swayam2.ac.in/aic22_ge23/preview

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II B.Tech – I Sem.

L	T	P	C
3	0	0	3

(23CS0901) PRINCIPLES OF ARTIFICIAL INTELLIGENCE
(**Common to CSM & CAI)**

COURSE OBJECTIVES

The objectives of this course

1. *The student should be made to study the concepts of Artificial Intelligence.*
2. *The student should be made to learn the methods of solving problems using Artificial Intelligence.*
3. *The student should be made to introduce the concepts of Expert Systems.*
4. *To understand the applications of AI, namely game playing, theorem proving, and machine learning.*
5. *To learn different knowledge representation techniques*

COURSE OUTCOMES (COs)

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

1. *Understand foundations of AI and history*
2. *Illustrate various searching algorithms*
3. *Describe knowledge representation issue and predicate logic*
4. *Explain Reasoning under uncertainty and review of probability*
5. *Understand various logic concepts*
6. *Describe Architecture of expert systems and Roles of expert systems*

UNIT - I

Introduction: AI problems, foundation of AI and history of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation.

UNIT - II

Searching- Searching for solutions, uniformed search strategies – Breadth first search, depth first Search. Search with partial information (Heuristic search) Hill climbing, A* ,AO* Algorithms, Problem reduction, Game Playing-Adversial search, Games, mini-max algorithm, optimal decisions in multiplayer games, Problem in Game playing, Alpha-Beta pruning, Evaluation functions.

UNIT III

Representation of Knowledge: Knowledge representation issues, predicate logic- logic programming, semantic nets- frames and inheritance, constraint propagation, representing knowledge using rules, rules based deduction systems. Reasoning under uncertainty, review of probability, Bayes' probabilistic interferences and dempstershafer theory.

UNIT IV

Logic concepts: First order logic. Inference in first order logic, propositional vs. first order inference, unification & lifts forward chaining, Backward chaining, Resolution, Learning from observation Inductive learning, Decision trees, Explanation based learning, Statistical Learning methods, Reinforcement Learning.

UNIT V

Expert Systems: Architecture of expert systems, Roles of expert systems – Knowledge Acquisition Meta knowledge Heuristics. Typical expert systems – MYCIN, DART, XCON: Expert systems shells.

TEXTBOOKS

1. S. Russel and P. Norvig, *Artificial Intelligence – A Modern Approach*, 2nd Edition, Pearson Education.
2. Kevin Night and Elaine Rich, Nair B., *Artificial Intelligence* (SIE), Mc Graw Hill

REFERENCES

1. David Poole, Alan Mackworth, Randy Goebel,"*Computational Intelligence: a logical approach*", Oxford University Press.
2. G. Luger, "*Artificial Intelligence: Structures and Strategies for complex problem solving*", Fourth Edition, Pearson Education.
3. J. Nilsson, "*Artificial Intelligence: A new Synthesis*", Elsevier Publishers.
4. *Artificial Intelligence*, SarojKaushik, CENGAGE Learning.

ONLINE LEARNING RESOURCES

1. https://ai.google/
2. https://swayam.gov.in/nd1_noc19_me71/preview

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II B.Tech – I Sem.

L	T	P	C
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(23CS0507) ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS
(Common to CSE, CSIT & CSE allied branches)

COURSE OBJECTIVES

The objectives of this course

1. *provide knowledge on advance data structures frequently used in Computer Science domain*
2. *Develop skills in algorithm design techniques popularly used*
3. *Understand the use of various data structures in the algorithm design*

COURSE OUTCOMES (COs)

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

1. *Illustrate the working of the advanced tree data structures and their applications.*
2. *Understand the Graph data structure, traversals and apply them in various contexts.*
3. *Use various data structures in the design of algorithms.*
4. *Analyze the efficiency of Greedy and Dynamic Programming design techniques to solve the optimization problems.*
5. *Recommend appropriate data structures based on the problem being solved.*
6. *Analyze algorithms with respect to space and time complexities.*

UNIT - I

Introduction: Introduction to Algorithm Analysis, Space and Time Complexity analysis, Asymptotic Notations.

AVL Trees: Creation, Insertion, Deletion operations and Applications

B-Trees: Creation, Insertion, Deletion operations and Applications

UNIT - II

Heap Trees (Priority Queues): Min and Max Heaps, Operations and Applications

Graphs: Terminology, Representations, Basic Search and Traversals, Connected Components and Biconnected Components, applications

Divide and Conquer: The General Method, Quick Sort, Merge Sort, Strassen's matrix multiplication, Convex Hull

UNIT III

Greedy Method: General Method, Job Sequencing with deadlines, Knapsack Problem, Minimum cost spanning trees, Single Source Shortest Paths

Dynamic Programming: General Method, All pairs shortest paths, Single Source Shortest Paths– General Weights (Bellman Ford Algorithm), Optimal Binary Search Trees, 0/1 Knapsack, String Editing, Travelling Salesperson problem

UNIT IV

Backtracking: General Method, 8-Queens Problem, Sum of Subsets problem, Graph Coloring, 0/1 Knapsack Problem

Branch and Bound: The General Method, 0/1 Knapsack Problem, Travelling Salesperson problem

UNIT V

NP Hard and NP Complete Problems: Basic Concepts, Cook's theorem

NP Hard Graph Problems: Clique Decision Problem (CDP), Chromatic Number Decision Problem (CNDP), Traveling Salesperson Decision Problem (TSP)

NP Hard Scheduling Problems: Scheduling Identical Processors, Job Shop Scheduling

TEXTBOOKS

1. Horowitz, Ellis; Sahni, Sartaj; Mehta, Dinesh, *Fundamentals of Data Structures in C++*, 2ndEdition Universities Press
2. Ellis Horowitz, SartajSahni, Sanguthevar Rajasekaran, *Computer Algorithms in C++*, 2nd Edition University Press

REFERENCES

1. Robert Kruse, *Data Structures and program design in C*, Pearson Education Asia
2. Trembley & Sorenson, *An introduction to Data Structures with applications*, McGraw Hill
3. Donald E Knuth, *The Art of Computer Programming, Vol.1: Fundamental Algorithms*, Addison-Wesley, 1997.
4. Langsam, Augenstein &Tanenbaum, *Data Structures using C & C++*, Pearson, 1995
5. N.Wirth, *Algorithms + Data Structures & Programs*, PHI
6. Horowitz Sahni & Mehta, *Fundamentals of Data Structures in C++*, Galgottia Pub.
7. Thomas Standish, *Data structures in Java*,Pearson Education Asia

ONLINE LEARNING RESOURCES

1. *https://www.tutorialspoint.com/advanced_data_structures/index.asp*
2. *http://peterindia.net/Algorithms.html*
3. *https://www.youtube.com/playlist?list=PLDN4rrl48XKpZkf03iYFl-O29szjTrs_O*

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II B.Tech – I Sem.

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(23CS0508) OBJECT ORIENTED PROGRAMMING THROUGH JAVA
(Common to CSE, CSIT & CSE allied branches)

COURSE OBJECTIVES

The objectives of this course

1. *Identify Java language components and how they work together in applications*
2. *Learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.*
3. *Learn how to extend Java classes with inheritance and dynamic binding and how to use exception handling in Java applications*
4. *Understand how to design applications with threads in Java*
5. *Understand how to use Java APIs for program development*

COURSE OUTCOMES (COs)

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

1. *Understand the Java language components for implementing control statements.*
2. *Apply the concepts of OOP's fundamentals like classes, Methods and class libraries to develop applications*
3. *Apply the concepts of arrays, inheritance develop efficient java applications.*
4. *Analyze the interfaces for implementing multiple inheritance.*
5. *Evaluate the concepts of packages, file I/O, by using access control, and exception handling mechanisms to solve real world scenarios*
6. *Create the GUI applications by using concepts like multi-threading, Java FX, JDBC*

UNIT - I

Object Oriented Programming: Basic concepts, Principles

Program Structure in Java: Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style.

Data Types, Variables, and Operators: Introduction, Data Types in Java, Declaration of Variables, Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, Attribute Final, Introduction to Operators, Precedence and Associativity of Operators, Assignment Operator (=), Basic Arithmetic Operators, Increment (++) and Decrement (- -) Operators, Ternary Operator, Relational Operators, Boolean Logical Operators, Bitwise Logical Operators.

Control Statements: Introduction, if Expression, Nested if Expressions, if–else Expressions, Ternary Operator?:, Switch Statement, Iteration Statements, while Expression, do–while Loop, for Loop, Nested for Loop, For–Each for Loop, Break Statement, Continue Statement.

UNIT - II

Classes and Objects: Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class

Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods, Passing Arguments by Value and by Reference, Keyword this.

Methods: Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Overriding Methods, Attributes Final and Static.

UNIT III

Arrays: Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays, Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Three-dimensional Arrays, Arrays as Vectors.

Inheritance: Introduction, Process of Inheritance, Types of Inheritances, Universal Super Class-Object Class, Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Inheritance.

Interfaces: Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations.

UNIT IV

Packages and Java Library: Introduction, Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE, Java.lang Package and its Classes, Class Object, Enumeration, class Math, Wrapper Classes, Auto-boxing and Auto-unboxing, Java util Classes and Interfaces, Formatter Class, Random Class, Time Package, Class Instant (java.time.Instant), Formatting for Date/Time in Java, Temporal Adjusters Class, Temporal Adjusters Class.

Exception Handling: Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throwable, Unchecked Exceptions, Checked Exceptions.

Java I/O and File: Java I/O API, standard I/O streams, types, Byte streams, Character streams, Scanner class, Files in Java.

UNIT V

String Handling in Java: Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings,Comparison, Modifying, Searching; Class String Buffer.

Multithreaded Programming: Introduction, Need for Multiple Threads Multithreaded Programming for Multi-core Processor, Thread Class, Main Thread-Creation of New Threads, Thread States, Thread Priority-Synchronization, Deadlock and Race Situations, Inter-thread Communication - Suspending, Resuming, and Stopping of Threads.

Java Database Connectivity: Introduction, JDBC Architecture, Installing MySQL and MySQL Connector/J, JDBC Environment Setup, Establishing JDBC Database Connections, ResultSet Interface

Java FX GUI: Java FX Scene Builder, Java FX App Window Structure, displaying text and image, event handling, laying out nodes in scene graph, mouse events

TEXTBOOKS

1. Anitha Seth, B.L.Juneja, *JAVA one step ahead*, Oxford.
2. DebasisSamanta, MonalisaSarma, *Joy with JAVA, Fundamentals of Object Oriented Programming*, Cambridge, 2023.
3. Paul Deitel, Harvey Deitel, *JAVA for Programmers*, 4th Edition, Pearson.

REFERENCES

1. The complete Reference Java, 11thedition, Herbert Schildt, TMH
2. Introduction to Java programming, 7th Edition, Y Daniel Liang, Pearson

ONLINE LEARNING RESOURCES

1. https://nptel.ac.in/courses/106/105/106105191/
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012880464547618816347_shared/overview

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II B.Tech – I Sem.

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(23CS0509) ADVANCED DATA STRUCTURES & ALGORITHM ANALYSIS LAB
(Common to CSE, CSIT & CSE allied branches)

COURSE OBJECTIVES

The objectives of this course

1. *acquire practical skills in constructing and managing Data structures*
2. *apply the popular algorithm design methods in problem-solving scenarios*

COURSE OUTCOMES (COs)

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

1. *Design and develop programs to solve real world problems with the popular algorithm design methods.*
2. *Demonstrate an understanding of Non-Linear data structures by developing implementing the operations on AVL Trees, B-Trees, Heaps and Graphs.*
3. *Relate the mathematical criterion for deciding whether an algorithm is efficient, and know many practically important problems that do not admit any efficient algorithms.*
4. *Critically assess the design choices and implementation strategies of algorithms and data structures in complex applications.*
5. *Utilize appropriate data structures and algorithms to optimize solutions for specific computational problems.*
6. *Compare the performance of different of algorithm design strategies*

EXPERIMENTS COVERING THE TOPICS:

- Operations on AVL trees, B-Trees, Heap Trees
- Graph Traversals
- Sorting techniques
- Finding Biconnected components in a graph
- Shortest path algorithms using greedy Method
- 0/1 Knapsack Problem using Dynamic Programming and Backtracking
- Travelling Salesperson problem using Branch and Bound
- N-Queens Problem using Backtracking
- Job Sequencing using Branch and Bound

Sample Programs:

1. Construct an AVL tree for a given set of elements which are stored in a file. And implement insert and delete operation on the constructed tree. Write contents of tree into a new file using in-order.
2. Construct B-Tree an order of 5 with a set of 100 random elements stored in array. Implement searching, insertion and deletion operations.
3. Construct Min and Max Heap using arrays, delete any element and display the content of the Heap.
4. Implement BFT and DFT for given graph, when graph is represented by

a) Adjacency Matrix b) Adjacency Lists

5. Write a program for finding the biconnected components in a given graph.
6. Implement Quick sort and Merge sort and observe the execution time for various input sizes (Average, Worst and Best cases).
7. Compare the performance of Single Source Shortest Paths using Greedy method when the graph is represented by adjacency matrix and adjacency lists.
8. Implement Job Sequencing with deadlines using Greedy strategy.
9. Write a program to solve 0/1 Knapsack problem Using Dynamic Programming.
10. Implement N-Queens Problem Using Backtracking.
11. Use Backtracking strategy to solve 0/1 Knapsack problem.
12. Implement Travelling Sales Person problem using Branch and Bound approach.

REFERENCES

1. Horowitz Ellis, SahniSartaj, Mehta, Dinesh, *Fundamentals of Data Structures in C++*, 2nd Edition, Universities Press
2. Ellis Horowitz, SartajSahni, Sanguthevar Rajasekaran, *Computer Algorithms/C++*, 2ndEdition, University Press
3. Robert Kruse, *Data Structures and program design in C*, Pearson Education Asia
4. Trembley& Sorenson, *An introduction to Data Structures with applications*, McGraw Hill

ONLINE LEARNING RESOURCES

1. http://cse01-iiith.vlabs.ac.in/
2. http://peterindia.net/Algorithms.html

(23CS0510) OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB
(Common to CSE, CSIT & CSE allied branches)

COURSE OBJECTIVES

The objectives of this course

1. *Practice object-oriented programming in the Java programming language*
2. *Implement Classes, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism*
3. *Illustrate inheritance, Exception handling mechanism, JDBC connectivity*
4. *Construct Threads, Event Handling, implement packages, Java FX GUI*

COURSE OUTCOMES (COs)

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

1. *Demonstrate a solid understanding of Java syntax, including data types, control structures, methods, classes, objects, inheritance, polymorphism, and exception handling.*
2. *Apply fundamental OOP principles such as encapsulation, inheritance, polymorphism, and abstraction to solve programming problems effectively.*
3. *Familiar with commonly used Java libraries and APIs, including the Collections Framework, Java I/O, JDBC, and other utility classes.*
4. *Identify and fix defects and common security issues in code.*
5. *Develop problem-solving skills and algorithmic thinking, applying OOP concepts to design efficient solutions to various programming challenges.*
6. *Proficiently construct graphical user interface (GUI) applications using JavaFX*

Experiments covering the Topics:

- Object Oriented Programming fundamentals- data types, control structures
- Classes, methods, objects, Inheritance, polymorphism,
- Exception handling, Threads, Packages, Interfaces
- Files, I/O streams, JavaFX GUI

Sample Programs:

Exercise – 1:

a) Write a JAVA program to display default value of all primitive data type of JAVA

b) Write a java program that display the roots of a quadratic equation ax2+bx=0. Calculate the discriminate D and basing on value of D, describe the nature of root.

Exercise - 2

a) Write a JAVA program to search for an element in a given list of elements using binary search mechanism.

b) Write a JAVA program to sort for an element in a given list of elements using bubble sort

c) Write a JAVA program using String Buffer to delete, remove character.

Exercise - 3

a) Write a JAVA program to implement class mechanism. Create a class, methods and invoke them inside main method.
b) Write a JAVA program implement method overloading.
c) Write a JAVA program to implement constructor.
d) Write a JAVA program to implement constructor overloading.

Exercise - 4
a) Write a JAVA program to implement Single Inheritance
b) Write a JAVA program to implement multi level Inheritance
c) Write a JAVA program for abstract class to find areas of different shapes

Exercise - 5
a) Write a JAVA program give example for "super" keyword.
b) Write a JAVA program to implement Interface. What kind of Inheritance can be achieved?
c) Write a JAVA program that implements Runtime polymorphism

Exercise - 6
a) Write a JAVA program that describes exception handling mechanism
b) Write a JAVA program Illustrating Multiple catch clauses
c) Write a JAVA program for creation of Java Built-in Exceptions
d) Write a JAVA program for creation of User Defined Exception

Exercise - 7
a) Write a JAVA program that creates threads by extending Thread class.First thread display "Good Morning "every 1 sec, the second thread displays "Hello "every 2 seconds and the third display "Welcome" every 3 seconds,(Repeat the same by implementing Runnable)
b) Write a program illustrating is Alive and join ()
c) Write a Program illustrating Daemon Threads.
d) Write a JAVA program Producer Consumer Problem

Exercise – 8
a) Write a JAVA program that import and use the user defined packages
b) Without writing any code, build a GUI that display text in label and image in an ImageView (use JavaFX)
c) Build a Tip Calculator app using several JavaFX components and learn how to respond to user interactions with the GUI

REFERENCES
1. P. J. Deitel, H. M. Deitel, *Java for Programmers*, Pearson Education, PHI, 4th Edition, 2007.
2. P. Radha Krishna, *Object Oriented Programming through Java*, Universities Press, 2nd Edition, 2007
3. Bruce Eckel, *Thinking in Java*, Pearson Education, 4th Edition, 2006.
4. Sachin Malhotra, Saurabh Chaudhary, *Programming in Java*, Oxford University Press, 5th Edition, 2010.

ONLINE LEARNING RESOURCES

1. https://java-iitd.vlabs.ac.in/
2. http://peterindia.net/JavaFiles.html

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II B.Tech – I Sem.

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(23CS0549) PYTHON PROGRAMMING
(Skill Enhancement Course)

(Common to All Branches of Engineering)

COURSE OBJECTIVES

The objectives of this course

1. *Introduce core programming concepts of Python programming language.*
2. *Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries*
3. *Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications using these*

COURSE OUTCOMES (COs)

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

1. *Showcase adept command of Python syntax, deftly utilizing variables, data types, control structures, functions, modules, and exception handling to engineer robust and efficient code solutions.*
2. *Apply Python programming concepts to solve a variety of computational problems*
3. *Understand the principles of object-oriented programming (OOP) in Python, including classes, objects, inheritance, polymorphism, and encapsulation, and apply them to design and implement Python programs*
4. *Acquire the skills in different operators and statements in python*
5. *Become proficient in using commonly used Python libraries and frameworks such as JSON, XML, NumPy, pandas*
6. *Exhibit competence in implementing and manipulating fundamental data structures such as lists, tuples, sets, dictionaries*

UNIT - I

History of Python Programming Language, Thrust Areas of Python, Installing Anaconda Python Distribution, Installing and Using Jupyter Notebook.

Parts of Python Programming Language: Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data Types, Indentation, Comments, Reading Input, Print Output, Type Conversions, the type () Function and Is Operator, Dynamic and Strongly Typed Language.

Control Flow Statements: if statement, if-else statement, if...elif…else, Nested if statement, while Loop, for Loop, continue and break Statements, Catching Exceptions Using try and except Statement.

Sample Experiments:

1. Write a program to find the largest element among three Numbers.
2. Write a Program to display all prime numbers within an interval
3. Write a program to swap two numbers without using a temporary variable.
4. Demonstrate the following Operators in Python with suitable examples.

i) Arithmetic Operators ii) Relational Operators iii) Assignment Operatorsiv) Logical Operators v) Bit wise Operators vi) Ternary Operator vii) Membership Operatorsviii) Identity Operators

5. Write a program to add and multiply complex numbers
6. Write a program to print multiplication table of a given number.

UNIT - II

Functions: Built-In Functions, Commonly Used Modules, Function Definition and Calling the function, return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments.

Strings: Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings.

Lists: Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, del Statement.

Sample Experiments:

7. Write a program to define a function with multiple return values.
8. Write a program to define a function using default arguments.
9. Write a program to find the length of the string without using any library functions.
10. Write a program to check if the substring is present in a given string or not.
11. Write a program to perform the given operations on a list:
    i. addition ii. Insertion iii. slicing
12. Write a program to perform any 5 built-in functions by taking any list.

UNIT III

Dictionaries: Creating Dictionary, Accessing and Modifying key:value Pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary Methods, del Statement.

Tuples and Sets: Creating Tuples, Basic Tuple Operations, tuple() Function, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Using zip() Function, Sets, Set Methods, Frozenset.

Sample Experiments:

13. Write a program to create tuples (name, age, address, college) for at least two members and concatenate the tuples and print the concatenated tuples.
14. Write a program to count the number of vowels in a string (No control flow allowed).
15. Write a program to check if a given key exists in a dictionary or not.
16. Write a program to add a new key-value pair to an existing dictionary.
17. Write a program to sum all the items in a given dictionary.

UNIT IV

Files: Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, Pickle Module, Reading and Writing CSV Files, Python os and os.path Modules.

Object-Oriented Programming: Classes and Objects, Creating Classes in Python, Creating Objects in Python, Constructor Method, Classes with Multiple Objects, Class Attributes Vs Data Attributes, Encapsulation, Inheritance, Polymorphism.

Sample Experiments:

18. Write a program to sort words in a file and put them in another file. The output file

should have only lower-case words, so any upper-case words from source must be lowered.

19. Python program to print each line of a file in reverse order.
20. Python program to compute the number of characters, words and lines in a file.
21. Write a program to create, display, append, insert and reverse the order of the items in the array.
22. Write a program to add, transpose and multiply two matrices.
23. Write a Python program to create a class that represents a shape. Include methods to calculate its area and perimeter. Implement subclasses for different shapes like circle, triangle, and square.

UNIT V

Introduction to Data Science: Functional Programming, JSON and XML in Python, NumPy with Python, Pandas.

Sample Experiments:

24. Python program to check whether a JSON string contains complex object or not.
25. Python Program to demonstrate NumPy arrays creation using array () function.
26. Python program to demonstrate use of ndim, shape, size, dtype.
27. Python program to demonstrate basic slicing, integer and Boolean indexing.
28. Python program to find min, max, sum, cumulative sum of array
29. Create a dictionary with at least five keys and each key represent value as a list where this list contains at least ten values and convert this dictionary as a pandas data frame and explore the data through the data frame as follows:

a) Apply head () function to the pandas data frame
b) Perform various data selection operations on Data Frame

30. Select any two columns from the above data frame, and observe the change in one attribute with respect to other attribute with scatter and plot operations in matplotlib

REFERENCES

1. Gowrishankar S, Veena A., *Introduction to Python Programming*, CRC Press.
2. S Sridhar, J Indumathi, V M Hariharan, *Python Programming*, 2ndEdition, Pearson, 2024
3. Y. Daniel Liang, *Introduction to Programming Using Python*, Pearson.

ONLINE LEARNING RESOURCES

1. https://www.coursera.org/learn/python-for-applied-data-science-ai
2. https://www.coursera.org/learn/python?specialization=python#syllabus

(23HS0805) ENVIRONMENTAL SCIENCE
(Common to All Branches of Engineering)

COURSE OBJECTIVES

The objectives of this course

1. *To make the students to get awareness on environment.*
2. *To understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day to day activities of human life.*
3. *To save earth from the inventions by the engineers.*

COURSE OUTCOMES (COs)

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

1. *To make the students to get awareness about the environment.*
2. *To understand the importance of protecting natural ecosystems for future.*
3. *To understand the various types of pollutions and its causes.*
4. *To understand the various engineering techniques to protect the environment.*
5. *To make awareness about social issues and laws of environmental protection.*
6. *To understand the concept of sustainable development and role of engineering Technology in environment and human health.*

UNIT - I

Multidisciplinary Nature of Environmental Studies: Definition, Scope and Importance – Need for Public Awareness.

Natural Resources: Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources.

UNIT - II

Ecosystems: Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem.

b. Grassland ecosystem

c. Desert ecosystem.

d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity and its Conservation : Introduction, Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-sports of biodiversity – Threats to **biodiversity**: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of

biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT III

Environmental Pollution: Definition, Cause, effects and control measures of :

a. Air Pollution.
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

Solid Waste Management: Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

UNIT IV

Social Issues and the Environment: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies.

Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

UNIT V

Human Population and the Environment: Population growth, variation among nations. Population explosion – Family Welfare Programmes. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

Field Work: Visit to a local area to document environmental assets River/forest grassland/hill/ mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc.

TEXTBOOKS

1. Erach Bharucha for University Grants Commission, *Text book of Environmental Studies for Undergraduate Courses*, Universities Press.
2. Palaniswamy, *Environmental Studies*, Pearson education
3. S. Azeem Unnisa, *Environmental Studies* Academic Publishing Company
4. K. Raghavan Nambiar, *Text book of Environmental Studies* for Undergraduate Courses as per UGC model syllabus, Scitech Publications (India), Pvt. Ltd.

REFERENCES

1. Deeksha Dave and E.Sai Baba Reddy, *Textbook of Environmental Science*,

Cengage Publications.
2. M.Anji Reddy, *Text book of Environmental Sciences and Technology*, BS Publication.
3. J.P.Sharma, *Comprehensive Environmental studies*, Laxmi publications.
4. J. Glynn Henry and Gary W. Heinke, *Environmental Sciences and Engineering*, Prentice hall of India Private limited
5. G.R.Chatwal, *A Text Book of Environmental Studies*, Himalaya Publishing House
6. Gilbert M. Masters and Wendell P. Ela, *Introduction to Environmental Engineering and Science*, Prentice hall of India Private limited

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II B.Tech – II Sem.

L	T	P	C
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(23HS0848) MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

(Common to All Branches of Engineering)

COURSE OBJECTIVES:

The objectives of this course

1. *To inculcate the basic knowledge of microeconomics and financial accounting*
2. *To make the students learn how demand is estimated for different products, input-output relationship for optimizing production and cost*
3. *To Know the Various types of market structure and pricing methods and strategy*
4. *To give an overview on investment appraisal methods to promote the students to learn how to plan long-term investment decisions.*
5. *To provide fundamental skills on accounting and to explain the process of preparing financial statements.*

COURSE OUTCOMES (COs)

On successful completion of this course, students will be able to

1. *Understand the nature of managerial economics and the role of it in business firms.(L1, L2)*
2. *Identify the determinants of demand and apply cost analysis under different market conditions.(L2,L3)*
3. *Integrate the concepts of price and output decisions of business firms.(L6)*
4. *Appreciate the importance of market structures and implement appropriate price and output decisions.(L2)*
5. *Assess the financial statements of a firm and the financial performance of the firm through the financial statements.(l5)*
6. *Measure operating, investing and financial performance of a firm.(L5)*

UNIT-I

Managerial Economics: Introduction – Nature, meaning, significance, functions, and advantages. Demand-Concept, Function, Law of Demand - Demand Elasticity- Types – Measurement. Demand Forecasting- Factors governing Forecasting, Methods. Managerial Economics and Financial Accounting and Management.

UNIT-II

Production and Cost Analysis: Introduction – Nature, meaning, significance, functions and advantages. Production Function– Least- cost combination– Short run and long run Production Function- Isoquants and Is costs, Cost & Break-Even Analysis - Cost concepts and Cost behaviour-Break-Even Analysis (BEA) - Determination of Break-Even Point (Simple Problems).

UNIT-III

Business Organizations and Markets: Introduction – Forms of Business Organizations- Sole Proprietary - Partnership - Joint Stock Companies - Public Sector Enterprises. Types of Markets - Perfect and Imperfect Competition - Features of Perfect Competition Monopoly- Monopolistic Competition– Oligopoly-Price-Output Determination - Pricing Methods and Strategies

UNIT-IV

Capital Budgeting: Introduction – Nature, meaning, significance. Types of Working Capital, Components, Sources of Short-term and Long-term Capital, Estimating Working capital requirements. Capital Budgeting– Features, Proposals, Methods and Evaluation. Projects – Pay Back Method, Accounting Rate of Return (ARR) Net Present Value (NPV) Internal Rate Return (IRR) Method (sample problems)

UNIT-V

Financial Accounting and Analysis: Introduction – Concepts and Conventions- Double-Entry Bookkeeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). Introduction to Financial Analysis - Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability.

TEXTBOOKS

1. Varshney & Maheswari: Managerial Economics, Sultan Chand.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH.

REFERENCES

1. Ahuja Hl Managerial economics Schand.
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi.
4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage.

Online Learning Resources:

https://www.slideshare.net/123ps/managerial-economics-ppt
https://www.slideshare.net/rossanz/production-and-cost-45827016
https://www.slideshare.net/darkyla/business-organizations-19917607
https://www.slideshare.net/balarajbl/market-and-classification-of-market
https://www.slideshare.net/ruchi101/capital-budgeting-ppt-59565396
https://www.slideshare.net/ashu1983/financial-accounting

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II B.Tech – II Sem.

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(23HS0839) STATISTICAL METHODS FOR DATA SCIENCE

COURSE OBJECTIVES:

1. *To provide students with the foundations of probabilistic and statistical analysis mostly used in varied applications in engineering and science like disease modeling, climate prediction and computer networks etc.*
2. *To train the students thoroughly in Mathematical concepts fundamentals of probability, test of hypothesis, Test of significance.*

COURSE OUTCOMES:

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

1. *Understand the basic concepts of Statistics.*
2. *Analyze the data and draw conclusion about collection of data under study using Point estimation*
3. *Analyze data and draw conclusion about collection of data under study using Interval estimation.*
4. *Use statistical reasoning, formulate a problem in statistical terms, perform exploratory analysis of data and carry out a variety of formal inference procedures*
5. *Analyze to test various hypotheses included in theory and types of errors for large samples.*
6. *Apply the different testing tools like t-test, F-test, chi-square test to analyze the relevant real life problems.*

UNIT I

Basic Concepts: Random variables (discrete and continuous), probability density functions, properties, mathematical expectation. Probability distributions: Binomial, Poisson and Normal-their properties. Population, sample, parameter and statistic; characteristics of a good estimator; Consistency – Invariance property of Consistent estimator, Sufficient condition for consistency; Unbiasedness; Sufficiency.

UNIT II

Point Estimation: Point Estimation- Estimator, Estimate, Methods of point estimation – Maximum likelihood method (the asymptotic properties of ML estimators are not included), Large sample properties of ML estimator (without proof)- applications, Method of moments, method of least squares, method of minimum chi-square and modified minimum chi-square-Asymptotic Maximum Likelihood Estimation and applications.

UNIT III

Interval Estimation: Confidence limits and confidence coefficient; Duality between acceptance region of a test and a confidence interval; Construction of confidence intervals for population proportion (small and large samples) and between two population proportions(large samples); Confidence intervals for mean and variance of a normal population; Difference between the mean and ratio of two normal populations.

UNIT IV

Testing of hypotheses: Types of errors, power of a test, most powerful tests; Neyman-Pearson Fundamental Lemma and its applications; Notion of Uniformly most powerful tests; Likelihood Ratio tests: Description and property of LR tests - Application to standard distributions.

UNIT V

Small sample tests: Student's t-test, test for a population mean, equality of two population means, paired t-test, F- test for equality of two population variances, Chi-square test for goodness of fit and test for independence of attributes, $\chi 2$ test for testing variance of a normal distribution.

TEXTBOOKS:

1. Miller and Freunds, Probability and Statistics for Engineers,7/e, Pearson, 2008.
2. Manoj Kumar Srivastava and Namita Srivastava, Statistical Inference – Testing of Hypotheses, Prentice Hall of India, 2014

REFERENCE BOOKS:

1. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.
2. S. Ross, a First Course in Probability, Pearson Education India, 2002.
3. W. Feller, an Introduction to Probability Theory and its Applications, 1/e, Wiley, 1968.
4. Robert V Hogg, Elliot A Tannis and Dale L.Zimmerman, Probability and Statistical Inference, 9th edition, Pearson publishers, 2013.

ONLINE LEARNING RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc21_ma74/preview
2. https://onlinecourses.nptel.ac.in/noc22_mg31/preview

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II B.Tech – II Sem.

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(23CS0902) MACHINE LEARNING
(Common to CSM & CAI)

COURSE OBJECTIVES

The objectives of this course

1. *Define machine learning and its different types (supervised and unsupervised) and understand their applications.*
2. *Apply supervised learning algorithms including decision trees and k-nearest neighbors (k-NN).*
3. *Implement unsupervised learning techniques, such as K-means clustering.*

COURSE OUTCOMES (COs)

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

1. *Identify machine learning techniques suitable for a given problem.*
2. *Solve real-world problems using various machine learning techniques.*
3. *Apply Dimensionality reduction techniques for data pre-processing.*
4. *Apply classification techniques for data processing*
5. *Explain what is learning and why it is essential in the design of intelligent machines.*
6. *Evaluate Advanced learning models for language, vision, speech, decision making etc.*

UNIT - I

Introduction to Machine Learning: Evolution of Machine Learning, Paradigms for ML, Learning by Rote, Learning by Induction, Reinforcement Learning, Types of Data, Matching, Stages in Machine Learning, Data Acquisition, Feature Engineering, Data Representation, Model Selection, Model Learning, Model Evaluation, Model Prediction, Search and Learning, Data Sets.

UNIT - II

Nearest Neighbor-Based Models: Introduction to Proximity Measures, Distance Measures, Non-Metric Similarity Functions, Proximity Between Binary Patterns, Different Classification Algorithms Based on the Distance Measures ,K-Nearest Neighbor Classifier, Radius Distance Nearest Neighbor Algorithm, KNN Regression, Performance of Classifiers, Performance of Regression Algorithms.

UNIT III

Models Based on Decision Trees: Decision Trees for Classification, Impurity Measures, Properties, Regression Based on Decision Trees, Bias–Variance Trade-off, Random Forests for Classification and Regression.

The Bayes Classifier: Introduction to the Bayes Classifier, Bayes' Rule and Inference, The Bayes Classifier and its Optimality, Multi-Class Classification | Class Conditional Independence and Naive Bayes Classifier (NBC)

UNIT IV

Linear Discriminants for Machine Learning: Introduction to Linear Discriminants, Linear Discriminants for Classification, Perceptron Classifier, Perceptron Learning Algorithm, Support Vector Machines, Linearly Non-Separable Case, Non-linear SVM, Kernel Trick, Logistic Regression, Linear Regression, Multi-Layer Perceptrons (MLPs), Backpropagation for Training an MLP.

UNIT V

Clustering: Introduction to Clustering, Partitioning of Data, Matrix Factorization | Clustering of Patterns, Divisive Clustering, Agglomerative Clustering, Partitional Clustering, K-Means Clustering, Soft Partitioning, Soft Clustering, Fuzzy C-Means Clustering, Rough Clustering, Rough K-Means Clustering Algorithm, Expectation Maximization-Based Clustering, Spectral Clustering.

TEXTBOOK

1. M N Murthy, V S Ananthanarayana, *Machine Learning Theory and Practice* Universities Press (India), 2024

REFERENCES

1. Tom M. Mitchell, *Machine Learning*, McGraw-Hill Publication, 2017
2. Peter Harrington, *Machine Learning in Action*, DreamTech
3. Pang-Ning Tan, Michel Stenbach, Vipin Kumar, *Introduction to Data Mining*, 7th Edition, 2019.

ONLINE LEARNING RESOURCES

1. https://nptel.ac.in/courses/106/106/106106144/
2. http://peterindia.net/OperatingSystems.html

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II B.Tech – II Sem.

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(23CS0512) DATABASE MANAGEMENT SYSTEMS
(Common to all CSE & CSE allied branches)

COURSE OBJECTIVES

The objectives of this course

1. *Introduce database management systems and to give a good formal foundation on the relational model of data and usage of Relational Algebra*
2. *Introduce the concepts of basic SQL as a universal Database language*
3. *Demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization*
4. *Provide an overview of physical design of a database system, by discussing Database indexing techniques and storage techniques*

COURSE OUTCOMES (COs)

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

1. *Understand the basic concepts of database management systems*
2. *Analyze a given database application scenario to use ER model for conceptual design of the database*
3. *Develop relational algebra expressions to query and optimize the database using SQL*
4. *Utilize SQL proficiently to address diverse query challenges*
5. *Employ normalization methods to enhance database structure*
6. *Assess and implement transaction processing, concurrency control and database recovery protocols in databases.*

UNIT - I

Introduction: Database system, Characteristics (Database Vs File System), Database Users, Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized and Client Server architecture for the database.

Entity Relationship Model: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams.

UNIT - II

Relational Model: Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance, Relational Algebra, Relational Calculus. BASIC SQL:Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update).

UNIT III

SQL: Basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions(Date and Time, Numeric, String conversion).Creating tables with relationship, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, view(updatable and non-updatable), relational set operations.

UNIT IV

Schema Refinement (Normalization): Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependencyLossless join and dependency preserving decomposition, (1NF, 2NF and 3 NF), concept of surrogate key, Boyce-Codd normal form(BCNF), MVD, Fourth normal form(4NF), Fifth Normal Form (5NF).

UNIT V

Transaction Concept: Transaction State, ACID properties, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability, lock based, time stamp based, optimistic, concurrency protocols, Deadlocks, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm.

Introduction to Indexing Techniques: B+ Trees, operations on B+Trees, Hash Based Indexing.

TEXTBOOKS

1. Raghurama Krishnan, Johannes Gehrke, Database Management Systems, TMH 3rd edition, (For Chapters 2, 3, 4)
2. Database System Concepts,5th edition, Silberschatz, Korth, Sudarsan,TMH (For Chapter 1 and Chapter 5)

REFERENCES

1. Robert Kruse, *Data Structures and program design in C*, Pearson Education Asia
2. Trembley & Sorenson, *An introduction to Data Structures with applications*, McGraw Hill
3. Donald E Knuth, Addison-Wesley, *The Art of Computer Programming*, Vol.1: Fundamental Algorithms, 1997.
4. Langsam, Augenstein & Tanenbaum, *Data Structures using C & C++:* Pearson, 1995
5. N.Wirth, *Algorithms + Data Structures & Programs*, PHI
6. Horowitz Sahni & Mehta, *Fundamentals of Data Structures in C++*, Galgottia Pub.
7. Thomas Standish, *Data structures in Java*, Pearson Education Asia
8. C J Date, *Introduction to Database Systems*, 8th edition, Pearson.
9. RamezElmasri, Shamkant B. Navathe, *Database Management System* 6th edition Pearson

ONLINE LEARNING RESOURCES

1. https://nptel.ac.in/courses/106/105/106105175/
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012758066672820 22456_shared/overview

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II B.Tech – II Sem.

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(23CS0506) DIGITAL LOGIC AND COMPUTER ORGANIZATION
(Common to all CSE & CSE allied branches)

COURSE OBJECTIVES

The objectives of this course

1. *Provide students with a comprehensive understanding of digital logic design principles and computer organization fundamentals*
2. *Describe memory hierarchy concepts*
3. *Explain input/output (I/O) systems and their interaction with the CPU, memory, and peripheral devices*

COURSE OUTCOMES (COs)

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

1. *Differentiate between combinational and sequential circuits based on their characteristics and functionalities.*
2. *Demonstrate an understanding of computer functional units.*
3. *Analyze the design and operation of processors, including instruction execution, pipelining, and control unit mechanisms, to comprehend their role in computer systems.*
4. *Demonstrate Hardwired Control and Multi programmed Control Units*
5. *Describe memory hierarchy concepts, including cache memory, virtual memory, and secondary storage, and evaluate their impact on system performance and scalability.*
6. *Explain input/output (I/O) systems and their interaction with the CPU, memory, and peripheral devices, including interrupts, DMA, and I/O mapping techniques.*

UNIT - I

Data Representation: Binary Numbers, Fixed Point Representation. Floating Point Representation. Number base conversions, Octal and Hexadecimal Numbers, components, Signed binary numbers, Binary codes

Digital Logic Circuits-I: Basic Logic Functions, Logic gates, universal logic gates, Minimization of Logic expressions. K-Map Simplification, Combinational Circuits, Decoders, Multiplexers

UNIT - II

Digital Logic Circuits-II: Sequential Circuits, Flip-Flops, Binary counters, Registers, Shift Registers, Ripple counters

Basic Structure of Computers: Computer Types, Functional units, Basic operational concepts, Bus structures, Software, Performance, multiprocessors and multi computers, Computer Generations, Von- Neumann Architecture

UNIT III

Computer Arithmetic: Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers, Signed-operand Multiplication, Fast Multiplication, Integer Division, Floating-Point Numbers and Operations

Processor Organization: Fundamental Concepts, Execution of a Complete Instruction, Multiple-Bus Organization, Hardwired Control and Multi programmed Control

UNIT IV

The Memory Organization: Basic Concepts, Semiconductor RAM Memories, Read-Only Memories, Speed, Size and Cost, Cache Memories, Performance Considerations, Virtual Memories, Memory Management Requirements, Secondary Storage

UNIT V

Input / Output Organization: Accessing I/O Devices, Interrupts, Processor Examples, Direct Memory Access, Buses, Interface Circuits, Standard I/O Interfaces

TEXTBOOKS

1. Carl Hamacher, ZvonkoVranesic, SafwatZaky, *Computer Organization*, 6th edition, McGraw Hill
2. M. Morris Mano, *Digital Design,* 6th Edition, Pearson Education.

REFERENCES

1. William Stallings, *Computer Organization and Architecture,* 11thEdition, Pearson.
2. M.Moris Mano, *Computer Systems Architecture,* 3rdEdition, Pearson
3. David A. Paterson, John L.Hennessy, *Computer Organization and Design*, Elsevier
4. Roth, *Fundamentals of Logic Design*, 5thEdition, Thomson

ONLINE LEARNING RESOURCES

1. https://nptel.ac.in/courses/106/103/106103068/

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(23CS0903) ARTIFICIAL INTELLIGENCE & MACHINE LEARNING LAB
(Common to all CSE & CAI)

COURSE OBJECTIVES

The objectives of this course

1. *The student should be made to study the concepts of Artificial Intelligence.*
2. *The student should be made to learn the methods of solving problems using AI*
3. *The student should be made to introduce the concepts of Expert Systems and Machine Learning.*
4. *To learn about computing central tendency measures and Data pre-processing techniques*
5. *To learn about classification and regression algorithms*
6. *To apply different clustering algorithms for a problem.*

COURSE OUTCOMES (COs)

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

1. *Understand the Mathematical and statistical prospective of machine learning algorithms through python programming*
2. *Appreciate the importance of visualization in the data analytics solution*
3. *Derive insights using Machine learning algorithms*
4. *Evaluate and demonstrate AI and ML algorithms*
5. *Evaluate different algorithms*

Software Required for ML: Python/R/Weka

List of Experiments

1. Pandas Library
   a. Write a python program to implement Pandas Series with labels.
   b. Create a Pandas Series from a dictionary.
   c. Creating a Pandas Data Frame.
   d. Write a program which makes use of the following Pandas methods
   i) describe () ii) head () iii) tail () iv) info ()
2. Pandas Library: Visualization
   a. Write a program which use pandas inbuilt visualization to plot following graphs:
   i) Bar plots ii) Histograms iii) Line plots iv) Scatter plots
3. Write a Program to Implement Breadth First Search using Python.
4. Write a program to implement Best First Searching Algorithm
5. Write a Program to Implement Depth First Search using Python.
6. Write a program to implement the Heuristic Search
7. Write a python program to implement A* and AO* algorithm. (Ex: find the shortest path)
8. Apply the following Pre-processing techniques for a given dataset.
   a. Attribute selection

b. Handling Missing Values
c. Discretization
d. Elimination of Outliers

9. Apply KNN algorithm for classification and regression
10. Demonstrate decision tree algorithm for a classification problem and perform parameter tuning for better results
11. Apply Random Forest algorithm for classification and regression
12. Demonstrate Naïve Bayes Classification algorithm.
13. Apply Support Vector algorithm for classification
14. Implement the K-means algorithm and apply it to the data you selected. Evaluate performance by measuring the sum of the Euclidean distance of each example from its class center. Test the performance of the algorithm as a function of the parameters K.

REFERENCES

1. Stuart J. Russell and Peter Norvig, *Artificial Intelligence A Modern Approach*, 4th Edition, Pearson, 2020
2. Martin C. Brown (Author), *Python: The Complete Reference*, McGraw Hill Education, Fourth edition, 2018
3. R. NageswaraRao , *Core Python Programming*, Dreamtech Press India Pvt Ltd 2018.
4. Tom M. Mitchell, *Machine Learning*, McGraw-Hill Publication, 2017
5. Peter Harrington, *Machine Learning in Action*, DreamTech
6. Pang-Ning Tan, Michel Stenbach, Vipin Kumar, *Introduction to Data Mining*,7th Edition, 2019.

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(23CS0515) DATABASE MANAGEMENT SYSTEMS LAB
(Common to All CSE & CSE Allied branches)

COURSE OBJECTIVES

The objectives of this course

1. *Populate and query a database using SQL DDL/DML Commands*
2. *Declare and enforce integrity constraints on a database*
3. *Writing Queries using advanced concepts of SQL*
4. *Programming PL/SQL including procedures, functions, cursors and triggers*

COURSE OUTCOMES (COs)

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

1. *Utilizing Data Definition Language (DDL), Data Manipulation Language (DML), and Data Control Language (DCL) commands effectively within a database environment*
2. *Constructing and execute queries to manipulate and retrieve data from databases.*
3. *Develop application programs using PL/SQL.*
4. *Determine the transaction atomicity, consistency, isolation, and durability for a given transaction-processing system.*
5. *Analyze requirements and design custom Procedures, Functions, Cursors, and Triggers, leveraging their capabilities to automate tasks and optimize database functionality*
6. *Establish database connectivity through JDBC (Java Database Connectivity)*

Experiments covering the topics:

- DDL, DML, DCL commands
- Queries, nested queries, built-in functions,
- PL/SQL programming- control structures
- Procedures, Functions, Cursors, Triggers,
- Database connectivity- ODBC/JDBC

Sample Experiments:

1. Creation, altering and droping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.
2. Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints. Example:- Select the roll number and name of the student who secured fourth rank in the class.
3. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.
4. Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between, least,

greatest, trunc, round, to_char, to_date)

5. Create a simple PL/SQL program which includes declaration section, executable section and exception –Handling section (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raised if no records were found)
6. Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.
7. Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.
8. Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE-APPLICATION ERROR.
9. Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.
10. Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.
11. Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.
12. Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers
13. Create a table and perform the search operation on table using indexing and non-indexing techniques.
14. Write a Java program that connects to a database using JDBC
15. Write a Java program to connect to a database using JDBC and insert values into it
16. Write a Java program to connect to a database using JDBC and delete values from it

REFERENCES

1. *Oracle: The Complete Reference* by Oracle Press
2. Nilesh Shah, *Database Systems Using Oracle*, PHI, 2007
3. Rick F Vander Lans, *Introduction to SQL*, Fourth Edition, Pearson Education, 2007
4. RamezElmasri, Shamkant, B. Navathe, *Database Systems*, Pearson Education, 6th Edition, 2013.
5. Corlos Coronel, Steven Morris, Peter Robb, *Database Principles Fundamentals of Design Implementation and Management*, 10th edition, Cengage Learning, 2022

ONLINE LEARNING RESOURCES

1. http://www.scoopworld.in
   http://vlabs.iitb.ac.in/vlabs-dev/labs/dblab/index.php

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(23CS0550) FULL STACK DEVELOPMENT – 1
(Common to All CSE & CSE Allied branches)

COURSE OBJECTIVES

The objectives of this course

1. *Make use of HTML elements and their attributes for designing static web pages*
2. *Build a web page by applying appropriate CSS styles to HTML elements*
3. *Experiment with JavaScript to develop dynamic web pages and validate forms*

COURSE OUTCOMES (COs)

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

1. *Design Websites.*
2. *Understand basic concepts of HTML and creation of static webpages*
3. *Apply Styling to web pages.*
4. *Make Web pages interactive.*
5. *Design Forms for applications.*
6. *Choose Control Structure based on the logic to be implemented.*

Experiments covering the Topics:

- Lists, Links and Images
- HTML Tables, Forms and Frames
- HTML 5 and Cascading Style Sheets, Types of CSS
- Selector forms
- CSS with Color, Background, Font, Text and CSS Box Model
- Applying JavaScript - internal and external, I/O, Type Conversion
- JavaScript Conditional Statements and Loops, Pre-defined and User-defined Objects
- JavaScript Functions and Events

Sample Experiments:

1. Lists, Links and Images
   a. Write a HTML program, to explain the working of lists.
   b. Note: It should have an ordered list, unordered list, nested lists and ordered list in an unordered list and definition lists.
   c. Write a HTML program, to explain the working of hyperlinks using <a> tag and href, target Attributes.
   d. Create a HTML document that has your image and your friend's image with a specific height and width. Also when clicked on the images it should navigate to their respective profiles.
   e. Write a HTML program, in such a way that, rather than placing large images on a page, the preferred technique is to use thumbnails by setting the height and width parameters to something like to 100*100 pixels. Each thumbnail image is also a link to

a full sized version of the image. Create an image gallery using this technique

2. HTML Tables, Forms and Frames
   a. Write a HTML program, to explain the working of tables. (use tags: <table>, <tr>, <th>, <td> and attributes: border, rowspan, colspan)
   b. Write a HTML program, to explain the working of tables by preparing a timetable. (Note: Use <caption> tag to set the caption to the table & also use cell spacing, cell padding, border, rowspan, colspan etc.).
   c. Write a HTML program, to explain the working of forms by designing Registration form. (Note: Include text field, password field, number field, date of birth field, checkboxes, radio buttons, list boxes using <select>&<option> tags, <text area> and two buttons ie: submit and reset. Use tables to provide a better view).
   d. Write a HTML program, to explain the working of frames, such that page is to be divided into 3 parts on either direction. (Note: first frame image, second frame paragraph, third frame hyperlink. And also make sure of using "no frame" attribute such that frames to be fixed).

3. HTML 5 and Cascading Style Sheets, Types of CSS
   a. Write a HTML program, that makes use of <article>, <aside>, <figure>, <figcaption>, <footer>, <header>, <main>, <nav>, <section>, , tags.
   b. Write a HTML program, to embed audio and video into HTML web page.
   c. Write a program to apply different types (or levels of styles or style specification formats) - inline, internal, external styles to HTML elements. (identify selector, property and value).

4. Selector forms
   a. Write a program to apply different types of selector forms
      i. Simple selector (element, id, class, group, universal)
      ii. Combinator selector (descendant, child, adjacent sibling, general sibling)
      iii. Pseudo-class selector
      iv. Pseudo-element selector
      v. Attribute selector

5. CSS with Color, Background, Font, Text and CSS Box Model
   a. Write a program to demonstrate the various ways you can reference a color in CSS.
   b. Write a CSS rule that places a background image halfway down the page, tilting it horizontally. The image should remain in place when the user scrolls up or down.
   c. Write a program using the following terms related to CSS font and text:
      i. font-size ii. font-weight iii. font-style
      iv. text-decoration v. text-transformation vi. text-alignment
   d. Write a program, to explain the importance of CSS Box model using
      i. Content ii. Border iii. Margin iv. padding

6. Applying JavaScript - internal and external, I/O, Type Conversion
   a. Write a program to embed internal and external JavaScript in a web page.

b. Write a program to explain the different ways for displaying output.
c. Write a program to explain the different ways for taking input.
d. Create a webpage which uses prompt dialogue box to ask a voter for his name and age. Display the information in table format along with either the voter can vote or not

7. JavaScript Pre-defined and User-defined Objects
   a. Write a program using document object properties and methods.
   b. Write a program using window object properties and methods.
   c. Write a program using array object properties and methods.
   d. Write a program using math object properties and methods.
   e. Write a program using string object properties and methods.
   f. Write a program using regex object properties and methods.
   g. Write a program using date object properties and methods.
   h. Write a program to explain user-defined object by using properties, methods, accessors, constructors and display.

8. JavaScript Conditional Statements and Loops
   a. Write a program which asks the user to enter three integers, obtains the numbers from the user and outputs HTML text that displays the larger number followed by the words "LARGER NUMBER" in an information message dialog. If the numbers are equal, output HTML text as "EQUAL NUMBERS".
   b. Write a program to display week days using switch case.
   c. Write a program to print 1 to 10 numbers using for, while and do-while loops.
   d. Write a program to print data in object using for-in, for-each and for-of loops
   e. Develop a program to determine whether a given number is an 'ARMSTRONG NUMBER' or not. [Eg: 153 is an Armstrong number, since sum of the cube of the digits is equal to the number i.e.,13 + 53+ 33 = 153]
   f. Write a program to display the denomination of the amount deposited in the bank in terms of 100's, 50's, 20's, 10's, 5's, 2's & 1's. (Eg: If deposited amount is Rs.163, the output should be 1-100's, 1-50's, 1- 10's, 1-2's & 1-1's)

9. JavaScript Functions and Events
   a. Design a appropriate function should be called to display
      i. Factorial of that number
      ii. Fibonacci series up to that number
      iii. Prime numbers up to that number
      iv. Is it palindrome or not
   b. Design a HTML having a text box and four buttons named Factorial, Fibonacci, Prime, and Palindrome. When a button is pressed an appropriate function should be called to display
      i. Factorial of that number
      ii. Fibonacci series up to that number
      iii. Prime numbers up to that number
      iv. Is it palindrome or not
   c. Write a program to validate the following fields in a registration page

i. Name (start with alphabet and followed by alphanumeric and the length should not be less than 6 characters)
ii. Mobile (only numbers and length 10 digits)
iii. E-mail (should contain format like xxxxxxx@xxxxxx.xxx)

TEXTBOOKS

1. John Dean, *Web Programming with HTML5, CSS and JavaScript*, Jones & Bartlett Learning, 2019.

REFERENCES

1. Robet W Sebesta, *Programming the World Wide Web*, 7thEdition, Pearson, 2013.
2. Vasan Subramanian, *Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node*, 2nd edition, APress, O'Reilly.

ONLINE LEARNING RESOURCES

1. https://www.w3schools.com/html
2. https://www.w3schools.com/css
3. https://www.w3schools.com/js/
4. https://www.w3schools.com/nodejs
5. https://www.w3schools.com/typescript

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(23HS0815) DESIGN THINKING & INNOVATION
(Common to All Engineering Branches)

COURSE OBJECTIVES

The objectives of this course

1. *Is to familiarize students with design thinking process as a tool for breakthrough innovation. It aims to equip students with design thinking skills and ignite the minds to create innovative ideas, develop solutions for real-time problems.*

COURSE OUTCOMES (COs)

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

1. *Define the concepts related to design thinking.*
2. *Explain the fundamentals of Design Thinking and innovation*
3. *Apply the design thinking techniques for solving problems in various sectors.*
4. *Analyze to work in a multidisciplinary environment*
5. *Evaluate the value of creativity*
6. *Formulate specific problem statements of real time issues*

UNIT - I

Introduction to Design Thinking

Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.

UNIT - II

Design Thinking Process

Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brainstorming, product development

Activity: Every student presents their idea in three minutes, Every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.

UNIT III

Innovation

Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations- Creativity to Innovation- Teams for innovation- Measuring the impact and value of creativity.

Activity: Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.

UNIT IV

Product Design

Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications- Innovation towards product design- Case studies

Activity: Importance of modelling, how to set specifications, Explaining their own product design.

UNIT V

Design Thinking in Business Processes

Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs- Design thinking for Startups- Defining and testing Business Models and Business Cases- Developing & testing prototypes.

Activity: How to market our own product, About maintenance, Reliability and plan for startup.

TEXTBOOKS

1. Tim Brown,*Change by design*, Harper Bollins (2009)
2. Idris Mootee, *Design Thinking for Strategic Innovation*, 2013, John Wiley & Sons.

REFERENCES

1. David Lee, *Design Thinking in the Classroom*, Ulysses press
2. Shrutin N Shetty, *Design the Future*, Norton Press
3. William Lidwell,*Universal Principles of Design*- Kritinaholden, Jill Butter.
4. Chesbrough.H, *The Era of Open Innovation* – 2013

ONLINE LEARNING RESOURCES

1. https://nptel.ac.in/courses/110/106/110106124/
2. https://nptel.ac.in/courses/109/104/109104109/
3. https://swayam.gov.in/nd1_noc19_mg60/previe

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SUGGESTIVE LIST OF PROGRAMMES UNDER COMMUNITY SERVICE PROJECT
(Common to All Engineering Branches)

The following the recommended list of projects for engineering students. The lists are not exhaustive and open for additions, deletions, and modifications. Colleges are expected to focus on specific local issues for this kind of project. The students are expected to carry out these projects with involvement, commitment, responsibility, and accountability. The mentors of a group of students should take the responsibility of motivating, facilitating, and guiding the students. They have to interact with local leadership and people and appraise the objectives and benefits of this kind of project. The project reports shall be placed in the college website for reference. Systematic, Factual, methodical and honest reporting should be ensured.

For Engineering Students

1. *Water facilities and drinking water availability*
2. *Health and hygiene*
3. *Stress levels and coping mechanisms*
4. *Health intervention programmes*
5. *Horticulture*
6. *Herbal plants*
7. *Botanical survey*
8. *Zoological survey*
9. *Marine products*
10. *Aqua culture*
11. *Inland fisheries*
12. *Animals and species*
13. *Nutrition*
14. *Traditional health care methods*
15. *Food habits*
16. *Air pollution*
17. *Water pollution*
18. *Plantation*
19. *Soil protection*
20. *Renewable energy*
21. *Plant diseases*
22. *Yoga awareness and practice*
23. *Health care awareness programmes and their impact*
24. *Use of chemicals on fruits and vegetables*
25. *Organic farming*
26. *Crop rotation*
27. *Floury culture*
28. *Access to safe drinking water*

29. *Geographical survey*
30. *Geological survey*
31. *Sericulture*
32. *Study of species*
33. *Food adulteration*
34. *Incidence of Diabetes and other chronic diseases*
35. *Human genetics*
36. *Blood groups and blood levels*
37. *Internet Usage in Villages*
38. *Android Phone usage by different people*
39. *Utilization of free electricity to farmers and related issues*
40. *Gender ration in schooling level- observation.*

Complementing the community service project the students may be involved to take up some awareness campaigns on social issues/special groups. The suggested list of programs

Programs for School Children

1. *Reading Skill Program (Reading Competition)*
2. *Preparation of Study Materials for the next class.*
3. *Personality / Leadership Development*
4. *Career Guidance for X class students*
5. *Screening Documentary and other educational films*
6. *Awareness Program on Good Touch and Bad Touch (Sexual abuse)*
7. *Awareness Program on Socially relevant themes.*

Programs for Women Empowerment

1. *Government Guidelines and Policy Guidelines*
2. *Women's Rights*
3. *Domestic Violence*
4. *Prevention and Control of Cancer*
5. *Promotion of Social Entrepreneurship*

General Camps

1. *General Medical camps*
2. *Eye Camps*
3. *Dental Camps*
4. *Importance of protected drinking water*
5. *ODF awareness camp*
6. *Swatch Bharath*
7. *AIDS awareness camp*
8. *Anti-Plastic Awareness*
9. *Programs on Environment*
10. *Health and Hygiene*
11. *Hand wash programmes*
12. *Commemoration and Celebration of important days*

Programs for Youth Empowerment

1. *Leadership*
2. *Anti-alcoholism and Drug addiction*
3. *Anti-tobacco*
4. *Awareness on Competitive Examinations*
5. *Personality Development*

Common Programs

1. *Awareness on RTI*
2. *Health intervention programmes*
3. *Yoga*
4. *Tree plantation*
5. *Programs in consonance with the Govt. Departments like –*
    - *i. Agriculture*
    - *ii. Health*
    - *iii. Marketing and Cooperation*
    - *iv. Animal Husbandry*
    - *v. Horticulture*
    - *vi. Fisheries*
    - *vii. Sericulture*
    - *viii. Revenue and Survey*
    - *ix. Natural Disaster Management*
    - *x. Irrigation*
    - *xi. Law & Order*
    - *xii. Excise and Prohibition*
    - *xiii. Mines and Geology*
    - *xiv. Energy*

Role of Students:

- *Students may not have the expertise to conduct all the programmes on their own. The students then can play a facilitator role.*
- *For conducting special camps like Health related, they will be coordinating with the Governmental agencies.*
- *As and when required the College faculty themselves act as Resource Persons.*
- *Students can work in close association with Non-Governmental Organizations like Lions Club, Rotary Club, etc or with any NGO actively working in that habitation.*
- *And also, with the Governmental Departments. If the program is rolled out, the District Administration could be roped in for the successful deployment of the program.*
- *An in-house training and induction program could be arranged for the faculty and participating students, to expose them to the methodology of Service Learning.*

Timeline for the Community Service Project Activity

Duration: 8 weeks

1. **Preliminary Survey (One Week):**

- *A preliminary survey including the socio-economic conditions of the allotted habitation to be conducted.*
- *A survey form based on the type of habitation to be prepared before visiting the habitation with the help of social sciences faculty. (However, a template could be designed for different habitations, rural/urban.*
- *The Governmental agencies, like revenue administration, corporation and municipal authorities and village secreteriats could be aligned for the survey.*

2. **Community Awareness Campaigns (One Week):**

- *Based on the survey and the specific requirements of the habitation, different awareness campaigns and programmesto be conducted, spread over two weeks of time. The list of activities suggested could be taken into consideration.*

3. **Community Immersion Programme (Three Weeks):**

- *Along with the Community Awareness Programmes, the student batch can also work with any one of the below-listed governmental agencies and work in tandem with them. This community involvement programme will involve the students in exposing themselves to experiential learning about the community and its dynamics. Programs could be in consonance with the Govt. Departments.*

4. **Community Exit Report (One Week):**

- *During the last week of the Community Service Project, a detailed report of the outcome of the 8 weeks' works to be drafted and a copy shall be submitted to the local administration. This report will be a basis for the next batch of students visiting that habitation. The same report submitted to the teacher-mentor will be evaluated by the mentor and suitable marks are awarded for onward submission to the University. Throughout the Community Service Project, a daily logbook need to be maintained by the students batch, which should be countersigned by the governmental agency representative and the teacher-mentor, who is required to periodically visit the students and guide them*

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(23CS1101) DATA SCIENCE

COURSE OBJECTIVES

The objectives of this course:

1. *Develop practical data analysis skills, which can be applied to practical problems.*
2. *Learn how to carry out a range of commonly used statistical methods including regression,classification, clustering.*
3. *Explore data-sets to create testable hypotheses and identify appropriate statistical tests.*
4. *To introduce the tools, technologies & programming languages this is used in day to day analytics cycle.*
5. *To discuss models in time series and text analysis.*

COURSE OUTCOMES (COs)

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

1. *Understand the basic concepts of Data Science and the skill sets needed for data analysis.*
2. *Illustrate appropriate statistical Methods for Evaluation tests.*
3. *Discuss in depth of association rules and their applicability to various problem domains.*
4. *Analyze and implement the types of Regression and Classification techniques available for data analysis.*
5. *Classify clustering techniques and their applicability to various problem domains.*
6. *Demonstrate different models in time series and text analysis.*

UNIT-I

Introduction to Data Science: Need for data science – benefits and uses – facets of data – data science process – setting the research goal – retrieving data – cleansing, integrating, and transforming data – exploratory data analysis – build the models – presenting and building applications.

UNIT-II

Statistical Methods for Evaluation: Hypothesis Testing, Difference of Means, Wilcoxon Rank-Sum Test, Type I and Type II Errors.

Association Rules: Overview, Apriori Algorithm, Evaluation of Candidate Rules - Applications of Association Rules, An Example: Transactions in a Grocery Store, Validation and Testing, Diagnostics.

UNIT-III

Regression: Linear Regression, Logistic Regression, Reasons to Choose and Cautions, Additional Regression Models.

Classification: Decision Trees, Na'ive Bayes, Diagnostics of Classifiers, Additional Classification Methods.

UNIT-IV

Clustering: Overview of Clustering, K-means, Additional Algorithms.

Time Series Analysis: Overview of Time Series Analysis, ARIMA Model, Additional Methods.

UNIT-V

Text Analysis: Text Analysis Steps, Collecting Raw Text, Representing Text, Term Frequency-Inverse Document Frequency (TFIDF), Categorizing Documents by Topics, Determining Sentiments – Gaining Insights.

TEXT BOOKS

1. David Cielen, Arno D. B. Meysman, and Mohamed Ali, *Introducing Data Science,* Manning Publications, 2016.
2. David Dietrich, Barry Heller & Beibei Yang, *Data Science and Big Data Analytics: Discovering, Analyzing*, Willey Publications.

REFERENCES

1. Dr. Mark Gardener, *Beginning R the statistical programming language*, John Wiley &Sons, Inc. 2012.
2. Richard Cotton, *Learning R: A Step-by-Step Function Guide to Data Analysis*.
3. Peng, R. D., & Matsui. E, *The Art of Data Science. A Guide for Anyone Who Works with Data*, Sky brude Consulting, 2015.

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(23CS0517) COMPUTER NETWORKS & INTERNET PROTOCOLS
(Common to CSE and CAD)

COURSE OBJECTIVES:
The course is designed to

1. *Understand the basic concepts of Computer Networks.*
2. *Introduce the layered approach for design of computer networks*
3. *Expose the network protocols used in Internet environment*
4. *Explain the format of headers of IP, TCP and UDP*
5. *Familiarize with the applications of Internet*
6. *Elucidate the design issues for a computer network*

COURSE OUTCOMES(CO):
After completion of the course students will be able to

1. *Identify the software and hardware components of a computer network*
2. *Design software for a computer network*
3. *Develop error, routing, and congestion control algorithms*
4. *Assess critically the existing routing protocols*
5. *Explain the functionality of each layer of a computer network*
6. *Choose the appropriate transport protocol based on the application requirements*

UNIT - I
Computer Networks and the Internet
What Is the Internet? Network Edge, The Network Core, Delay, Loss, and Throughput in Packet Switched Networks, Reference Models, Multimedia Networks, Guided Transmission Media, Wireless Transmission

UNIT - II
The Data Link Layer, Access Networks, and LANs
Data Link Layer Design Issues, Error Detection and Correction, Elementary Data Link Protocols, Sliding window protocol, Introduction to the Link Layer, Error-Detection and -Correction Techniques, Multiple Access Links and Protocols, Switched Local Area Networks, Link Virtualization: A Network as a Link Layer, Data Center Networking, Retrospective: A Day in the Life of a Web Page (Packet)

UNIT - III
The Network Layer:
Routing Algorithms, Internetworking, The Network Layer in The Internet

UNIT - IV

The Transport Layer:

Connectionless Transport: UDP, The Internet Transport Protocols: TCP, Congestion Control

UNIT - V

The Application Layer:

Principles of Network Applications, The Web and HTTP, Electronic Mail in the Internet, DNS—The Internet‘s Directory Service, Peer-to-Peer Applications, Video Streaming and Content Distribution Networks

TEXT BOOKS

1. Andrew S. Tanenbaum and David J. Wetherall, *Computer Networks*, 5th Edition, Pearson.
2. James F. Kurose, Keith W. Ross, Computer Networking: A Top-Down Approach, 6th Edition, Pearson, 2019.

REFERENCES

1. Forouzan, Data Communications and Networking, 5th Edition, McGraw Hill Publication.
2. Youlu Zheng, Shakil Akhtar, Networks for Computer Scientists and Engineers, Oxford Publishers, 2016

ONLINE LEARNING RESOURSES

1. https://nptel.ac.in/courses/106101092
2. https://inl.info.ucl.ac.be/CNP3

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(23CS0511) OPERATING SYSTEMS
(Common to All CSE & CSE Allied branches)

COURSE OBJECTIVES

The objectives of this course

1. *Understand the basic concepts and principles of operating systems, including process management, memory management, file systems, and Protection*
2. *Make use of process scheduling algorithms and synchronization techniques to achieve better performance of a computer system.*
3. *Illustrate different conditions for deadlock and their possible solutions.*

COURSE OUTCOMES (COs)

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

1. *Describe the basics of the operating systems, mechanisms of OS to handle processes, threads, and their communication.*
2. *Understand the basic concepts and principles of operating systems, including process management, memory management, file systems, and Protection.*
3. *Analyze the requirement for process synchronization and deadlocks handled by operating system.*
4. *Make use of process scheduling algorithms and synchronization techniques to achieve better performance of a computer system.*
5. *Illustrate different conditions for deadlock and their possible solutions.*
6. *Analyze the memory management and its allocation policies.*

UNIT - I

Operating Systems Overview: Introduction, Operating system functions, Operating systems operations, Computing environments, Free and Open-Source Operating Systems

System Structures: Operating System Services, User and Operating-System Interface, system calls, Types of System Calls, system programs, Operating system Design and Implementation, Operating system structure, Building and Booting an Operating System, Operating system debugging

UNIT - II

Processes: Process Concept, Process scheduling, Operations on processes, Inter-process communication.

Threads and Concurrency: Multithreading models, Thread libraries, Threading issues.

CPU Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling.

UNIT III

Synchronization Tools: The Critical Section Problem, Peterson's Solution, Mutex Locks,

Semaphores, Monitors, Classic problems of Synchronization.

Deadlocks: system Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from Deadlock.

UNIT IV

Memory-Management Strategies: Introduction, Contiguous memory allocation, Paging, Structure of the Page Table, Swapping.

Virtual Memory Management: Introduction, Demand paging, Copy-on-write, Page replacement, Allocation of frames, Thrashing

Storage Management: Overview of Mass Storage Structure, HDD Scheduling.

UNIT V

File System: File System Interface: File concept, Access methods, Directory Structure; File **system Implementation:** File-system structure, File-system Operations, Directory implementation, Allocation method, Free space management; File-System Internals: File-System Mounting, Partitions and Mounting, File Sharing.

Protection: Goals of protection, Principles of protection, Protection Rings, Domain of protection, Access matrix.

TEXTBOOKS

1. Operating System Concepts, Silberschatz A, Galvin P B, Gagne G, 10th Edition, Wiley, 2018.
2. Modern Operating Systems, Tanenbaum A S, 4th Edition, Pearson , 2016

REFERENCES

1. *Operating Systems -Internals and Design Principles, Stallings W, 9th edition, Pearson, 2018*
2. *Operating Systems: A Concept Based Approach, D.M Dhamdhere, 3rd Edition, McGraw- Hill, 2013*

ONLINE LEARNING RESOURCES:

1. *https://nptel.ac.in/courses/106/106/106106144/*
2. *http://peterindia.net/OperatingSystems.html*

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(23CS0519) INTRODUCTION TO QUANTUM TECHNOLOGIES AND APPLICATIONS
(Common to CSE and its allied branches)

COURSE OBJECTIVES

The objectives of this course are to make the student:

1. *Introduce fundamental quantum concepts like superposition and entanglement.*
2. *Understand theoretical structure of qubits and quantum information.*
3. *Explore conceptual challenges in building quantum computers.*
4. *Explain principles of quantum communication and computing.*
5. *Examine real-world applications and the future of quantum technologies*.

COURSE OUTCOMES (COs)

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

1. *Explain core quantum principles in a non-mathematical manner.*
2. *Compare classical and quantum information systems.*
3. *Identify theoretical issues in building quantum computers.*
4. *Discuss quantum communication and computing concepts.*
5. *Recognize applications, industry trends, and career paths in quantum technology.*
6. *Societal & ethical implications of quantum technologies*

UNIT-I : Introduction to Quantum Theory and Technologies

The transition from classical to quantum physics, Fundamental principles explained conceptually: Superposition, Entanglement, Uncertainty Principle, Wave-particle duality, Classical vs Quantum mechanics – theoretical comparison, Quantum states and measurement: nature of observation, Overview of quantum systems: electrons, photons, atoms, The concept of quantization: discrete energy levels,Why quantum? Strategic, scientific, and technological significance, A snapshot of quantum technologies: Computing, Communication, and Sensing, National and global quantum missions: India's Quantum Mission, EU, USA, China

UNIT-II : Theoretical Structure of Quantum Information Systems

What is a qubit? Conceptual understanding using spin and polarization, Comparison: classical bits vs quantum bits, Quantum systems: trapped ions, superconducting circuits, photons (non-engineering view),Quantum coherence and decoherence – intuitive explanation, Theoretical concepts: Hilbert spaces, quantum states, operators – only interpreted in abstract, The role of entanglement and non-locality in systems, Quantum

information vs classical information: principles and differences, Philosophical implications: randomness, determinism, and observer role.

UNIT-III: Building a Quantum Computer – Theoretical Challenges and Requirements

What is required to build a quantum computer (conceptual overview)?, Fragility of quantum systems: decoherence, noise, and control, Conditions for a functional quantum system: Isolation, Error management, Scalability, Stability, Theoretical barriers: Why maintaining entanglement is difficult, Error correction as a theoretical necessity, Quantum hardware platforms (brief conceptual comparison),Superconducting circuits, Trapped ions, Photonics, Vision vs reality: what's working and what remains elusive, The role of quantum software in managing theoretical complexities

UNIT-IV: Quantum Communication and Computing – Theoretical Perspective

Quantum vs Classical Information, Basics of Quantum Communication, Quantum Key Distribution (QKD),Role of Entanglement in Communication, The Idea of the Quantum Internet – Secure Global Networking, Introduction to Quantum Computing, Quantum Parallelism (Many States at Once),Classical vs Quantum Gates, Challenges: decoherence and Error Correction, Real-World Importance and Future Potential

UNIT-V : Applications, Use Cases, and the Quantum Future

Real-world application domains: Healthcare (drug discovery), Material science, Logistics and optimization, Quantum sensing and precision timing, Industrial case studies: IBM, Google, Microsoft, Psi Quantum, Ethical, societal, and policy considerations, Challenges to adoption: cost, skills, standardization, emerging careers in quantum: roles, skillsets, and preparation pathways, Educational and research landscape – India's opportunity in the global quantum race.

TEXTBOOKS

1. Michael A. Nielsen, Isaac L. Chuang, *Quantum Computation and Quantum Information*, Cambridge University Press, 10th Anniversary Edition, 2010.
2. Eleanor Rieffel and Wolfgang Polak, *Quantum Computing: A Gentle Introduction*, MIT Press, 2011.
3. Chris Bernhardt, *Quantum Computing for Everyone*, MIT Press, 2019.

REFERENCE BOOK

1. David McMahon, *Quantum Computing Explained*, Wiley, 2008.

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III B.Tech – I Sem.

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(23CS0518) AUTOMATA THEORY AND COMPILER DESIGN
(Professional Elective course –I)
(Common to CSE and CAD)

COURSE OBJECTIVES:

The course is designed to

1. *Able to understand the concept of abstract machines, construct FA, Regular Expressions for the regular languages and equivalent FSMs.*
2. *Able to construct pushdown automata equivalent to Context free Grammars, construct Turing Machines and understand undecidability.*
3. *Emphasize the concepts learnt in phases of compiler, lexical analyser and Top-down parser.*
4. *Able to understand the concepts of Bottom-up parser, Intermediate Code Generation.*
5. *Able to understand the concepts of Code optimizer and Code Generation.*

COURSE OUTCOMES:

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

1. *Demonstrate knowledge on Automata Theory, Regular Expression and Analyze and Design of finite automata, and prove equivalence of various finite automata.*
2. *Demonstrate knowledge on context free grammar, Analyze and design of PDA and TM.*
3. *Understand the fundamental concepts and structure of compiler design, including its role in program translation.*
4. *Explain and analyze the different phases of a compiler and apply this knowledge to construct lexical and syntax analyzers using tools like LEX and YACC*
5. *Ability to implement semantic rules into a parser that performs attribution while parsing and apply error detection and correction methods.*
6. *Apply the code optimization techniques to improve the space and time complexity of programs while programming and Ability to design a compiler.*

UNIT-I

Introduction to Automata and Regular Expressions : I

Introduction, Alphabets, Strings and Languages, Chomsky Hierarchy, Automata and Grammars, Regular Grammar and Language, Finite Automata, Deterministic finite Automata (DFA), Nondeterministic finite Automata (NFA), Equivalence of NFA and DFA, Minimization of Finite Automata, Regular Expressions, Converting Regular Grammar and Expression into Finite Automata, Pumping lemma for regular sets, Closure properties of regular sets (Without proof).

UNIT-II

Context Free Grammars and Pushdown Automata:

Context Free Language, Context Free Grammar, Derivation and Parse tree, Ambiguity, Simplification of CFG‘s, Chomsky Normal Form, Greibach Normal Form, Push Down Automat (PDA), Design of PDA, Equivalence of PDA and CFL/CFG

UNIT-III

Turing Machines and Introduction to Compilers

Turing Machine, TM Model, Language acceptance, Design of Turing Machine, Compilers, Phases of Compiler, The role of Lexical Analyzer, Input Buffering.

UNIT-IV

Parsers and Intermediate Code Generation: Parser, Top-Down parsers: Recursive Descent Parsers, Predictive Parsers

Bottom–up Parsers: Shift-Reduce Parsing, LR parsers, Intermediate Code Generation: Three address codes.

UNIT-V

Code Optimization and Code Generation: Code Optimization: Peephole optimization, Basic blocks and flow graphs, DAG, Principles of Source Code Optimization, Code Generation: Issues in Design of Code Generation, Simple Code Generator

TEXT BOOKS:

1. Introduction to Automata theory languages and Computation, Hopcroft H.E. and Ullman Jeffrey.D, 3/e, 2006, Pearson Education, New Delhi, India.
2. Mishra K L P and Chandrasekaran N, ―Theory of Computer Science - Automata, Languages and Computation‖, 2/e, 2007, PHI, New Delhi, India.
3. Compilers: Principles, Techniques, and Tools, Updated 2e July 2023 Alfred V. Aho , Monica S. Lam, Ravi Sethi , Jeffrey D. Ullman , Sorav Bansal.

REFERENCES:

1. Introduction to Languages and Theory of Computation, John C Martin, 1/e, 2009, Tata McGraw Hill Education, Hyderabad, India.
2. Introduction to Theory of Computation, Sipser, 2/e, 2005, Thomson, Australia.
3. Compiler Construction: Principles And Practice, Kenneth C. Louden, Thomson/ Delmar Cengage Learning, 2006.
4. Lex &yacc, Doug Brown, John Levine and Tony Mason, 2 nd Edition, O‘reilly Media
5. Engineering a compiler, Keith Cooper and Linda Torczon, 2 nd Edition, Morgan Kaufmann, 2011.

Online Learning Resources:

1. https://nptel.ac.in/courses/106/104/106104028/
2. https://nptel.ac.in/courses/106/104/106104123/

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(23CS0532) OBJECT ORIENTED ANALYSIS AND DESIGN
(Common to CSE and CAD)
(Professional Elective course –I)

COURSE OBJECTIVES:

The course is designed to

1. *Describe the activities in the different phases of the object-oriented development lifecycle.*
2. *Understand the concepts of object-oriented model with the E-R and EER models.*
3. *Model a real-world application by using UML diagram.*
4. *Design architectural modelling.*
5. *Describing an application of UML.*

COURSE OUTCOMES:

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

1. *The importance of modelling in UML.*
2. *Compare and contrast the object-oriented model with the E-R and EER models.*
3. *Design use case diagram. Design an application using deployment diagram.*
4. *Apply UML diagrams to build library application.*
5. *Construct class, sequence, and activity diagrams to represent dynamic and static aspects of a system.*
6. *Design complete object-oriented software solutions using appropriate UML tools and design principles*

UNIT – I

Introduction to UML: Importance of modelling, principles of modelling, object-oriented modelling, conceptual model of the UML, Architecture, Software Development Life Cycle.

UNIT – II

Basic Structural Modelling: Classes, Relationships, common Mechanisms, and diagrams.

Advanced Structural Modelling: Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages. Class & Object Diagrams: Terms, concepts, modelling techniques for Class & Object Diagrams.

UNIT – III

Basic Behavioural Modelling-I: Interactions, Interaction diagrams.

Basic Behavioural Modelling-II: Use cases, Use case Diagrams, Activity Diagrams.

UNIT – IV

Advanced Behavioral Modelling: Events and signals, state machines, processes and Threads, time and space, state chart diagrams. Architectural Modelling: Component, Deployment, Component diagrams and Deployment diagrams.

UNIT – V

Patterns and Frameworks, Artifact Diagrams. Case Study: The Unified Library application.

TEXT BOOKS:

1. Grady Booch, James Rumbaugh, and Ivar Jacobson, *The Unified Modeling Language User Guide*, 2nd Edition, Pearson Education.
2. John W. Satzinger, Robert B. Jackson, and Stephen D. Burd, *Object-Oriented Analysis and Design with the Unified Process*, Cengage Learning.

REFERENCE BOOKS:

1. Meilir Page-Jones, *Fundamentals of Object-Oriented Design in UML*, Pearson Education.
2. Pascal Roques, *Modeling Software Systems Using UML2*, Wiley–Dreamtech India Pvt. Ltd.
3. Atul Kahate, *Object-Oriented Analysis and Design*, The McGraw-Hill Companies.
4. Mark Priestley, *Practical Object-Oriented Design with UML*, Tata McGraw-Hill (TMH).
5. Craig Larman, *Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and the Unified Process*, Pearson Education

ONLINE LEARNING RESOURCES:

1. https://www.coursera.org/learn/object-oriented-design
2. https://nptel.ac.in/courses/106105153

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(23CS1110) INFORMATION RETRIEVAL SYSTEMS
(Professional Elective Course-I)

COURSE OBJECTIVES
The objectives of this course
1. To learn the different models for information storage and retrieval
2. To learn about the various retrieval utilities
3. To understand indexing and querying in information retrieval systems
4. To expose the students to the notions of structured and semi structured data

COURSE OUTCOMES (COs)
On successful completion of this course, the student will be able to
1. Understand the basic concepts of retrieval Strategies
2. Describe the various retrieval utilities for improving search
3. Discuss the specific problems arising in CLIR
4. Analyzing of indexing and compressing documents to improve space and time efficiency
5. Discuss the procedure for Integrating Structured Data and Text
6. Recognize the Distributed Information Retrieval in web search

UNIT -I Retrieval Strategies: Definition, Motivation, Information Retrieval vs Data Retrieval, Objectives, Functional Overview, Relationship to DBMS, Digital libraries and Data Warehouses, Vector space model,Probabilistic retrieval strategies: Simple term weights, Non binary independence model, Language Models .

UNIT- II Retrieval Utilities: Relevance feedback, Clustering, N-grams, Regression analysis, Thesauri

UNIT - III Retrieval Utilities: Semantic networks, Parsing.Cross-Language Information Retrieval: Introduction, Crossing the language barrier.

UNIT- IV Efficiency: Inverted index, Query processing, Signature files, Duplicate document detection

UNIT -V Integrating Structured Data and Text: A Historical progression, Information retrieval as a relational application, Semi-structured search using a relational schema.
Distributed Information Retrieval: A Theoretical model of distributed retrieval, Web search.

TEXT BOOKS

1. David A. Grossman, Ophir Frieder, *Information Retrieval – Algorithms and Heuristics, 2nd Edition, 2012, Springer, (Distributed by Universities Press)*
2. Kowalski, Gerald, Mark T Maybury: *Information Retrieval Systems: Theory and Implementation, Kluwer Academic Press, 1997.*

REFERENCES

1. Yates, *Modern Information Retrieval Systems, Pearson Education.*
2. Gerald J Kowalski, Mark T Maybury, *Information Storage and Retrieval Systems, Springer, 2000.*
3. Soumen Chakrabarti, *Mining the Web : Discovering Knowledge from Hypertext Data, Morgan-Kaufmann Publishers, 2002.*
4. Christopher D. Manning, Prabhakar Raghavan, Hinrich Schütze, *An Introduction to Information Retrieval, Cambridge University Press, Cambridge, England, 2009.*

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(23CS0545) INTERNET OF THINGS
(Professional Elective course (PEC) –I)
(Common to CSE and CAD)

COURSE OBJECTIVES:

The objectives of this course

1. *Understand the basics of Internet of Things and protocols.*
2. *Discuss the requirement of IoT technology*
3. *Introduce some of the application areas where IoT can be applied.*
4. *Understand the vision of IoT from a global perspective, understand its applications, determine its market perspective using gateways, devices and data management*

COURSE OUTCOMES:

After completion of the course, students will be able to

1. *Understand general concepts of Internet of Things.*
2. *Apply design concept to IoT solutions*
3. *Analyze various M2M and IoT architectures*
4. *Evaluate design issues in IoT applications*
5. *Create IoT solutions using sensors, actuators and Devices*
6. *Demonstrate the use of communication protocols and data handling techniques in IoT systems*

UNIT- I Introduction to IoT

Definition and Characteristics of IoT, physical design of IoT, IoT protocols, IoT communication models, IoT Communication APIs, Communication protocols, Embedded Systems, IoT Levels and Templates

UNIT- II Prototyping IoT Objects using Microprocessor/Microcontroller

Working principles of sensors and actuators, setting up the board – Programming for IoT, Reading from Sensors, Communication: communication through Bluetooth, Wi-Fi.

UNIT-III IoT Architecture and Protocols

Architecture Reference Model- Introduction, Reference Model and architecture, IoT reference Model, Protocols- 6LowPAN, RPL, CoAP, MQTT, IoT frameworks- Thing Speak.

UNIT- IV Device Discovery and Cloud Services for IoT

Device discovery capabilities- Registering a device, Deregister a device, Introduction to Cloud Storage models and communication APIs Web-Server, Web server for IoT.

UNIT- V UAV IoT

Introduction to Unmanned Aerial Vehicles/Drones, Drone Types, Applications: Defense, Civil, Environmental Monitoring; UAV elements and sensors- Arms, motors, Electronic Speed Controller(ESC), GPS, IMU, Ultra sonic sensors; UAV Software –Arudpilot, Mission Planner, Internet of Drones(IoD)- Case study FlytBase.

TEXT BOOKS:

1. Vijay Madisetti and Arshdeep Bahga, *Internet of Things (A Hands-on Approach)*, 1st Edition, VPT, 2014.
2. K. Valavanis and George J. Vachtsevanos, *Handbook of Unmanned Aerial Vehicles*, Springer, Boston, Massachusetts: Credo Reference, 2016.

REFERENCE BOOKS:

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, *From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence*, 1st Edition, Academic Press, 2014.
2. Arshdeep Bahga, Vijay Madisetti, *Internet of Things: A Hands-On Approach*, Universities Press, 2014.
3. Pethuru Raj, Anupama C. Raman, *The Internet of Things: Enabling Technologies and Use Cases*, CRC Press.
4. Francis daCosta, *Rethinking the Internet of Things: A Scalable Approach to Connecting Everything*, 1st Edition, Apress Publications, 2013.
5. Cuno Pfister, *Getting Started with the Internet of Things*, O'Reilly Media, 2011. ISBN: 978-1-4493-9357-1.
6. *DGCA RPAS Guidance Manual*, Revision 3, 2020.
7. John Baichtal, *Building Your Own Drones: A Beginners' Guide to Drones, UAVs, and ROVs*, Que Publishing.

ONLINE LEARNING RESOURCES:

1. https://www.arduino.cc/
2. https://www.raspberrypi.org/
3. https://nptel.ac.in/courses/106105166/5
4. https://nptel.ac.in/courses/108108098/4

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(23CE0150) GREEN BUILDINGS
(OPEN ELECTIVE - I)

COURSE OBJECTIVES

The objectives of this course is

1. *To understand the fundamental concepts of green buildings, their necessity, and sustainable features.*
2. *To analyze green building concepts, rating systems, and their benefits in India.*
3. *To apply green building design principles, energy efficiency measures, and renewable energy sources.*
4. *To evaluate air conditioning systems, HVAC designs, and energy modeling for sustainable buildings.*
5. *Assess material conservation strategies, waste management, and indoor environmental quality in green buildings.*

COURSE OUTCOMES

Upon successful completion of the course, students will be able to

1. *Choose appropriate materials and techniques for achieving the goal of green buildings during their design.*
2. *Analyze market opportunities, resources, different practices of green buildings and its effects on environment*
3. *Evaluate energy efficiency in design of green buildings*
4. *Design effective and eco-friendly green buildings*
5. *Apply natural air conditioning and lighting techniques in design of green buildings*
6. *Conserve materials, water and maintain quality of environment in construction of green buildings*

UNIT – I

Introduction to Green Building– Necessity of Green Buildings, Benefits of Green Buildings, Green Building Materials and Equipment in India, Key Requisites for Constructing A GreenBuilding, Important Sustainable Features for Green Buildings.

UNIT – II

Green Building Concepts and Practices– Indian Green Building Council, Green Building Movement in India, Benefits Experienced in Green Buildings, Launch of Green Building Rating Systems, Residential Sector, Market Transformation; Green Building Opportunities and Benefits: Opportunities of Green Buildings, Green Building Features, Material and Resources, Water Efficiency, Optimum Energy Efficiency, Typical Energy-Saving

Approaches in Buildings, LEED India Rating System, and Energy Efficiency.

UNIT – III

Green Building Design– Introduction, Reduction in Energy Demand, Onsite Sources and Sinks, Maximizing System Efficiency, Steps to Reduce Energy Demand and Use Onsite Sources and Sinks, Use of Renewable Energy Sources, Eco-Friendly Captive Power Generation for Factories, Building Requirements.

UNIT – IV

Air Conditioning– Introduction, CII Godrej Green Business Centre, Design Philosophy, Design Interventions, Energy Modeling, HVAC System Design, Chiller Selection, Pump Selection, Selection of Cooling towers, Selection of Air Handling Units, Pre-Cooling of Fresh Air, Interior Lighting Systems, Key Features of The Building, Eco-Friendly Captive Power Generation for Factories, Building Requirements.

UNIT – V

Material Conservation– Handling of Non-Process Waste, Waste Reduction During Construction, Materials With Recycled Content, Local Materials, Material Reuse, Certified Wood, Rapidly Renewable Building Materials and Furniture. Indoor Environment Quality and Occupational Health– Air Conditioning, Indoor Air Quality, Sick Building Syndrome, tobacco Smoke.

TEXT BOOKS

1. Indian Society of Heating Refrigerating and Air conditioning Engineers, *Handbook on Green Practice,* 2025
2. Tom Woolley and Sam Kimings, *Green Building Hand Book,* 2009

REFRENCE BOOKS

1. Trish Riley, *Complete Guide to Green Buildings*.
2. Kent Peterson, *Standard for the Design for High Performance Green Buildings*, 2009.
3. Bureau of Energy Efficiency (BEE) *Energy Conservation Building Code – ECBC 2020*
4. Dr.G.Prabhakaran, *Green Buildings and Eco-Engineering*, Vinsa Publishing, 1st edition, 2025

ONLINE LEARNING RESOURCES:

1. https://archive.nptel.ac.in/courses/105/102/105102195/

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III B.Tech – I Sem.

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(23CE0151) CONSTRUCTION TECHNOLOGY AND MANAGEMENT
(OPEN ELECTIVE - I)

COURSE OBJECTIVES

The objectives of this course is

1. *Understand project management fundamentals, organizational structures, and leadership principles in construction.*
2. *Analyse manpower planning, equipment management, and cost estimation in civil engineering projects.*
3. *Apply planning, scheduling, and project management techniques such as CPM and PERT.*
4. *Evaluate various contract types, contract formation, and legal aspects in construction management.*
5. *Assess safety management practices, accident prevention strategies, and quality management systems in construction.*

COURSE OUTCOMES (COs)

Upon successful completion of the course, students will be able to:

1. *Realize objectives, functions, public relations and management structure in projects*
2. *Plan and care the human resource needed for the project and can fix the rent of the construction equipment and can perform benefit cost analysis.*
3. *Apply different techniques in scheduling of projects.*
4. *Formulate CPM/PERT networks to evaluate the project completion time and also monitor the project during its life cycle.*
5. *Draft a contract document by incorporating various clauses as per Indian Contract act.*
6. *Implement safety measures to reduce construction related accidents*

UNIT – I

Introduction: Project forms, Management Objectives and Functions; Organizational Chart of A Construction Company; Manager's Duties and Responsibilities; Public Relations; Leadership and Team - Work; Ethics, Morale, Delegation and Accountability

UNIT – II

Man and Machine: Man-Power Planning, Training, Recruitment, Motivation, Welfare Measures and Safety Laws; Machinery for Civil Engineering., Earth Movers and Hauling.Costs, Factors Affecting Purchase, Rent, and Lease of Equipment, and Cost Benefit Estimation.

UNIT – III

Planning, Scheduling and Project Management: Planning Stages, Construction Schedules and Project Specification, Monitoring and Evaluation; Bar-Chart, CPM, PERT, Network-formulation and Time Computation.

UNIT – IV

Contracts: Types of Contracts, formation of Contract – Contract Conditions – Contract for Labor, Material, Design, Construction – Drafting of Contract Documents Based On IBRD/ MORTH Standard Bidding Documents – Construction Contracts – Contract Problems – Arbitration and Legal Requirements Computer Applications in Construction Management: Software for Project Planning, Scheduling and Control.

UNIT – V

Safety Management – Implementation and Application of QMS in Safety Programs, ISO 9000 Series, Accident Theories, Cost of Accidents, Problem Areas in Construction Safety, Fall Protection, Incentives, Zero Accident Concepts, Planning for Safety, Occupational Health and Ergonomics.

TEXT BOOKS

1. S. K. Sears, G. A. Sears, and R. H. Clough, *Construction Project Management*, 6th Edition, John Wiley and Sons, 2016.
2. Saleh Mubarak, *Construction Project Scheduling and Control*, 4th Edition, 2019.
3. I. M. Pandey, *Financial Management*, 12th Edition, Pearson India Education Services Pvt. Ltd., 2021.

REFERENCE BOOKS

1. J. O'Brien and F. L. Plotnick, *CPM in Construction Management*, McGraw-Hill, 2010.
2. B. C. Punmia and K. K. Khandelwal, *Project Planning and Control with PERT and CPM*, Laxmi Publications, 2002.
3. Stephens Nunnally, *Construction Methods and Management*, Pearson New International Edition, 8th Edition.
4. M. Rhoden and B. Cato, *Construction Management and Organisational Behaviour*, Wiley-Blackwell, 2016.

ONLINE LEARNING RESOURCES:

1. https://archive.nptel.ac.in/courses/105/104/105104161/
2. https://archive.nptel.ac.in/courses/105/103/105103093/

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III B.Tech – I Sem.

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(23EE0261) ELECTRICAL SAFETY PRACTICES AND STANDARDS
(Open Elective Course-I)

COURSE OBJECTIVES

The objectives of this course is

1. *To understand the basic principles of electrical safety, effects of electric shock, and hazards like arc and blast.*
2. *To learn about safety equipment, overvoltage protection, and fire prevention methods in electrical systems.*
3. *To gain knowledge of grounding practices, bonding methods, and maintaining safe distances in electrical environments.*
4. *To become familiar with electrical safety standards, regulations, and practical safety practices in various installations.*

COURSE OUTCOMES

Upon successful completion of the course, students will be able to:

1. *Understanding the Fundamentals of Electrical Safety*
2. *Identifying and Applying Safety Components*
3. *Analyzing Grounding Practices and Electrical Bonding*
4. *Applying Safety Practices in Electrical Installations and Environments*
5. Identify *various national and international standards and statutory requirements related to electrical safety*
6. *Compare and interpret the applications of different electrical safety codes and regulations*

UNIT I

Introduction to Electrical Safety:

Fundamentals of Electrical safety-Electric Shock- physiological effects of electric current - Safety requirements –Hazards of electricity- Arc - Blast- Causes for electrical failure.

UNIT II

Safety Components:

Introduction to conductors and insulators- voltage classification -safety against over voltages- safety against static electricity-Electrical safety equipment‘s - Fire extinguishers for electrical safety.

UNIT III

Grounding:

General requirements for grounding and bonding- Definitions- System grounding- Equipment grounding - The Earth - Earthing practices- Determining safe approach distance- Determining arc hazard category.

UNIT IV

Safety Practices:

General first aid- Safety in handling hand held electrical appliances tools- Electrical safety in train stations-swimming pools, external lighting installations, medical locations- Case studies.

UNIT V

Standards For Electrical Safety:

Electricity Acts- Rules & regulations- Electrical standards-NFPA 70 E-OSHA standards-IEEE standards-National Electrical Code 2005 – National Electric Safety code NESC-Statutory requirements from electrical inspectorate

TEXT BOOKS

1. Massimo A. G. Mitolo, *Electrical Safety of Low-Voltage Systems*, McGraw-Hill, USA, 2009.
2. Mohamed El-Sharkawi, *Electric Safety: Practice and Standards*, CRC Press, USA, 2014.

REFERENCE BOOKS

1. Kenneth G. Mastrullo and Ray A. Jones, *The Electrical Safety Program Book*, 2nd Edition, Jones & Bartlett Publishers, London, 2011.
2. Palmer Hickman, *Electrical Safety–Related Work Practices*, Jones & Bartlett Publishers, London, 2009.
3. W. Fordham Cooper, *Electrical Safety Engineering*, Butterworth and Company, London, 1986.
4. John Cadick, Mary Capelli-Schellpfeffer, and Dennis K. Neitzel, *Electrical Safety Handbook*, 4th Edition, McGraw-Hill, New York, USA, 2012.

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(23ME0356) SUSTAINBLE ENERGY TECHNOLOGIES
(Open Elective Course-I)

COURSE OBJECTIVES

The objectives of this course is

1. *To demonstrate the importance the impact of solar radiation, solar PV modules*
2. *To understand the principles of storage in PV systems*
3. *To discuss solar energy storage systems and their applications.*
4. *To get knowledge in wind energy and bio-mass*
5. *To gain insights in geothermal energy, ocean energy and fuel cells.*

COURSE OUTCOMES

Upon successful completion of the course, students will be able to:

1. *Illustrate the importance of solar radiation and solar PV modules.*
2. *Discuss the storage methods in PV systems*
3. *Explain the solar energy storage for different applications*
4. *Understand the principles of wind energy, and bio-mass energy.*
5. *Attain knowledge in geothermal energy, ocean energy and fuel cells.*
6. *Explain the principles of sustainability and the environmental, social, economic aspects of energy use.*

UNIT I

SOLAR RADIATION: Role and potential of new and renewable sources, the solar energy option, Environmental impact of solar power, structure of the sun, the solar constant, sun-earth relationships, coordinate systems and coordinates of the sun, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data, numerical problems.

UNIT II

SOLAR PV MODULES AND PV SYSTEMS:

PV Module Circuit Design, Module Structure, Packing Density, Interconnections, Mismatch and Temperature Effects, Electrical and Mechanical Insulation, Lifetime of PV Modules, Degradation and Failure, PV Module Parameters, Efficiency of PV Module, Solar PV Systems-Design of Off Grid Solar Power Plant. Installation and Maintenance.

STORAGE IN PV SYSTEMS:

Battery Operation, Types of Batteries, Battery Parameters, Application and Selection of Batteries for Solar PV System, Battery Maintenance and Measurements, Battery Installation for PV System.

UNIT III

SOLAR ENERGY COLLECTION: Flat plate and concentrating collectors, classification of concentrating collectors, orientation.

SOLAR ENERGY STORAGE AND APPLICATIONS: Different methods, sensible, latent heat and stratified storage, solar ponds, solar applications- solar heating/cooling technique, solar distillation and drying, solar cookers, central power tower concept and solar chimney.

UNIT IV

WIND ENERGY: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, betz criteria, types of winds, wind data measurement.

BIO-MASS: Principles of bio-conversion, anaerobic/aerobic digestion, types of bio-gas digesters, gas yield, utilization for cooking, bio fuels, I.C. engine operation and economic aspects.

UNIT V

GEOTHERMAL ENERGY: Origin, Applications, Types of Geothermal Resources, Relative Merits

OCEAN ENERGY: Ocean Thermal Energy; Open Cycle & Closed Cycle OTEC Plants, Environmental Impacts, Challenges

FUEL CELLS: Introduction, Applications, Classification, Different Types of Fuel Cells Such as Phosphoric Acid Fuel Cell, Alkaline Fuel Cell, PEM Fuel Cell, MC Fuel Cell.

TEXTBOOKS

1. Sukhatme S. P. and J. K. Nayak, *Solar Energy – Principles of Thermal Collection and Storage*, Tata McGraw-Hill, 2008.
2. Khan B. H., *Non-Conventional Energy Resources*, Tata McGraw-Hill, New Delhi, 2006.

REFERENCE BOOKS

1. D. Yogi Goswami, Frank Kreith, and John F. Kreider, *Principles of Solar Engineering*, Taylor & Francis.
2. Ashok V. Desai, *Non-Conventional Energy*, New Age International (P) Ltd.
3. Ramesh and Kumar, *Renewable Energy Technologies*, Narosa Publishing House.
4. G. D. Roy, *Non-Conventional Energy Source*, Standard Publishers.

ONLINE LEARNING RESOURCES:

1. https://nptel.ac.in/courses/112106318
2. https://youtube.com/playlist?list=PLyqSpQzTE6M-ZgdjYukayF6QevPv7WE-r&si=-mwIa2X-SuSiNy13
3. https://youtube.com/playlist?list=PLyqSpQzTE6M-djYukayF6QevPv7WE-r&si=Apfjx6oDfz1Rb_N3

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(23EC0406) ELECTRONIC CIRCUITS
(Open Elective Course-I)

COURSE OBJECTIVES

The objectives of this course is

1. *To understand semiconductor diodes, their characteristics and applications.*
2. *To explore the operation, configurations, and biasing of BJTs.*
3. *To study the operation, analysis, and coupling techniques of BJT amplifiers.*
4. *To learn the operation, applications and uses of feedback amplifiers and oscillators.*
5. *To analyze the characteristics, configurations, and applications of operational amplifiers.*

COURSE OUTCOMES

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

1. *Explain the operation and characteristics of PN junction diodes and special-purpose diodes such as Zener, Tunnel, LED, Varactor, and Photodiode.*
2. *Analyze the behavior of rectifier circuits (half-wave, full-wave, and bridge) with and without filters, and describe clipping and clamping circuits.*
3. *Demonstrate the operation of Bipolar Junction Transistors in different configurations and evaluate suitable biasing techniques for amplifier stability.*
4. *Compare the performance of single and multistage amplifiers using different coupling methods and analyze the simplified hybrid model in CE, CB, and CC configurations.*
5. *Classify feedback amplifiers and oscillators, and construct basic RC and LC oscillator circuits to meet required oscillation conditions.*
6. *Apply operational amplifier concepts to design and implement analog signal processing applications such as summing amplifiers, integrators, differentiators, and comparators.*

UNIT-I

Semiconductor Diode and Applications: Introduction, PN junction diode – structure, operation and VI characteristics, Half-wave, Full-wave and Bridge Rectifiers with and without Filters, Positive and Negative Clipping and Clamping circuits (Qualitative treatment only).

Special Diodes: Zener and Avalanche Breakdowns, VI Characteristics of Zener diode, Zener diode as voltage regulator, Construction, operation and VI characteristics of Tunnel Diode, LED, Varactor Diode, Photo Diode

UNIT-II

Bipolar Junction Transistor (BJT): Principle of Operation, Common Emitter, Common Base and Common Collector Configurations, Transistor as a switch and Amplifier, Transistor Biasing and Stabilization - Operating point, DC & AC load lines, Biasing - Fixed Bias, Self Bias, Bias Stability, Bias Compensation using Diodes.

UNIT-III

Single stage amplifiers: Classification of Amplifiers - Distortion in amplifiers, Analysis of CE, CC and CB configurations with simplified hybrid model.

Multistage amplifiers: Different Coupling Schemes used in Amplifiers - RC coupled amplifiers, Transformer Coupled Amplifier, Direct Coupled Amplifier; Multistage RC coupled BJT amplifier (Qualitative treatment only).

UNIT-IV

Feedback amplifiers: Concepts of feedback, Classification of feedback amplifiers, Effect of feedback on amplifier characteristics, Voltage Series, Voltage Shunt, Current Series and Current Shunt Feedback Configurations (Qualitative treatment only).

Oscillators: Classification of oscillators, Condition for oscillations, RC Phase shift Oscillators, Generalized analysis of LC Oscillators-Hartley and Colpitts Oscillators, Wien Bridge Oscillator.

UNIT-V

Op-amp: Classification of IC'S, basic information of Op-amp, ideal and practical Op-amp, 741 op-amp and its features, modes of operation-inverting, non-inverting, differential.

Applications of op-amp : Summing, scaling and averaging amplifiers, Integrator, Differentiator, phase shift oscillator and comparator.

TEXTBOOKS

1. J. Millman and Christos C. Halkias, *Electronic Devices and Circuits*, 3rd Edition, Tata McGraw-Hill, 2006.
2. David A. Bell, *Electronic Devices and Circuit Theory*, 5th Edition, Oxford University Press, 2008.

REFERENCE BOOKS

1. R. L. Boylestad, Louis Nashelsky, and K. Lal Kishore, *Electronic Devices and Circuit Theory*, 12th Edition, Pearson, 2006.
2. N. Salivahanan and N. Suresh Kumar, *Electronic Devices and Circuits*, 3rd Edition, Tata McGraw-Hill, 2012.
3. S. Sedra and K. C. Smith, *Microelectronic Circuits*, 5th Edition, Oxford University Press.

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III B.Tech – I Sem.

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(23HS0855) MATHEMATICS FOR MACHINE LEARNING AND AI
(Open Elective Course-I)

COURSE OBJECTIVES

The objectives of this course is

1. *To provide a strong mathematical foundation for understanding and developing AI/ML algorithms.*
2. *To enhance the ability to apply linear algebra, probability, and calculus in AI/ML models.*
3. *To equip students with optimization techniques and graph-based methods used in AI applications.*
4. *To develop critical problem-solving skills for analysing mathematical formulations in AI/ML.*

COURSE OUTCOMES

After successful completion of this course, the students should be able to:

1. *Apply linear algebra concepts to ML techniques like PCA and regression.*
2. *Analyze probabilistic models and statistical methods for AI applications.*
3. *Implement optimization techniques for machine learning algorithms*
4. *Apply the fundamental concepts of Gradient Descent in machine learning to choose*
5. *the right optimization algorithm*
6. *Utilize vector calculus and transformations in AI-based models.*
7. *Develop graph-based AI models using mathematical representations.*

UNIT I: Linear Algebra for Machine Learning

Review of Vector spaces, basis, linear independence, Vector and matrix norms, Matrix factorization techniques, Eigenvalues, eigenvectors, diagonalization, Singular Value Decomposition (SVD) and Principal Component Analysis (PCA).

UNIT II: Probability and Statistics for AI

Probability distributions: Gaussian, Binomial, Poisson. Bayes‘ Theorem, Maximum Likelihood Estimation (MLE), and Maximum a Posteriori (MAP).Entropy and Kullback-Leibler (KL) Divergence in AI, Cross entropy loss, Markov chains.

UNIT III: Optimization Techniques for ML

Multivariable calculus: Gradients, Hessians, Jacobians. Constrained optimization: Lagrange multipliers and KKT conditions. Gradient Descent and its variants (Momentum, Adam) Newton‘s method, BFGS method.

UNIT IV: Vector Calculus & Transformations

Vector calculus: Gradient, divergence, curl. Fourier Transform & Laplace Transform in ML applications.

UNIT V: Graph Theory for AI

Graph representations: Adjacency matrices, Laplacian matrices. Bayesian Networks & Probabilistic Graphical Models. Introduction to Graph Neural Networks (GNNs).

TEXTBOOKS

1. Marc Peter Deisenroth, A. Aldo Faisal, and Cheng Soon Ong, *Mathematics for Machine Learning*, Cambridge University Press, 2020.
2. Christopher Bishop, *Pattern Recognition and Machine Learning*, Springer.

REFERENCE BOOKS

1. Gilbert Strang, *Linear Algebra and Its Applications*, Cengage Learning, 2016.
2. Jonathan Gross and Jay Yellen, *Graph Theory and Its Applications*, CRC Press, 2018.

WEB REFERENCES:

1. MIT– Mathematics for Machine Learning https://ocw.mit.edu
2. Stanford CS229 – Machine Learning Course https://cs229.stanford.edu/
3. DeepAI – Mathematical Foundations for AI https://deepai.org

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(23HS0842) MATERIALS CHARACTERIZATION TECHNIQUES
(Open Elective Course-I)

COURSE OBJECTIVES

The objectives of this course is

1. *To provide exposure to different characterization techniques.*
2. *To explain the basic principles and analysis of different spectroscopic techniques.*
3. *To elucidate the working of Scanning electron microscope - Principle, limitations and applications.*
4. *To illustrate the working of the Transmission electron microscope (TEM) - SAED patterns and its applications.*
5. *To educate the uses of advanced electric and magnetic instruments for characterization.*

COURSE OUTCOMES

After successful completion of this course, the students should be able to:

1. *Analyze the crystal structure and crystallite size by various methods*
2. *Analyze the morphology of the sample by using a Scanning Electron Microscope.*
3. *Analyze the morphology and crystal structure of the sample by using Transmission Electron Microscope*
4. *Explain the differences between SEM and TEM*
5. *Explain the principle and experimental arrangement of various spectroscopic techniques*
6. *Identify the construction and working principle of various Electrical & Magnetic Characterization technique*

UNIT I Structure analysis by Powder X-Ray Diffraction

Introduction, Bragg‘s law of diffraction, Intensity of Diffracted beams, Factors affecting Diffraction, Intensities, Structure of polycrystalline Aggregates, Determination of crystal structure, Crystallite size by Scherer and Williamson-Hall (W-H) Methods, Small angle X-ray scattering (SAXS) (in brief).

UNIT II Microscopy technique -1 –Scanning Electron Microscopy (SEM)

Introduction, Principle, Construction and working principle of Scanning Electron Microscopy, Specimen preparation, Different types of modes used (Secondary Electron and Backscatter Electron), Advantages, limitations and applications of SEM.

UNIT III Microscopy Technique -2 - Transmission Electron Microscopy (TEM)

Construction and Working principle, Resolving power and Magnification, Bright and dark fields, Diffraction and image formation, Specimen preparation, Selected Area Diffraction, Applications of Transmission Electron Microscopy, Difference between SEM and TEM, Advantage and Limitations of Transmission Electron Microscopy.

UNIT IV Spectroscopy techniques

Principle, Experimental arrangement, Analysis and advantages of the spectroscopic techniques (i) UV-Visible spectroscopy (ii) Raman Spectroscopy, (iii) Fourier Transform infrared (FTIR) spectroscopy, (iv) X-ray photoelectron spectroscopy (XPS).

UNIT V Electrical & Magnetic Characterization techniques

Electrical Properties analysis techniques (DC conductivity, AC conductivity) Activation Energy, Effect of Magnetic field on the electrical properties (Hall Effect). Magnetization measurement by induction method, Vibrating sample Magnetometer (VSM) and SQUID.

TEXTBOOKS

1. Yang Leng, *Material Characterization: Introduction to Microscopic and Spectroscopic Methods*, John Wiley & Sons (Asia) Pvt. Ltd., 2013.
2. David Brandon and Wayne D. Kaplan, *Microstructural Characterization of Materials*, John Wiley & Sons Ltd., 2008.

REFERENCE BOOKS

1. Colin Neville Banwell and Elaine M. McCash, *Fundamentals of Molecular Spectroscopy*, 4th Edition, Tata McGraw-Hill, 2008.
2. Bernard Dennis Cullity and Stuart R. Stock, *Elements of X-Ray Diffraction*, Prentice Hall, 2001.
3. Khalid Sultan, *Practical Guide to Materials Characterization: Techniques and Applications*, Wiley, 2021.
4. Sam Zhang, Lin Li, and Ashok Kumar, *Materials Characterization Techniques*, CRC Press, 2008.

NPTEL COURSES LINK

1. https://nptel.ac.in/courses/115/103/115103030/
2. https://nptel.ac.in/content/syllabus_pdf/113106034.pdf
3. https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-mm08/

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(23HS0846) INTRODUCTION TO QUANTUM MECHANICS
(Open Elective Course-I)

COURSE OBJECTIVES

The objectives of this course is

1. *To understand the fundamental differences between classical and quantum mechanics.*
2. *To study wave-particle duality, uncertainty principle, and their implications*
3. *To learn and apply Schrödinger equations to basic quantum systems*
4. *To use operator formalism and mathematical tools in quantum mechanics*
5. *To explore angular momentum, spin and their quantum mechanical representations.*

COURSE OUTCOMES

After successful completion of this course, the students should be able to:

1. *Explain the key principles of quantum mechanics and wave-particle duality.*
2. *Apply Schrödinger equations to solve one-dimensional quantum problems*
3. *Analyze various types of operators.*
4. *Solve quantum mechanical problems using operator and matrix methods*
5. *Evaluate quantum states using Dirac notation and expectation values.*
6. *Analyze angular momentum and spin systems using Pauli matrices and operators.*

UNIT- I PRINCIPLES OF QUANTUM MECHANICS

Introduction: Limitations of classical Mechanics, black body radiation and origin of quantum theory of radiation.Wave-particle duality: de Broglie Hyphothesis, Heisenberg uncertainty principle. Postulates of quantum mechanics, Physical significance of wave function (ψ), Orthogonal, Normalized and Orthonormal functions. Schrödinger time independent and time dependent wave equation, Solution of the time dependent Schrödinger equation, Concept of stationary states.

UNIT- II ONE DIMENSIONAL PROBLEMS AND SOLUTIONS

Potential step – Reflection and Transmission at the interface. Potential well: Square well potential with rigid walls, Square well potential with finite walls. Potential barrier and Periodic potential and Harmonic oscillator- Energy eigen functions and eigen values.

UNIT-III OPERATOR FORMALISM

Operators, Operator Algebra, Eigen values and Eigen vectors, Matrix representation of wave functions and linear operators.

UNIT- IV MATHEMATICAL TOOLS FOR QUANTUM MECHANICS

The concept of row and column matrices, Matrix algebra,Hermitian operators – definition. Dirac's bra and ket notation, Expectation values, Heisenberg (operator) representation of harmonic oscillator, Ladder operators and their significance.

UNIT- V ANGULAR MOMENTUM AND SPIN

Angular momentum operators: Definition. Eigen functions and Eigen values of AM operators. Matrix representation of angular momentum operators, System with spin half(1/2), Spin angular momentum, Pauli's spin matrices. Clebsch-Gordon coefficients. Rigid Rotator: Eigen functions and Eigen values.

TEXT BOOKS

1. A. Messaia, *Quantum Mechanics*, Vol 1, Noth-Holland Pub. Co., Amsterdam,(1961).
2. P.M.Mathews and K.Venkatesam, *A Text Book of Quantum Mechanics*, Tata McGraw Hill, New Delhi,(1976).
3. R.H.Dicke and J.P.Witke, *Introduction to Quantum Mechanics*, Addison-Wisley Pub.Co.Inc.,London, (1960).
4. S.L.Gupta, V.Kumar, H.V.Sarama and R.C.Sharma, *Quantum Mechanics*, Jai Prakash Nath& Co, Meerut, (1996).

REFERENCE BOOKS

1. Fuel Cell Handbook, 7th Edition, U.S. Department of Energy (EG&G Technical Services and Corporation).
2. Quantum Mechanics. L.I. Schiff, McGraw Hill Book Co., Tokyo, (1968).
3. Introduction to Quantum Mechanics. Richard L. Liboff, Pearson Education Ltd (Fourth Edn.) 2003.

NPTEL COURSES LINK

1. https://archive.nptel.ac.in/courses/115/101/115101107/
2. https://archive.nptel.ac.in/courses/122/106/122106034/
3. https://nptel.ac.in/courses/115106066

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(23HS0806) CHEMISTRY OF ENERGY SYSTEMS
(Open Elective Course -I)

COURSE OBJECTIVES

The objectives of this course is

1. *To make the student understand basic electrochemical principles such as standard electrode potentials, emf and applications of electrochemical principles in the design of batteries.*
2. *To understand the basic concepts of processing and limitations of fuel cells and their applications.*
3. *To impart knowledge to the students about fundamental concepts of photochemical cells, reactions and applications.*
4. *Necessity of harnessing alternate energy resources such as solar energy and its basic concepts.*
5. *To impart knowledge to the students about fundamental concepts of hydrogen storage in different materials and liquefaction method.*

COURSE OUTCOMES

After successful completion of this course, the students should be able to:

1. *Understand the problems based on electrode potential and concept of batteries.*
2. *Apply fuel technology in various energy and engineering contexts.*
3. *Analyze the design and working mechanisms and applications of photo electrochemical cells.*
4. *Analyze the advantages of photoelectric catalytic process such as high efficiency, low environmental impact and renewable energy applications.*
5. *Apply the electrochemical principles to photo voltaic cell, solar power and solar cells.*
6. *Analyze various methods for storage of hydrogen fuel.*

UNIT-I

Electrochemical Systems: Galvanic cell, Nernst equation, standard electrode potential, application of EMF, electrical double layer, polarization, Batteries- Introduction ,Lead-acid , Nickel- cadmium, Lithium ion batteries and their applications**.**

UNIT-II

Fuel Cells: Fuel cell- Introduction, Basic design of fuel cell, working principle, Classification of fuel cells, Polymer electrolyte membrane (PEM) fuel cells, Solid-oxide fuel cells (SOFC), Fuel cell efficiency and applications.

UNIT-III

Photo and Photo electrochemical Conversions: Photochemical cells Introduction and applications of photochemical reactions, specificity of photo electrochemical cell, advantage of photoelectron catalytic conversions and their applications.

UNIT-IV

Solar Energy: Introduction and prospects, photovoltaic (PV) technology, concentrated solar power (CSP), Solar cells and applications.

UNIT-V

Hydrogen Storage: Hydrogen storage and delivery: State-of-the art, Established technologies, Chemical and Physical methods of hydrogen storage, Compressed gas storage, Liquid hydrogen storage, Other storage methods, Hydrogen storage in metal hydrides, metal organic frameworks (MOF), Metal oxide porous structures, hydrogel , and Organic hydrogen carriers.

TEXT BOOKS

1. Ira N. Levine, Physical Chemistry.
2. B. S. Bahl, Arun Bahl, and G. D. Tuli, *Essentials of Physical Chemistry*.
3. Peter Atkins and Tina Overton, *Inorganic Chemistry* (also known as *Shriver and Atkins' Inorganic Chemistry*), Oxford University Press.

REFERENCE BOOKS

1. *Fuel Cell* Handbook, 7th Edition, U.S. Department of Energy (EG&G Technical Services and Corporation).
2. Arvind Tiwari and Shyam, *Handbook of Solar Energy and Applications*.
3. Klaus Jäger, Olindo Isabella, Arno Smets, René van Swaaij, and Miro Zeman, *Solar Energy: Fundamentals, Technology and Systems*.
4. Levine Klebanoff, *Hydrogen Storage: Technologies and Materials*

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III B.Tech – I Sem.

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(23HS0821) ENGLISH FOR COMPETITIVE EXAMINATIONS
(Open Elective Course-I)

COURSE OBJECTIVES

The objectives of this course is

1. *To enable the students to learn about the structure of competitive English*
2. *To understand the grammatical aspects and identify the errors*
3. *To enhance verbal ability and identify the errors*
4. *To improve word power to answer competitive challenges*
5. *To make them ready to crack competitive exams*

COURSE OUTCOMES (CO):

By the end of the program students will be able to

1. *Identify the basics of English grammar and its importance*
2. *Explain the use of grammatical structures in sentences*
3. *Demonstrate the ability to use various concepts in grammar and vocabulary and their applications in everyday use and in competitive exams*
4. *Analyze an unknown passage and reach conclusions about it.*
5. *Choose the appropriate form of verbs in framing sentences*
6. *Develop speed reading and comprehending ability thereby perform better in competitive exams*

UNIT - I GRAMMAR-1

Nouns-classification-errors-Pronouns-types-errors-Adjectives-types-errors-Articles-definite-indefinite - Degrees of Comparison-Adverbs-types- errors-Conjunctions-usage-repositions-usage-Tag Questions, types-identifying errors- Practice.

UNIT- II GRAMMAR-2

Verbs-tenses- structure-usages- negatives- positives- time adverbs-Sequenceof tenses--If Clause-Voice-active voice and passive voice- reported Speech-Agreement- subject and verb-Modals-Spotting Errors-Practices

UNIT- III VERBAL ABILITY

Sentence completion-Verbal analogies-Word groups-Instructions-Critical reasoning-Verbal deduction- Select appropriate pair-Reading Comprehension-Paragraph-Jumbles-Selecting the proper statement by reading a given paragraph.

UNIT – IV READING COMPREHENSION AND VOCUBULARY

Competitive Vocabulary :Word Building – Memory techniques-Synonyms, Antonyms, Affixes-Prefix &Suffix-One word substitutes-Compound words-Phrasal Verbs-Idioms and Phrases-Homophones-Linking Words-Modifiers-Intensifiers - Mastering Competitive Vocabulary-Cracking the unknowing passage-speed reading techniques- Skimming & Scanning-types of answering–Elimination methods

UNIT - V WRITING FOR COMPETITIVE EXAMINATIONS

Punctuation- Spelling rules- Word order-Sub Skills of Writing- Paragraph meaning-salient features-types - Note-making, Note-taking, summarizing-precise writing- Paraphrasing-Expansion of proverbs- Essay writing-types

TEXTBOOKS

1. Wren & Martin, *English for Competitive Examinations*, S. Chand & Co., 2021.
2. *Objective English for Competitive Examination*, Tata McGraw Hill, New Delhi, 2014.

REFERENCE BOOKS

1. Hari Mohan Prasad, *Objective English for Competitive Examination*, Tata McGraw Hill, New Delhi, 2014.
2. Philip Sunil Solomon, *English for Success in Competitive Exams*, Oxford University Press, 2016.
3. Shalini Verma, *Word Power Made Handy*, S. Chand Publications.
4. Neira, Anjana Dev & Co., *Creative Writing: A Beginner's Manual*, Pearson Education India, 2008.
5. Abhishek Jain, *Vocabulary Learning Techniques Vol. I & II*, RR Global Publishers, 2013.
6. Michel Swan, *Practical English Usage*, Oxford University Press, 2006.

ONLINE RESOURCES

1. https://www.grammar.cl/english/parts-of-speech.htm
2. https://academicguides.waldenu.edu/writingcenter/grammar/partsofspeech
3. https://learnenglish.britishcouncil.org/grammar/english-grammar reference/active-passive-voice
4. https://languagetool.org/insights/post/verb-tenses/
5. https://www.britishcouncil.in/blog/best-free-english-learning-resources-british-ouncil

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(23HS0822) ENTREPRENEURSHIP AND NEW VENTURE CREATION
(Open Elective Course-I)

COURSE OBJECTIVES

The objectives of this course is

1. *To foster an entrepreneurial mind-set for venture creation and entrepreneurial leadership*
2. *To encourage creativity and innovation*
3. *To enable them to learn pitching and presentation skills*
4. *To make the students understand MVP development and validation techniques to determine Product-Market fit and Initiate Solution design, Prototype for Proof of Concept*
5. *To enhance the ability of analyzing Customer and Market segmentation, estimate Market size, develop and validate Customer Persona*

COURSE OUTCOMES

By the end of the program students will be able to

1. *Develop an entrepreneurial mindset and appreciate the concept of entrepreneurship*
2. *Comprehend the process of problem-opportunity identification through design thinking, identify market potential and customers while developing a compelling value proposition solution*
3. *Analyze and refine business models to ensure sustainability and profitability*
4. *Build Prototype for Proof of Concept and validate MVP of their practice venture idea*
5. *Create business plan, conduct financial analysis and feasibility analysis to assess the financial viability of a venture*
6. *Prepare and deliver an investible pitch deck of their practice venture to attract stakeholders*

UNIT I

Entrepreneurship Fundamentals and context - Meaning and concept, attributes and mindset of entrepreneurial and entrepreneurial leadership, role models in each and their role in economic development. An understanding of how to build entrepreneurial mindset, skill sets, attributes and networks while on campus.

Core Teaching Tool: Simulation, Game, Industry Case Studies (Personalized for students – 16 industries to choose from), Venture Activity

UNIT II

Problem & Customer Identification - Understanding and analysing the macro-Problem and Industry perspective technological, socioeconomic and urbanization trends and their

implication on new opportunities Identifying passion- identifying and defining problem using Design thinking principles- Analysing problem and validating with the potential customer - Understanding customer segmentation, creating and validating customer personas.
Core Teaching Tool: Several types of activities including Class, game, Gen AI, _Get out of the Building‘and Venture Activity.

UNIT III Solution design, Prototyping & Opportunity Assessment and Sizing
Understanding Customer Jobs-to-be-done and crafting innovative solution design to map to customer‘s needs and create a strong value proposition. Understanding prototyping and Minimum Viable product (MVP) - Developing a feasibility prototype with differentiating value, features and benefits - Assess relative market position via competition analysis - Sizing the market and assess scope and potential scale of the opportunity.
Core Teaching Tool: Venture Activity, no-code Innovation tools, Class activity

UNIT-IV
Business & Financial Model, Go-to-Market Plan - Introduction to Business model and types, Lean approach, 9 block lean canvas model, riskiest assumptions to Business models. Importance of Build - Measure – Lean approach.
Business planning: components of Business plan- Sales plan, People plan and financial plan.
Financial Planning: Types of costs, preparing a financial plan for profitability using financial template, understanding basics of Unit economics and analysing financial performance.
Introduction to Marketing and Sales, Selecting the Right Channel, creating digital presence, building customer acquisition strategy. Choosing a form of business organization specific to your venture
Identifying sources of funds: Debt& Equity, Map the Start-up Life-cycle to Funding Options.
Core Teaching Tool: Founder Case Studies – Sama and Securely Share; Class activity and discussions; Venture Activities.

UNIT-V
Scale Outlook and Venture Pitch readiness - Understand and identify potential and aspiration for scale vis-a-vis your venture idea. Persuasive Storytelling and its key components. Build an Investor ready pitch deck.
Core Teaching Tool: Expert talks; Cases; Class activity and discussions; Venture Activities.

TEXT BOOKS
1. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Sabyasachi Sinha Entrepreneurship, McGrawHill, 11th Edition.(2020)
2. Ries, E. The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses. Crown Business,(2011).

3. Osterwalder, A., & Pigneur, Y. Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers. John Wiley & Sons. (2010).

REFERENCES

1. Simon Sinek,Start with Why, Penguin Books limited. (2011)
2. Brown Tim,Change by Design Revised & Updated: How Design Thinking
3. Transforms Organizations and Inspires Innovation, Harper Business.(2019)
4. Namita Thapar (2022) The Dolphin and the Shark: Stories on Entrepreneurship, Penguin Books Limited
5. Saras D. Sarasvathy, (2008) Effectuation: Elements of Entrepreneurial Expertise, Elgar Publishing *Ltd.*

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(23CS1102) DATA SCIENCE LAB

COURSE OBJECTIVES

The objectives of this course:

1. *Understand the python libraries for data science.*
2. *Understand the basic Statistical and Probability*
3. *Measures for data Science. To learn descriptive analytics on the benchmark data sets.*
4. *Apply correlation and regression analytics on standard data sets.*
5. *Present and interpret data using visualization in python.*

COURSE OUTCOMES (COs)

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

1. *Write, test and debug simple Python Programs*
2. *Develop different type of Arrays and Matrix functions by importing NumPy.*
3. *Perform various Statistical and Comparison operation on arrays and matrix.*
4. *Visualize data using graphs by importing Matplotlib*
5. *Perform graphical representation through visualization tools*
6. *Handle and transform data in Data Pre-Processing.*

LIST OF EXPERIMENTS:

1. Download, install and explore the features of NumPy, SciPy, Jupyter, Statsmodels and Pandas packages.
2. Working with Numpy arrays
3. Working with Pandas data frames
4. Reading data from text files, Excel and the web and exploring various commands for doing descriptive analytics on the Iris data set.
5. Use the diabetes data set from UCI and Pima Indians Diabetes data set for performing the following:
   a. Univariate analysis: Frequency, Mean, Median, Mode, Variance, Standard Deviation, Skewness and Kurtosis.
   b. Bivariate analysis: Linear and logistic regression modeling
   c. Multiple Regression analysis
   d. Also compare the results of the above analysis for the two data sets.
6. Apply and explore various plotting functions on UCI data sets.
   a. Normal curves
   b. Density and contour plots

c. Correlation and scatter plots
d. Histograms
e. Three dimensional plotting

7. Visualizing Geographic Data with Basemap.

REFERENCES

1. *Data visualization with python: create an impact with meaningful data insights using interactive and engaging visuals,* Mario Dobler, Tim Grobmann, *Packt Publications, 2019*
2. *Practical Tableau: 100 Tips, Tutorials, and Strategies from a Tableau Zen Master*, Ryan Sleeper,*Oreilly Publications, 2018*.
3. *Data Visualization with R: 111 Examples by* Thomas Rahlf, *Springer, 2020.*

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III B.Tech – I Sem.

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(23CS1002) COMPUTER NETWORKS & OPERATING SYSTEMS LAB
(Common to CIC & CIA & CAD)

COURSE OBJECTIVES:

The objectives of this course

1. *To understand 1.the different types of networks*
2. *To discuss the software and hardware components of a network*
3. *To enlighten the working of networking commands supported by operating system*
4. *To familiarize the use of networking functionality supported by JAVA*
5. *To familiarize with computer networking tools.*

COURSE OUTCOMES (CO):

After completion of the course, students will be able to

1. *Understand the network configurations using network commands.*
2. *Analyze the network topology using Packet Tracer Software.*
3. *Create the applications using JAVA RMI and JAVA TCP, UDP sockets.*
4. Analyze the programs using UNIX operating system calls *like fork, exec, etc..,.*
5. *Evaluate CPU scheduling and Page replacement algorithms*
6. *Analyze the Bankers Algorithms to Avoid Dead Locks*

LIST OF ACTIVITIES/EXPERIMENTS

COMPUTER NETWORKS:

1. Study different types of Network cables (Copper and Fiber) and prepare cables (Straight and Cross) to connect Two or more systems. Use crimping tool to connect jacks. Use LAN tester to connect the cables.

- Install and configure Network Devices: HUB, Switch and Routers. Consider both manageable and non-manageable switches. Do the logical configuration of the system. Set the bandwidth of different ports.
- Install and Configure Wired and Wireless NIC and transfer files between systems in Wired LAN and Wireless LAN. Consider both adhoc and infrastructure mode of operation.

2. Work with the commands Ping, Tracert, Ipconfig, pathping, telnet, ftp, getmac, ARP, Hostname, Nbtstat, netdiag, and Nslookup
3. Use Packet tracer software to build network topology and configure using Distance vector routing protocol.
4. Use Packet tracer software to build network topology and configure using Link State routing protocol.
5. Using JAVA RMI Write a program to implement Basic Calculator.

6. Implement a Chatting application using JAVA TCP and UDP sockets.
7. Hello command is used to know whether the machine at the other end is working or not. Echo command is used to measure the round-trip time to the neighbor. Implement Hello and Echo commands using JAVA.
8. Using Wireshark perform the following operations:

- Inspect HTTP Traffic
- Inspect HTTP Traffic from a Given IP Address,
- Inspect HTTP Traffic to a Given IP Address,
- Reject Packets to Given IP Address,
- Monitor Apache and MySQL Network Traffic.

OPERATING SYSTEMS:

Experiments covering the Topics:

- UNIX fundamentals, commands & system calls
- CPU Scheduling algorithms, thread processing
- IPC, semaphores, monitors, deadlocks
- Page replacement algorithms, file allocation strategies
- Memory allocation strategies

Sample Experiments:

1. Practicing of Basic UNIX Commands.
2. Write programs using the following UNIX operating system calls fork, exec, getpid, exit, wait, close, stat, opendir and readdir
3. Simulate the following CPU scheduling algorithms
   a) FCFS b) SJF c) Priority d) Round Robin
4. Write a program to solve producer-consumer problem using Semaphores.
5. Implement the following memory allocation methods for fixed partition
   a) First fit b) Worst fit c) Best fit
6. Simulate the following page replacement algorithms
   a) FIFO b) LRU c) LFU
7. Simulate Paging Technique of memory management.
8. Implement Bankers Algorithm for Dead Lock avoidance

TEXT BOOKS:

1. Shivendra S.Panwar, Shiwen Mao, Jeong-dong Ryoo, and Yihan Li, "*TCP/IP Essentials: A Lab-Based Approach*", Cambridge University Press, 2004.
2. Operating System Concepts, Silberschatz A, Galvin P B, Gagne G, 10th Edition, Wiley, 2018.

REFERENCES:

1. Cisco Networking Academy, "CCNA1 and CCNA2 Companion Guide", Cisco Networking Academy Program, 3rd edition, 2003.
2. Elloitte Rusty Harold, "Java Network Programming", 3rd edition, O'REILLY, 2011.

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(23CS0551) FULL STACK DEVELOPMENT- II
(Skill Enhancement Course)

COURSE OBJECTIVES

The objectives of this course is

1. *Make use of Modern- day JavaScript with ES6 standards for designing Dynamic web pages*
2. *Building robust & responsive User Interfaces using popular JavaScript library* ***React.js****'. Building robust backend APIs using* ***Express. js****'*
3. *Establishing the connection between frontend (React)User interfaces and backend APIs (Express) with Data Bases(My SQL)*
4. *Familiarize students with GitHub for remote repository hosting and collaborative development*

COURSE OUT COMES

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

1. *Building fast and interactive UIs*
2. *Applying Declarative approach for developing web apps*
3. *Understanding ES6 features to embrace modern JavaScript*
4. *Building reliable APIs with Express. Js*
5. *Integrate front-end and back-end components to create full-stack web applications.*
6. *Deploy full-stack applications with database integration and version control tools*

EXPERIMENTS COVERING THE TOPICS

1. Introduction to DOM (Document Object Model), Ecma Script (ES6) standards and features like Arrow functions, Spread operator, Rest operator, Type coercion, Type hoisting, String literals, Array and Object Destructuring.
2. Basics of React. js like React Components, JSX, Conditional rendering Differences between Real DOM and Virtual DOM.
3. Important React.js concepts like React hooks, Props, React forms, Fetch API, Iterative rendering using JavaScript map() function.
4. JavaScript runtime environment node. js and its uses, Express. js and Routing, Micro-Services architecture and MVC architecture, database connectivity using (My SQL)
5. Introduction to My SQL, setting up MySQL and configuring, Databases, My SQL queries, subqueries, creating My SQL driver for database connectivity to Express. js server.

6. Introduction to Git and GitHub and upload project& team collaboration

SAMPLE EXPERIMENTS

1. **Introduction to Modern JavaScript and DOM**
   a) Write a JavaScript program to link JavaScript file with the HTML page
   b) Write a JavaScript program to select the elements in HTML page using selectors
   c) Write a JavaScript program to implement the event listeners
   d) Write a JavaScript program to handle the click events for the HTML button elements
   e) Write a JavaScript program to With three types of functions
      i. Function declaration
      ii. Function definition
      iii. Arrow functions
2. **Basics of React. js**
   a) Write a React program to implement a counter button using react class components
   b) Write a React program to implement a counter button using react functional components
   c) Write a React program to handle the button click events in functional component
   d) Write a React program to conditionally render a component in the browser
   e) Write a React program to display text using String literals

   Important concepts of React. js
   a) Write a React program to implement a counter button using React use State hook
   b) Write a React program to fetch the data from an API using React use Effect hook
   c) Write a React program with two react components sharing data using Props.
   d) Write a React program to implement the forms in react
   e) Write a React program to implement the iterative rendering using map() function.
3. **Introduction to Node. js and Express. js**
   a) Write a program to implement the _hello world‘ message in the route through the browser using Express
   b) Write a program to develop a small website with multiple routes using Express. js
   c) Write a program to print the _hello world‘ in the browser console using Express. js
   d) Write a program to implement the CRUD operations using Express. js
   e) Write a program to establish the connection between API and Database using Express – My SQL driver
4. **Introduction to My SQL**
   a) Write a program to create a Database and table inside that database using My SQL Command line client
   b) Write a My SQL queries to create table, and insert the data, update the data in the table
   c) Write a My SQL queries to implement the subqueries in the My SQL command line client
   d) Write a My SQL program to create the script files in the My SQL workbench
   e) Write a My SQL program to create a database directory in Project and initialize

a database. sql file to integrate the database into API

TEXTBOOKS

1. Jon Duckett, *Web Design with HTML, CSS, JavaScript and jQuery*, Wiley.
2. Nicholas C. Zakas, *Professional JavaScript for Web Developers*, Wiley.
3. John Dean, *Web Programming with HTML5, CSS, and JavaScript*, Jones & Bartlett Learning, 2019.
4. Vasan Subramanian, *Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node*, 2nd Edition, Apress (O'Reilly).
5. Robin Nixon, *Learning PHP, MySQL, JavaScript, CSS & HTML5: A Step-by-Step Guide to Creating Dynamic Websites*, O'Reilly.
6. Azat Mardan, *Full Stack JavaScript: Learn Backbone.js, Node.js and MongoDB*, 2015.

REFERENCE BOOKS

1. Eric Bush, *Full-Stack JavaScript Development*.
2. Robert W. Sebesta, *Programming the World Wide Web*, 7th Edition, Pearson, 2013.
3. Tomasz Dyl, Kamil Przeorski, and Maciej Czarnecki, *Mastering Full Stack React Web Development*, 2017.

ONLINE LEARNING RESOURCES

1. https://ict.iitk.ac.in/product/full-stack-developer-html5-css3-js-bootstrap-php-4/
2. https://www.w3schools.com/html
3. https://www.w3schools.com/css
4. https://www.w3schools.com/js/
5. https://www.w3schools.com/nodejs
6. https://www.w3schools.com/typescript

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(23EC0417) Tinkering Lab
(Common to All Branches)

The aim of tinkering lab for engineering students is to provide a hands-on learning environment where students can explore, experiment, and innovate by building and testing prototypes. These labs are designed to demonstrate practical skills that complement theoretical knowledge.

COURSE OBJECTIVES

The objectives of this course is

1. *Encourage Innovation and Creativity*
2. *Provide Hands-on Learning and Impart Skill Development*
3. *Foster Collaboration and Teamwork*
4. *Enable Interdisciplinary Learning, Prepare for Industry and Entrepreneurship*
5. *Impart Problem-Solving mind-set*

These labs bridge the gap between academia and industry, providing students with the practical experience. Some students may also develop entrepreneurial skills, potentially leading to start- ups or innovation-driven careers. Tinkering labs aim to cultivate the next generation of engineers by giving them the tools, space, and mind-set to experiment, innovate, and solve real-world challenges.

COURSE OUTCOMES

The students will be able to experiment, innovate, and solve real-world challenges

LIST OF EXPERIMENTS:

1) Make your own parallel and series circuits using breadboard for any application of your choice.
2) Design and 3D print a Walking Robot
3) Design and 3D Print a Rocket.
4) Temperature & Humidity Monitoring System (DHT11 + LCD)
5) Water Level Detection and Alert System
6) Automatic Plant Watering System
7) Bluetooth-Based Door Lock System
8) Smart Dustbin Using Ultrasonic Sensor
9) Fire Detection and Alarm System
10) RFID-Based Attendance System
11) Voice-Controlled Devices via Google Assistant
12) Heart Rate Monitoring Using Pulse Sensor
13) Soil Moisture-Based Irrigation
14) Smart Helmet for Accident Detection

15) Milk Adulteration Detection System
16) Water Purification via Activated Carbon
17) Solar Dehydrator for Food Drying
18) Temperature-Controlled Chemical Reactor
19) Ethanol Mini-Plant Using Biomass
20) Smart Fluid Flow Control (Solenoid + pH Sensor)
21) Portable Water Quality Tester
22) AI Crop Disease Detection
23) AI-based Smart Irrigation
24) ECG Signal Acquisition and Plotting
25) AI-Powered Traffic Flow Prediction
26) Smart Grid Simulation with Load Monitoring
27) Smart Campus Indoor Navigator
28) Weather Station Prototype
29) Firefighting Robot with Sensor Guidance
30) Facial Recognition Dustbin
31) Barcode-Based Lab Inventory System
32) Growth Chamber for Plants
33) Biomedical Waste Alert System
34) Soil Classification with AI
35) Smart Railway Gate
36) Smart Bin Locator via GPS and Load Sensors
37) Algae-Based Water Purifier
38) Contactless Attendance via Face Recognition

Note: The students can also design and implement their own ideas, apart from the list of experiments mentioned above.

Note: A minimum of 8 to 10 experiments must be completed by the students

Students need to refer to the following links:

1. https://aim.gov.in/pdf/equipment-manual-pdf.pdf
2. https://atl.aim.gov.in/ATL-Equipment-Manual/
3. https://aim.gov.in/pdf/Level-1.pdf
4. https://aim.gov.in/pdf/Level-2.pdf
5. https://aim.gov.in/pdf/Level-3.pdf

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(23CS1103) EVALUATION OF COMMUNITY SERVICE INTERNSHIP

Mandatory Community Service Project / Internship of 08 weeks duration during summer vacation

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(23CS1104) BIG DATA ANALYTICS
(Common to CAD and CCC)

COURSE OBJECTIVES

The objectives of this course:

1. *Understand the Big Data Platform and its Use cases*
2. *Provide an over view of Apache Hadoop*
3. *Provide HDFS Concepts and Interfacing with HDFS*
4. *Understand Map Reduce Jobs*
5. *Provide hands on Hodoop EcoSystem*

COURSE OUTCOMES (COs)

On successful completion of course, the students can able to:

1. *Understanding the concepts Data structures in java along with their applications*
2. *Describe the access and process of data on Hadoop Distributed File System*
3. *Illustrate the Map-reduce programming in Hadoop framework*
4. *Develop BigData Solutions using Hadoop Eco System*
5. *Analyze the Big Data using Stream memory and Spark*
6. *Understand the usage of BigSQL*

UNIT-I: Data structures in Java: Linked List, Stacks, Queues, Sets, Maps; Generics: Generic classes and Type parameters, Implementing Generic Types, Generic Methods, Wrapper Classes, Concept of Serialization.

UNIT-II: Working with Big Data: Google File System, Hadoop Distributed File System (HDFS) Building blocks of Hadoop (Namenode, Datanode, Secondary Namenode, Job Tracker, Task Tracker), Introducing and Configuring Hadoop cluster (Local, Pseudo-distributed mode, Fully Distributed mode), Configuring XML files.

UNIT-III: Writing Map Reduce Programs: A Weather Dataset, Understanding Hadoop API forMap Reduce Framework (Old and New), Basic programs of Hadoop Map Reduce: Driver code, Mapper code, Reducer code, Record Reader, Combiner, and Practitioner.

UNIT-IV: Stream Memory and Spark: Introduction to Streams Concepts– Stream Data Model and Architecture, Stream computing, Sampling Data in a Stream, Filtering Streams, Counting Distinct Elements in a Stream, Introduction to Spark Concept, Spark Architecture and components Spark installation, Spark RDD(Resilient Distributed Dataset) – Spark RDD operations.

UNIT-V: Pig: Hadoop Programming Made Easier Admiring the Pig Architecture, Going with the Pig Latin Application Flow, Working through the ABCs of Pig Latin, Evaluating Local and Distributed Modes of Running Pig Scripts, Checking out the Pig Script Interfaces, Scripting with Pig Latin.

Applying Structure to Hadoop Data with Hive: Saying Hello to Hive, Seeing How the Hive is Put Together, Getting Started with Apache Hive, Examining the Hive Clients, Working with Hive Data Types, Creating and Managing Databases and Tables, Seeing How the Hive Data Manipulation Language Works, Querying and Analyzing data.

TEXTBOOKS

1. *Wiley & Big Java 4th Edition*, Cay Horstmann, Wiley John Sons, *INC*
2. *Hadoop: The Definitive Guide by* Tom White, *3rd.Edition, O'reilly*

REFERENCES

1. Dr. Mark Gardener, Beginning R the statistical programming language, John Wiley &Sons,Inc. 2012.
2. Richard Cotton, Learning R: A Step-by-Step Function Guide to Data Analysis.
3. Peng, R. D., & Matsui. E, The Art of Data Science. A Guide for Anyone Who Works with
   Data, Sky brude Consulting, 2015.

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III B.Tech – II Sem.

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(23CS0918) DATA VISUALIZATION
(Professional Elective Course-I)
(Common to CSM & CAI)

COURSE OBJECTIVES

The objectives of this course:

1. *To understand the principles, techniques, and tools of data visualization*
2. *To develop the ability to transform data into visual insights using different types of charts and plots.*
3. *To introduce the cognitive and perceptual foundations of effective data visualization.*
4. *To apply tools and programming environments (like Python, Tableau, or Power BI) for creating interactive and dynamic visualizations.*
5. *To analyze real-world datasets and effectively communicate data-driven findings visually.*

COURSE OUTCOMES:

After completion of the course, students will be able to:

1. *Interpret different types of data and recognize the appropriate visualization methods. Understand, Analyze)*
2. *Design effective and interactive data visualizations using various tools. (Apply, Create)*
3. *Apply visual encoding techniques to represent complex data effectively*
4. *Evaluate the effectiveness of visual representations based on perceptual principles*
5. *Analyze and visualize real-world data sets using Python libraries and dashboards. (Analyze, Evaluate)*
6. *Create visual stories and dashboards for effective communication of insights. (Create, Apply)*

UNIT I: Introduction to Data Visualization & Perception

Introduction to Data Visualization, Importance and Scope of Data Visualization, Data Types and Sources, Visual Perception: Pre-attentive Processing, Gestalt Principles, Data-Ink Ratio, Data Density, Lie Factor, Visualization Process and Design Principles, Tools Overview: Tableau, Power BI, Python Libraries

UNIT II: Visualization Techniques for Categorical & Quantitative Data

Charts for Categorical Data: Bar Charts, Pie Charts, Column Charts, Charts for Quantitative Data: Histograms, Line Charts, Boxplots, Scatter Plots, Bubble Charts, Heatmaps, Choosing the Right Chart Type, Best Practices in Labeling, Coloring, and Scaling.

UNIT III: Multidimensional, Temporal and Hierarchical Data Visualization

Visualizing Multivariate Data: Parallel Coordinates, Radar Charts, Time-Series Visualization: Time Plots, Animation over Time, Geographic Data Visualization: Maps, Choropleths, Hierarchical Data: Treemaps, Sunburst Charts, Network and Graph Visualization.

UNIT IV: Data Visualization Using Python and Dashboards

Introduction to Matplotlib, Seaborn, and Plotly, Creating Static and Interactive Charts, Pandas Visualization Capabilities, Dashboards with Dash, Streamlit, Power BI, Case Studies: Real-world Dataset Visualization.

UNIT V: Storytelling with Data and Ethical Visualization

Storytelling and Narrative Techniques in Visualization, Dashboards and Reporting, Misleading

Visualizations and Bias, Ethical Principles in Data Visualization, Final Project: Create a Storytelling Dashboard with Real Data. .

TEXTBOOKS:

1. Tamara Munzner, Visualization *Analysis and Design*, CRC Press, 2014.
2. Nathan Yau, Data Points: Visualization That Means Something, Wiley, 2013.

REFERENCE BOOKS:

1. Alberto Cairo, The Truthful Art: Data, Charts, and Maps for Communication, New Riders, 2016.
2. Cole Nussbaumer Knaflic, Storytelling with Data: A Data Visualization Guide for Business Professionals, Wiley, 2015.
3. Claus O. Wilke, Fundamentals of Data Visualization, O'Reilly, 2019.
4. Rohan Chopra, Hands-On Data Visualization with Bokeh, Packt Publishing, 2019.

Online Learning Resources:

1. NPTEL: Data Visualization - IIT Madras
2. Coursera: Data Visualization with Python by IBM

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(23CS0524) CLOUD COMPUTING
(common to CSE and CAD)

COURSE OBJECTIVE

The objectives of this course:

1. *To explain the evolving computer model called cloud computing.*
2. *To introduce the various levels of services that can be achieved by cloud.*
3. *To describe the security as pects in cloud*.

COURSE OUT COMES(CO):

After completion of the course, students will be able to

1.Ability to create cloud computing environment
2.Ability to design applications for Cloud environment
3.Design & develop back up strategies for cloud data based on features.
4.Explore emerging trends and technologies in cloud computing such as serverless architecture, edge computing
5.Use and Examine different cloud computing services.
6.Apply different cloud programming model as perneed.

UNIT I : Basics of Cloud computing

Introduction to cloud computing: Introduction, Character is tics of cloud computing, Cloud Models, Cloud Services Examples, Cloud Based services and applications

Cloud concepts and Technologies: Virtualization, Load balancing, Scalability and Elasticity, Deployment, Replication, Monitoring, Software defined, Network function virtualization, Map Reduce, Identity and Access Management, services level Agreements, Billing.

Cloud Services and Plat forms: Compute Services, Storage Services, Data, base Services, Application services, Content delivery services Analytics Services, Deployment and Management Services, Identity and Access Management services, Open Source Private Cloud software.

UNIT II: Hadoop and Python

Hadoop Map Reduce: Apache Hadoop, Hadoop Map Reduce Job Execution, Hadoop Schedulers, Hadoop Clusterset up.

Cloud Application Design: Reference Architecture for Cloud Applications, Cloud Application Design Methodologies, Data Storage Approaches.

Python Basics: Introduction, Installing Python, Python data Types & Data Structures,Controlflow,Function,Modules,Packages,Filehandling,Date/TimeOperations, Classes

UNIT III : Python for Cloud computing

Python for Cloud: Python for Amazon web services, Python for Google Cloud Platform, Python for windows Azure, Python for Map Reduce, Python packages of Interest, Python web Application Frame work, Designing a REST ful web API.

Cloud Application Developmentin Python: Design Approaches, Image Processing APP, Document Storage App, Map Reduce App, Social Media Analytics App.

UNIT IV : Big data, multimedia and Tuning

Big Data Analytics: Introduction, Clustering Big Data, Classification of Big data Recommendation of Systems.

Multimedia Cloud: Introduction, Case Study: Live video Streaming App, Streaming Protocols, case Study: Video Trans coding App.

Cloud Application Bench marking and Tuning: Introduction, Work load Character is tics, Application Performance Metrics, Design Considerations for a Bench marking Methodology, Bench marking Tools, Deployment Prototyping, Load Testing & Bottleneck Detection case Study, Hadoop bench marking case Study.

UNIT V : Applications and Issues in Cloud

Cloud Security: Introduction, CSA Cloud Security Architecture, Authentication, Authorization, Identity Access Management, Data Security, Key Management, Auditing.

Cloud for Industry, Health care & Education: Cloud Computing for Health care, Cloud computing for Energy Systems, Cloud Computing for Transportation Systems, Cloud Computing for Manufacturing Industry, Cloud computing for Education.

Migrating in to a Cloud: Introduction, Broad Approaches to migrating into the cloud, the seven– step model of migration in to a cloud.

Organizational readiness and Change Management in The Cloud Age: Introduction, Basic concepts of Organizational Readiness, Drivers for changes: A frame work to comprehend the competitive environment, common change management models, change management maturity models, Organizational readiness self– assessment.

Legal Issues in Cloud Computing: Introduction, Data Privacy and security Issues, cloud contracting models, Jurisdictional issues raised by virtualization and at a location, commercial and business considerations, Special Topics.

TEXT BOOKS:

1. Arshdeep Bahga and Vijay Madisetti, *Cloud Computing: A Hands-On Approach*, Universities Press, 2016.
2. Rajkumar Buyya, James Broberg, and Andrzej Goscinski, *Cloud Computing: Principles and Paradigms*, Wiley, 2016.

REFERENCE BOOKS:

1. Rajkumar Buyya, Christian Vecchiola, and S. Thamarai Selvi, *Mastering Cloud Computing*, Tata McGraw Hill.
2. Arshdeep Bahga and Vijay Madisetti, *Cloud Computing: A Hands-On Approach*.
3. Anthony T. Velte, Toby J. Velte, and Robert Elsenpeter, *Cloud Computing: A Practical Approach*, Tata McGraw Hill, Reprint 2011.
4. Gautam Shroff, *Enterprise Cloud Computing*, Cambridge University Press, 2010.
5. George Reese, *Cloud Application Architectures: Building Applications and Infrastructure in the Cloud*, O'Reilly, SPD, Reprint 2011.

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(23CS0535) SOFTWARE TESTING METHODOLOGIES
(Common to CSE and CAD)
(Professional Elective course (PEC) –II)

COURSE OBJECTIVES:

The objectives of this course:

1. *To study the fundamental concepts of software testing which includes objectives, process, criteria, strategies, and methods.*
2. *To discuss various software testing types and levels of testing like black and white box testing along with levels unit test, integration, regression, and system testing.*
3. *It also helps to learn the types of bugs, testing levels with which the student can very well identify a bug and correct as when it happens.*
4. *It provides knowledge on transaction flow testing and data flow testing techniques so that the flow of the program is tested as well.*
5. *To learn the domain testing, path testing and logic based testing to explore the testing process easier.*

COURSE OUTCOMES:

After completion of the course, students will be able to

1. *Know the basic concepts of software testing and its essentials.*
2. *Able to identify the various bugs and correcting them after knowing the consequences of the bug.*
3. *Apply control flow-based structural models to design and perform software testing effectively.*
4. *Apply automated testing tools and techniques to evaluate software quality and reliability in real-time scenarios.*
5. *Use of program's control flow as a structural model is the corner stone of testing.*
6. *Performing functional testing using control flow and transaction flow graphs.*

UNIT-I

Introduction:-Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs, Flow graphs and Path testing:- Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.

UNIT-II

Transaction Flow Testing:-transaction flows, transaction flow testing techniques. Dataflow testing:- Basics of dataflow testing, strategies in dataflow testing, application of dataflow testing.

UNIT-III

Domain Testing:-domains and paths, Nice & ugly domains, domain testing, domains and interfaces testing, domain and interface testing, domains and testability.

UNIT-IV

Paths, Path products and Regular expressions:- path products &path expression, reduction procedure, applications, regular expressions & flow anomaly detection. Logic Based Testing:- over view, decision tables, path expressions, kv charts, specifications.

UNIT-V

State, State Graphs and Transition testing:- state graphs, good & bad state graphs, state testing, Testability tips. Graph Matrices and Application:-Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm, building tools

TEXT BOOKS

1. Boris Beizer, *Software Testing Techniques*, 2nd Edition, Dreamtech Press.
2. Dr. K.V.K.K. Prasad, *Software Testing Tools*, Dreamtech Press.

REFERENCE BOOKS:

1. Brian Marick, *The Craft of Software Testing*, Pearson Education.
2. *Software Testing Techniques*, SPD (O'Reilly).
3. Edward Kit, *Software Testing in the Real World*, Pearson Education.
4. William E. Perry, *Effective Methods of Software Testing*, John Wiley & Sons.
5. Glenford J. Myers, *The Art of Software Testing*, John Wiley & Sons.

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(23CS0525) CRYPTOGRAPHY & NETWORK SECURITY
(Professional Elective course (PEC) –II)
(Common to CSE and CAD)

COURSE OBJECTIVES:

This course aim sat training students to master the:

1. *The concepts of classical encryption techniques and concepts of finite fields and number theory*
2. *Working principles and utilities of various crypto graphic algorithms including secret key crypto graphy, hashes, and message digests, and public key algorithms*
3. *Design issues and working principles of various authentication protocols, PKI standards*
4. *Various secure communication standards including Kerberos, I Psec, TLS and email*
5. *Concepts of crypto graphic utilities and authentication mechanisms to design secure applications*

COURSE OUT COMES:

After completion of the course, students will be able to

1. *Identify information security goals, classical encryption techniques and acquire fundamental knowledge on the concepts off in it fields and number theory*
2. *Compare and apply different encryption and decryption techniques to solve problems related to confidentiality and authentication*
3. *Apply the knowledge of crypto graphic check sums and evaluate the performance of different message digest algorithms for verifying the integrity of varying message sizes.*
4. *Demonstrate the ability to apply **user authentication principles** including **Kerberos** for secure authentication*
5. *Gain proficiency in securing web communications using **TLS** and **HTTPS**, manage secure remote access with **SSH**, and design **firewall policies***
6. *Analyze and implement intrusion detection systems and network security protocols to defend against cyber attacks and threats.*

UNIT-I Computer and Network Security Concepts:

Computer Security Concepts, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, A Model for Network Security, Classical Encryption Techniques: Sym metric Cip her Model, Substitution Techniques, Transposition Techniques, Steganography, Block Ciphers: Traditional Block Cipher Structure, The Data Encryption Standard, Advanced Encryption Standard: AES Structure, AES Transformation Functions.

UNIT II Number Theory:

The Euclidean Algorithm, Modular Arithmetic, Fermat‘s and Euler‘s Theorems, The Chinese Remainder Theorem, Discrete Logarithms, Finite Fields: Finite Fields of the Form GF(p),

Finite Fields of the Form GF(2^n) .

Public Key Cryptography: Principles, Public Key Cryptography Algorithms, RSA Algorithm, Diffie Hellman Key Exchange, Elliptic Curve Cryptography.

UNIT-III Cryptographic Hash Functions:

Application of Cryp to graphic Hash Functions, Requirements & Security, Secure Hash Algorithm, Message Authentication Functions, Requirements & Security, HMAC &CMAC.

Digital Signatures: NIST Digital Signature Algorithm, Distribution of Public Keys,X.509 Certificates, Public- Key Infrastructure

UNITIV User Authentication:

Remote User Authentication Principles, Kerberos. Electronic Mail Security: Pretty Good Privacy (PGP) And S/MIME.

IP Security: IP Security Overview, IP Security Policy, Encapsulating Security Payload, Combining Security Associations, Internet Key Exchange.

UNIT V Transport Level Security:

Web Security Requirements, Transport Layer Security (TLS), HTTPS, Secure Shell (SSH)

Fire walls: Fire wall Character is tics and Access Policy, Types of Fire walls, Fire wall Location and Configurations.

TEXT BOOKS:

1. William Stallings, *Cryptography and Network Security*, 8th Edition, Pearson Education.
2. Bernard Menezes, *Cryptography, Network Security and Cyber Laws*, Cengage Learning, 2010.

REFERENCE BOOKS:

1. Behrouz A. Forouzan and Debdeep Mukhopadhyay, *Cryptography and Network Security*, 3rd Edition, McGraw Hill, 2015.
2. Jason Albanese and Wes Sonnenreich, *Network Security Illustrated*, McGraw Hill, 2003 .

ONLINE LEARNING RESOURCES:

1. https://nptel.ac.in/courses/106/105/106105031/lecture
2. https://nptel.ac.in/courses/106/105/106105162/lecturebyDr.SouravMukhopadhyayIIT Kharagpur[VideoLecture]
3. https://www.mitel.com/articles/web-communication-cryptography-and-network- security web articles by Mitel Power Connections

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(23CS1111) NEURAL NETWORKS
(Professional Elective Course-II)

COURSE OBJECTIVES

The objectives of this course

1. *Understand components of artificial neural networks and model a Neuron and Express both Artificial Intelligence and Neural Network*
2. *Analyze ANN learning, Error correction learning, Memory-based learning, Hebbian 3. 3. . learning, Competitive learning and Boltzmann learning*
3. *Implement Simple perception, Perception learning algorithm, Modified Perception learning algorithm, and Adaptive linear combiner, Continuous perception, learning in continuous perception.*
4. *Analyze the limitation of Single Layer Perceptron and Develop MLP with 2 hidden layers, Develop Delta learning rule of the output layer and Multilayer feed forward neural network with continuous perceptions*

COURSE OUTCOMES

On Successful completion of this course, the student will be able to

1. *Understanding the Neuron and Neural Network, ANN learning, and its applications.*
2. *Describe the different types of learning processes*
3. *Perform Pattern Recognition, Linear classification.*
4. *Develop different single layer Perception learning algorithms*
5. *Illustrate different multiple layer Perception learning algorithms*
6. *Demonstrate on different Radial basis Function model and Recurrent perceptron*

UNIT-I

Introduction to Neural Networks: Neural Network, Human Brain, Models of Neuron, Neural networks viewed as directed graphs, Biological Neural Network, Artificial neuron, Artificial Neural Network architecture, ANN learning, analysis and applications, Historical notes.

UNIT-II

Learning Processes: Introduction, Error correction learning, Memory-based learning, Hebbian learning, Competitive learning, Boltzmann learning, credit assignment problem, learning with and without teacher, learning tasks, Memory and Adaptation.

UNIT-III

Single layer Perception: Introduction, Pattern Recognition, Linear classifier, Simple perception, Perception learning algorithm, Modified Perception learning algorithm, Adaptive linear combiner, Continuous perception, Learning in continuous perception, Limitation of Perception

UNIT-IV

Multi-Layer Perceptron Networks: Introduction, MLP with 2 hidden layers, Simple layer of a MLP, Delta learning rule of the output layer, Multilayer feed forward neural network with continuous perceptions, generalized delta learning rule, Back propagation algorithm

UNIT-V

Radial basis Function-Recurrent perceptron

Radial basis Functions-Information processing of an RBF Network-Training of RBF Networks-Growing of RBF Networks-Compare multilayer perceptron's and RBF Recurrent perceptron-like Networks-Jordan Networks-Elman Network-Training Recurrent Networks-Unfolding in time-Teacher forcing-Recurrent back propagation.

TEXT BOOKS

1. Gunjan Goswami, Introduction to Artificial Neural Networks, S.K. Kataria & Sons, 2019
2. S. Sivanandam, Introduction to Artificial Neural Networks, 2019
3. David Kriesel, A Brief Introduction to Neural Networks, dkriesel.com, 2005

REFERENCES

1. Simon Haykins, *Neural* Network- *A Comprehensive Foundation, Pearson Prentice Hall*, 2nd Edition, 1999. ISBN-13:978-0-13-147139-9/ISBN-10:0-13-147139-2
2. Zurada and Jacek M, *Introduction to Artificial Neural Systems, West Publishing Company*, 1992, ISBN: 9780534954604
3. Vojislav Kecman, *Learning & Soft Computing, Pearson Education*, 1st Edition, 2004, ISBN:0-262-11255-8
4. M T Hagan, H B Demoth, M Beale, *Neural Networks Design*, Thomson Learning, 2002. ISBN-10:0-9717321-1-6/ISBN-13:978-0-9717321-1-7

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(23CS0906) COMPUTER VISION AND IMAGE PROCESSING

(*Common to CSM,CAD & CAI*)

COURSE OBJECTIVES:

The objectives of this course

1. *Introduce fundamental concepts of image processing and computer vision.*
2. *Develop proficiency in applying algorithms for image analysis and interpretation.*
3. *Explore techniques for feature extraction, object recognition, and scene understanding.*
4. *Understand the integration of machine learning methods in computer vision applications.*

COURSE OUTCOMES:

Upon successful completion of the course, students will be able to:

1. *Understand image formation, representation, and apply basic image processing and frequency domain techniques for image enhancement and restoration.*
2. *Apply edge detection, segmentation, morphological, and texture analysis techniques for extracting features from images.*
3. Apply stereo vision and camera calibration techniques for 3D scene understanding and depth estimation.
4. *Analyze motion using optical flow and related techniques for dynamic scene interpretation.*
5. *Evaluate object recognition approaches and machine learning models including traditional and deep learning techniques used in computer vision.*
6. *Implement advanced computer vision applications such as image compression, face recognition, and medical image analysis using case studies.*

UNIT I: Introduction to Computer Vision and Image Processing

Overview of Computer Vision and Image Processing: Definitions and scope, Historical development and applications, Image Formation and Representation: Image acquisition methods, Sampling and quantization, Color spaces and models, Fundamentals of Image Processing: Point operations (brightness and contrast adjustments), Histogram processing, Spatial filtering techniques Fourier Transform and Frequency Domain Processing: Discrete Fourier Transform (DFT), Filtering in the frequency domain, Image restoration concept.

UNIT II: Image Analysis Techniques

Edge Detection and Feature Extraction: Gradient operators (Sobel, Prewitt), Canny edge detector, Corner and interest point detection, Image Segmentation: Thresholding methods, Region-based segmentation, Clustering techniques (K-means, Mean-Shift), Morphological Image Processing: Erosion and dilation, Opening and closing operations, Applications in shape analysis, Texture Analysis, Statistical methods (co-occurrence matrices), Transform-based methods (Gabor filters), Applications in pattern recognition.

UNIT III: 3D Vision and Motion Analysis

Stereo Vision: Epipolar geometry, Disparity mapping, Depth estimation techniques, Structure from Motion (SfM): Feature tracking across frames, 3D reconstruction from motion, Applications in scene understanding, Optical Flow and Motion Analysis: Lucas-Kanade method, Horn-Schunck method, Motion segmentation, Camera Calibration and 3D Reconstruction: Intrinsic and extrinsic parameters, Calibration techniques, 3D point cloud generation

UNIT IV: Object Recognition and Machine Learning in Vision

Feature Descriptors and Matching: Scale-Invariant Feature Transform (SIFT), Speeded-Up Robust Features (SURF), Feature matching algorithms, Object Detection and Recognition: Template matching, Deformable part models, Convolutional Neural Networks (CNNs), Introduction to Machine Learning for Vision: Supervised and unsupervised learning, Support Vector Machines (SVMs), Decision trees and random forests, Deep Learning Architectures: Autoencoders, Recurrent Neural Networks (RNNs), Generative Adversarial Networks (GANs)

UNIT V: Applications and Advanced Topics

Image Compression: Lossy and lossless compression techniques, Standards (e.g., JPEG, PNG), Morphological Image Processing: Dilation, erosion, opening, and closing operations., Applications in shape analysis, Case Studies: Face recognition systems., Automated visual inspection, Medical image analysis.

REFERENCE BOOKS

1. Forsyth, D. A., & Ponce, J. (2002). *Computer Vision: A Modern Approach*. Prentice Hall.
2. Shapiro, L. G., & Stockman, G. C. (2001). *Computer Vision*. Prentice Hall.

TEXTBOOKS:

1. Gonzalez, R. C., & Woods, R. E. (2008). *Digital Image Processing* (3rd ed.). Pearson Prentice Hall.Stony Brook University
2. Szeliski, R. (2010). *Computer Vision: Algorithms and Applications*. Springer.

ONLINE LEARNING RESOURCES:

1. Coursera: *Introduction to Computer Vision and Image Processing*. LinkCoursera
2. Stanford University: *CS231n: Deep Learning for Computer Vision*. Linkcs231n.stanford.edu
3. MIT OpenCourseWare: *Introduction to Computer Vision*. Link

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(23CS0538) SOFTWARE PROJECT MANAGEMENT
(Professional Elective course –III)
(Common to CSE and CAD)

COURSE OBJECTIVE:

This course is designed to enable the students to understand the fundamental principles of Software Project management & will also have a good knowledge of the responsibilities of a project manager and how to handle them.

COURSE OUT COMES:

After completion of the course, students will be able to

1. *Describe the fundamentals of Project Management*
2. *Recognize and use Project Scheduling Techniques*
3. *Familiarize with Project Control Mechanisms*
4. *Understand Team Management*
5. *Recognize the importance of Project Documentation and Evaluation*
6. *Evaluate software project success factors and best practices through case studies*

UNIT-I

Conventional Software Management: The water fall model, conventional software Management performance Evolution of Software Economics: software Economics. Pragmatic Software Cost Estimation Improving Software Economics: Reducing Software Product Size, Improving Software Processes, Improving Team Effectiveness, Improving Automation, Achieving Required Quality ,Peer Inspections.

UNIT-II

The old way and the new: The principles of convention al software Engineering, principles of modern software management, transitioning to aniter ative process.

Lifecycle phases: Engineering and production stages, inception, Elaboration, construction, transition phases. Artifacts of the process: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts

UNIT-III

Work Flows of the process: Software process work flows, Inter Trans work flows.Check points of the Process: Major Mile Stones, Minor Milestones, Periodic status assessments. Iterative Process Planning: work break down structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning

UNIT-IV

Process Automation: Automation Building Blocks, The Project Environment. Project Control and Process instrumentation: The seven core Metrics, Management indicators, quality indicators Tailoring the Process: Process discriminants. Managing people and organizing teams.

UNIT-V

Project Organizations and Responsibilities: Line - of-Business Organizations, Project Organizations, evolution of Organizations.

Future Software Project Management: modern Project Profiles, Next generation Software economics, modern process stransitions.

Case Study: The Command Center Processing and Display System-Replacement(CCPDS-R)

TEXT BOOKS:

1. Walker Royce, *Software Project Management*, Pearson Education, 2012.
2. Bob Hughes, Mike Cotterell, and Rajib Mall, *Software Project Management*, 6th Edition, McGraw Hill, 2017.

REFERENCE BOOKS:

1. Pankaj Jalote, *Software Project Management in Practice*, 5th Edition, Pearson Education, 2017.
2. Murali K. Chemuturi and Thomas M. Cagley Jr., *Mastering Software Project Management: Best Practices, Tools and Techniques*, J. Ross Publishing, 2010.
3. Sanjay Mohapatra, *Software Project Management*, Cengage Learning, 2011.

ONLINE LEARNING RESOURCES:

1. http://nptel.ac.in/courses/106101061/29

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(23CS1112) RECOMMENDATION SYSTEMS
(Professional Elective Course-III)

COURSE OBJECTIVES

The objectives of this course are to

1. To decompose a Pattern features and Statistical techniques
2. To use Cluster analysis and synthetic pattern recognition
3. To understand Feature extraction techniques and advances in the field
4. To understand the, algorithms, evaluation tools, and user experiences including personalization.

COURSE OUTCOMES (COs)

On successful completion of the course, students will be able to

1. To understand basic techniques and problems in the field of recommender systems
2. Analyse the collaborative filtering and its approaches
3. Evaluate Types of recommender systems: non-personalized, content based, collaborative filtering
4. Apply algorithms and techniques to develop knowledge based recommendation
5. Analyse various Opportunities for hybridization in recommender system
6. To evaluate state-of-the-art recommender systems.

UNIT-I: Introduction: Recommender system functions, Linear Algebra notation: Matrix addition, Multiplication, transposition, and inverses, covariance matrices, Understanding ratings, Applications of recommendation systems, Issues with recommender system.

UNIT-II: Collaborative Filtering: User-based nearest neighbor recommendation, Item-based nearest neighbor recommendation, Model based and pre-processing based approaches, Attacks on collaborative recommender systems.

UNIT-III: Content-based recommendation: High level architecture of content-based systems, Advantages and drawbacks of content based filtering, Item profiles, Discovering features of documents, Obtaining item features from tags, Representing item profiles, Methods for learning user profiles, Similarity based retrieval, Classification algorithms.
Knowledge based recommendation: Knowledge representation and reasoning, Constraint based recommenders, Case based recommenders.

UNIT-IV: Hybrid approaches: Opportunities for hybridization, Monolithic hybridization design: Feature combination, Feature augmentation, Parallelized hybridization design: Weighted, Switching, Mixed, Pipelined hybridization design: Cascade Meta-level, Limitations of hybridization strategies.

UNIT-V: Evaluating Recommender System: Introduction, General properties of evaluation research, Evaluation designs, Evaluation on historical datasets, Error metrics, Decision-Support metrics, User-Centred metrics.

Recommender Systems and communities: Communities, collaboration and recommender systems in personalized web search, Social tagging recommender systems, Trust and recommendations.

TEXT BOOKS

1. Jannach D., Zanker M. and FelFering A., *Recommender Systems: An Introduction, Cambridge University Press(2011), 1st ed.*
2. Ricci F., Rokach L., Shapira D., Kantor B.P., *Recommender Systems Handbook, Springer(2011), 1st ed.*

REFERENCES

1**.** *Digital Image Processing*- Refael C. Gonzalez and Richard E. Woods, *Wesley.*
2. *Computer Vision - A modern approach*, by D. Forsyth and J. Ponce, *Prentice Hall Robot Vision, By* B. K. P. Horn, McGraw-Hill.
3. *Introductory Techniques for 3D Computer Vision*, by E. Trucco and A. Verri, Publisher: *Prentice Hall.*
4. *Computer Vision*, D. H. Ballard, C. M. Brown, *Prentice-Hall, Englewood Cliffs, 1982.*

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(23CS1113) SOCIAL NETWORK ANALYSIS AND APPLICATIONS
(Professional Elective Course-III)

COURSE OBJECTIVES

The objectives of this course are to

1. *To understand the concept of semantic web and related applications.*
2. *To learn knowledge representation using ontology.*
3. *To understand human behavior in social web and related communities*
4. *To learn visualization of social networks.*

COURSE OUTCOMES (COs)

On successful completion of the course, students will be able to

1. *Ability to design and develop semantic web related applications*
2. *Ability to represent knowledge using ontology .*
3. *Illustrate different community structures and link prediction models.*
4. *Ability to visualize social networks*
5. *Ability to predict human behavior in social web and related communities*
6. *Describe the online social network visualization and its applications*

UNIT-I

INTRODUCTION: Introduction to Semantic Web: Limitations of current Web – Development of Semantic Web – Emergence of the Social Web – Social Network analysis: Development of Social Network Analysis – Key concepts and measures in network analysis – Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities – Web-based networks – Applications of Social Network Analysis.

UNIT-II

MODELLING, AGGREGATING AND KNOWLEDGE REPRESENTATION: Ontology and their role in the Semantic Web: Ontology-based knowledge Representation – Ontology languages for the Semantic Web: Resource Description Framework – Web Ontology Language – Modelling and aggregating social network data: State-of-the-art in network data representation – Ontological representation of social individuals – Ontological representation of social relationships – Aggregating and reasoning with social network data – Advanced representations.

UNIT-III

EXTRACTION AND MINING COMMUNITIES IN WEB SOCIAL NETWORKS: Extracting evolution of Web Community from a Series of Web Archive – Detecting communities in social networks – Definition of community – Evaluating communities – Methods for community detection and mining – Applications of community mining algorithms – Tools for detecting communities

social network infrastructures and communities – Decentralized online social networks – Multi-Relational characterization of dynamic social network communities.

UNIT-IV

PREDICTING HUMAN BEHAVIOR AND PRIVACY ISSUES: Understanding and predicting human behavior for social communities – User data management – Inference and Distribution – Enabling new human experiences – Reality mining – Context – Awareness – Privacy in online social networks – Trust in online environment – Trust models based on subjective logic – Trust network analysis – Trust transitivity analysis – Combining trust and reputation – Trust derivation based on trust comparisons – Attack spectrum and counter measures.

UNIT-V

VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS: Graph theory – Centrality – Clustering – Node-Edge Diagrams – Matrix representation – Visualizing online social networks, visualizing social networks with matrix-based representations – Matrix and Node-Link Diagrams – Hybrid representations – Applications – Cover networks – Community welfare – Collaboration networks – Co-Citation networks.

TEXT BOOKS:

1. Peter Mika, ―*Social Networks and the Semantic Web, First Edition, Springer 2007*.
2. Borko Furht, ―*Handbook of Social Network Technologies and Applications, 1st Edition, Springer, 2010.*

REFERENCES:

1. Guandong Xu ,Yanchun Zhang and Lin Li,-*Web Mining and Social Networking – Techniques and applications, First Edition, Springer, 2011.*
2. Dion Goh and Schubert Foo,-*Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively, IGI Global Snippet, 2008.*
3. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, *Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modelling, IGI Global Snippet, 2009.*
4. John G. Breslin, Alexander Passant and Stefan Decker, *-The Social Semantic Web, Springer, 2009.*

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(23CS1114) R PROGRAMMING
(Professional Elective Course-III)

COURSE OBJECTIVES

The objectives of this course:

1. *Understand the fundamentals of 'R' programming.*
2. *Use R for statistical programming, computation, graphics, and modeling*
3. *Write functions and use R in an efficient way*
4. *Fit some basic types of statistical models*
5. *Be able to expand their knowledge of R on their own*

COURSE OUTCOMES (COs)

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

1. *Understanding the basic concept of R programming framework and data types and data structures*
2. *Understanding the concepts such as control structures and recursion using R programming*
3. *Applying mathematical and statistical operations data structures in R*
4. *Utilize different functional programming and file handling operations in R*
5. *Analyze the various graphics function using R programming*
6. *Understanding the concept of various Probability Distributions, Regression*

UNIT-I

Introduction, How to run R, R Sessions and Functions, Basic Math, Variables, Data Types, Vectors, Conclusion, Advanced Data Structures, Data Frames, Lists, Matrices, Arrays, Classes.

UNIT-II

R Programming Structures, Control Statements, Loops, Looping Over Nonvector Sets,-If-Else, Arithmetic and Boolean Operators and values, Default Values for Argument, Return Values, Deciding Whether to explicitly call return-Returning Complex Objects, Functions are Objective, No Pointers in R, Recursion.

UNIT-III

Doing Math and Simulation in R, Math Function, Extended Example Calculating Probability-Cumulative Sums and Products-Minima and Maxima-Calculus, Functions Fir Statistical Distribution, Sorting, Linear Algebra Operation on Vectors and Matrices, Extended Example: Vector cross Product-Extended Example: Finding Stationary Distribution of Markov Chains, Set Operation, Input /output, Accessing the Keyboard and Monitor, Reading and writer Files.

UNIT-IV

Graphics, Creating Graphs, The Workhorse of R Base Graphics, the plot() Function –Customizing Graphs, Saving Graphs to Files.

UNIT-V

Probability Distributions, Normal Distribution-Binomial Distribution-Poisson Distributions Other Distribution, Basic Statistics, Correlation and Covariance, T-Tests, ANOVA. Linear Models, Simple Linear Regression, -Multiple Regression Generalized Linear Models, Logistic Regression, Poisson Regression-other Generalized Linear Models-Survival Analysis, Nonlinear Models, Splines-Decision-Random Forests.

TEXT BOOKS

1. Norman Matloff, *The Art of R Programming*, Cengage Learning.
2. Lander, *R for Everyone*, Pearson

REFERENCES

1. Dr. Mark Gardener, *Beginning R the statistical programming language*, John Wiley
2. Paul Teetor, *R Cookbook*, Oreilly.
3. Rob Kabacoff, *R in Action*, Manning
4. Richard Cotton, *Learning R: A Step-by-Step Function Guide to Data Analysis*.
5. Peng, R. D., & Matsui. E, T*he Art of Data Science. A Guide for Anyone Who Works with Data*, Sky brude Consulting, 2015.

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(23CE0152) DISASTER MANAGEMENT

Open Elective course –II

COURSE OBJECTIVES

The objectives of this course is

1. *Understand the fundamental concepts of natural disasters, their occurrence, and disaster risk reduction strategies.*
2. *Analyze the impact of cyclones on structures and explore retrofitting techniques for adaptive reconstruction.*
3. *Apply wind engineering principles and computational techniques in designing wind-resistant structures.*
4. *Evaluate earthquake effects on buildings and develop strategies for seismic retrofitting.*
5. *Assess seismic safety planning, design considerations, and innovative construction materials for disaster-resistant structures.*

COURSE OUTCOMES:

After successful completion of this course, students will be able to:

1. *Examine types and patterns of natural disasters, interpret hazard maps, and evaluate disaster risk reduction and recovery measures.*
2. *Analyze the impact of cyclones on structures and explore retrofitting techniques for adaptive reconstruction.*
3. *Apply wind engineering principles in the design of wind–resistant structures.*
4. *Apply computational techniques for the analysis and design of wind–resistant structures.*
5. *Evaluate earthquake effects on buildings and develop strategies for seismic retrofitting.*
6. *Design disaster-resistant structures with innovative construction materials.*

UNIT-I

Introduction to Natural Disasters – Brief introduction to different types of natural disasters, occurrence of disasters in different climatic and geographical regions, hazard maps (earthquake and cyclone) of the world and India, regulations for disaster risk reduction, post-disaster recovery and rehabilitation (socioeconomic consequences).

UNIT-II

Cyclones and Their Impact – Climate change and its impact on tropical cyclones, nature of cyclonic wind, velocities and pressure, cyclone effects, storm surges, floods, and landslides. Behavior of structures in past cyclones and windstorms, case studies. Cyclonic retrofitting,

strengthening of structures, and adaptive sustainable reconstruction. Life-line structures such as temporary cyclone shelters

UNIT-III

Wind Engineering and Structural Response – Basic wind engineering, aerodynamics of bluff bodies, vortex shedding, and associated unsteadiness along and across wind forces. *Lab:* Wind tunnel testing and its salient features. Introduction to Computational Fluid Dynamics (CFD). General planning and design considerations under windstorms and cyclones. Wind effects on buildings, towers, glass panels, etc., and wind-resistant features in design. Codal provisions, design wind speed, pressure coefficients. Coastal zoning regulations for construction and reconstruction in coastal areas. Innovative construction materials and techniques, traditional construction techniques in coastal areas

UNIT-IV

Seismology and Earthquake Effects – Causes of earthquakes, plate tectonics, faults, seismic waves; magnitude, intensity, epicenter, energy release, and ground motions. Earthquake effects on ground, soil rupture, liquefaction, and landslides. Performance of ground and buildings in past earthquakes – behavior of various types of buildings and structures, collapse patterns; behavior of non-structural elements such as services, fixtures, and mountings – case studies. Seismic retrofitting – weakness in existing buildings, aging, concepts in repair, restoration, and seismic strengthening

UNIT-V

Planning and Design Considerations for Seismic Safety – General planning and design considerations; building forms, horizontal and vertical eccentricities, mass and stiffness distribution, soft storey effects, etc.; seismic effects related to building configuration. Plan and vertical irregularities, redundancy, and setbacks. Construction details – various types of foundations, soil stabilization, retaining walls, plinth fill, flooring, walls, openings, roofs, terraces, parapets, boundary walls, underground and overhead tanks, staircases, and isolation of structures. Innovative construction materials and techniques. Local practices – traditional regional responses. Computational investigation techniques.

TEXT BOOKS

1. David Alexander, *Natural Disasters*, 1st Edition, CRC Press, 2017.
2. Edward A. Keller and Duane E. DeVecchio, *Natural Hazards: Earth's Processes as Hazards, Disasters, and Catastrophes*, 5th Edition, Routledge, 2019.

REFRENCE BOOKS

1. Ben Wisner, J.C. Gaillard, and Ilan Kelman (Editors), Handbook of Hazards and Disaster Risk Reduction and Management, 2nd Edition, Routledge, 2012.
2. Damon P. Coppola, Introduction to International Disaster Management, 4th Edition, Butterworth-Heinemann, 2020.
3. Bimal Kanti Paul, Environmental Hazards and Disasters: Contexts, Perspectives and Management, 2nd Edition, Wiley-Blackwell, 2020.

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(23CE0153) SUSTAINABILITY IN ENGINEERING PRACTICES
Open Elective course –II

COURSE OBJECTIVES

The objectives of this course is

1. *Understand the fundamentals of sustainability, the carbon cycle, and the environmental impact of construction materials.*
2. *Analyze sustainable construction materials, their durability, and life cycle assessment.*
3. *Apply energy calculations in construction materials and assess their embodied energy.*
4. *Evaluate green building standards, energy codes, and performance ratings.*
5. *Assess the environmental effects of energy use, climate change, and global warming.*

COURSE OUTCOMES

After successful completion of this course, students will be able to:

1. *Recognize the rule of construction materials in contributing to CO_2 emissions from materials*
2. *Choose construction materials that are more sustainable.*
3. *Calculate the embodied energy of various construction materials and assess their contribution to overall building energy consumption.*
4. *Differentiate between embodied and operational energy in buildings and evaluate total life cycle energy use for sustainable construction.*
5. *Implement energy efficiency standards, and rating systems such as LEED, GRIHA, and ECBC, including the role of materials, insulation, and thermal performance in sustainable building design*
6. *Analyze the environmental impacts of non-renewable energy sources, including their role in global warming, greenhouse effects, acid rain, and regional climate changes.*

UNIT - I

Introduction: Introduction and Definition of Sustainability - Carbon Cycle - Role of Construction Material: Concrete and Steel, Etc. - CO2Contribution From Cement and Other Construction Materials.

UNIT - II

Materials used in sustainable construction - Construction Materials and Indoor Air Quality - No/Low Cement Concrete - Recycled and Manufactured Aggregate - Role of QC and Durability - Life Cycle and Sustainability.

UNIT – III

Energy Calculations - Components of embodied energy – calculation of embodied energy for construction materials – energy concept and primary energy – embodied energy vis-à-vis operational energy in conditioned buildings – life cycle energy use.

UNIT – IV

Green Buildings - Control of Energy Use in Building - ECBC Code, Codes in Neighboring Tropical Countries -OTTV Concepts and Calculations – Features of LEED and TERI – GRIHA Ratings - Role of Insulation and Thermal Properties of Construction Materials - Influence of Moisture Content and Modeling - Performance Ratings of Green Buildings - Zero Energy Building

UNIT – V

Non-Renewable Sources of Energy and Environmental Impact – Energy norm, coal, oil, natural gas, nuclear energy, global temperature, greenhouse effects, global warming, acid rain: causes, effects and control methods, regional impacts of temperature.

TEXT BOOK

1. Charles J. Kibert, *Sustainable Construction: Green Building Design & Delivery*, 4th Edition, Wiley Publishers, 2016.
2. Steve Goodhew, *Sustainable Construction Process*, Wiley Blackwell, UK, 2016.

REFERENCE BOOK

1. Craig A. Langston & Grace K.C. Ding, *Sustainable Practices in the Built Environment*, Butterworth-Heinemann Publishers, 2011.
2. William P. Spence, *Construction Materials, Methods & Techniques*, 3rd Edition, Yesdee Publication Pvt. Ltd, 2012.

ONLINE REFERENCE

1. https://archive.nptel.ac.in/courses/105/105/105105157/

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(23EE0262) RENEWABLE ENERGY SOURCES
Open Elective course –II

COURSE OBJECTIVES
The objectives of this course is

1. *Know the importance of energy, resources of renewable energy, their usage and impact on environment.*
2. *Recognize the significance of solar energy, its harnessing technologies & its applications.*
3. *Identify the method of exploiting energy from wind and parameters to be considered for the selection of site for wind turbine installation.*
4. *Explain the concept of bio energy and its conversion devices.*
5. *Differentiate various renewable energies such as tidal energy, fuel cells.*

COURSE OUTCOMES
After successful completion of this course, students will be able to:

1. *State various sources of energies, its availability and explain the importance of them by observing the global energy scenario.*
2. *Distinguish the types of solar energy tapping devices and describe the method of harnessing the solar energy.*
3. *Summarize the wind energy systems and elucidate the impact of it in environmental aspects.*
4. *Describe the biomass conversion process and list out various bioenergy applications.*
5. *Interpret the knowledge of renewable energies such as tidal energy, OTEC.*
6. *Identify numerous applications renewable energy resources and illustrate its harnessing technologies.*

UNIT – I Solar Energy
Solar radiation - beam and diffuse radiation, solar constant, Sun at Zenith, attenuation and measurement of solar radiation, local solar time, derived solar angles, sunrise, sunset and day length. Flat plate collectors, concentrating collectors, storage of solar energy - thermal storage.

UNIT – II PV Energy Systems
Introduction, The PV effect in crystalline silicon basic principles, the film PV, Other PV technologies, Solar PV modules from solar cells, mismatch in series and parallel connections design and structure of PV modules, Electrical characteristics of silicon PV cells and modules, Stand-alone PV system configuration, Grid connected PV systems

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UNIT – III Wind Energy

Principle of wind energy conversion; Basic components of wind energy conversion systems; wind mill components, various types and their constructional features; design considerations of horizontal and vertical axis wind machines: analysis of aerodynamic forces acting on wind mill blades; wind data and energy estimation and site selection considerations.

UNIT – IV Geothermal Energy

Estimation and nature of geothermal energy, geothermal sources and resources like hydrothermal, geo-pressured hot dry rock, magma. Advantages, disadvantages and application of geothermal energy, prospects of geothermal energy in India

UNIT – V Miscellaneous Energy Technologies

Ocean Energy: Tidal Energy ,Principle of working, Operation methods, advantages and limitations. Wave Energy Principle of working, energy and power from waves, wave energy conversion devices, advantages and limitations.Bio mass Energy: Biomass conversion technologies, Biogas generation plants, Classification, advantages and disadvantages, constructional details, site selection, digester design consideration.
Fuel cell: Principle of working of various types of fuel cells and their working, performance and limitations.

TEXT BOOKS

1. G. D. Rai, *Non-Conventional Energy Sources*, 4th Edition, Khanna Publishers, 2000.
2. Chetan Singh Solanki, *Solar Photovoltaics: Fundamentals, Technologies and Applications*, 2nd Edition, PHI Learning Private Limited, 2012.

REFERENCE BOOKS

1. Stephen Peake, *Renewable Energy: Power for a Sustainable Future*, Oxford International Edition, 2018.
2. S. P. Sukhatme, *Solar Energy*, 3rd Edition, Tata McGraw Hill Education Pvt. Ltd., 2008.
3. B. H. Khan, *Non-Conventional Energy Resources*, 2nd Edition, Tata McGraw Hill Education Pvt. Ltd., 2011.
4. S. Hasan Saeed and D. K. Sharma, *Non-Conventional Energy Resources*, 3rd Edition, S. K. Kataria & Sons, 2012.
5. G. N. Tiwari and M. K. Ghosal, *Renewable Energy Resource: Basic Principles and Applications*, Narosa Publishing House, 2004.

ONLINE REFERENCE:

1. https://nptel.ac.in/courses/103103206
2. https://nptel.ac.in/courses/108108078

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(23ME0349) AUTOMATION AND ROBOTICS
Open Elective course –II

COURSE OBJECTIVES

The objectives of this course is

1. *Fundamentals of industrial automation, production types, automation strategies, and hardware elements used in modern manufacturing processes.*
2. *Understanding of automated manufacturing systems, and strategies for improving productivity and flexibility in industrial automation*
3. *Knowledge of industrial automation and robotics, sensors, and end-effector design for modern manufacturing environments.*
4. *Explain industrial automation and robotics, and trajectory planning for intelligent and efficient manufacturing applications.*
5. *Familiarity of industrial automation and robotics, and practical applications in manufacturing processes.*

COURSE OUTCOMES

After successful completion of this course, students will be able to:

1. *Understand and analyze the structure and functions of automated manufacturing systems, and evaluate hardware components for efficient production.*
2. *Analyze and design automated flow lines with or without buffer storage, perform quantitative evaluations, apply assembly line balancing techniques.*
3. *Classify robot configurations, select suitable actuators and sensors, analyze and apply automation and robotics principles to optimize production efficiency and flexibility.*
4. *Explain the various components of robots and its feed back systems and its corrective measures*
5. *Apply kinematic and dynamic modeling using D-H notation and select appropriate hardware and control strategies for real-world industrial scenario to analyze and design automated and robotic systems.*
6. *Design, program, and implement robotic systems, understand and apply robotics technology to manufacturing tasks*

UNIT – I Introduction to Automation

Introduction to Automation, Need, Types, Basic elements of an automated system,
Manufacturing Industries, Types of production, Functions in manufacturing, Organization and information processing in manufacturing, Automation strategies and levels of automation, Hardware components for automation and process control, mechanical feeders, hoppers, orienters, high speed automatic insertion devices

UNIT – II Automated flow lines

Automated flow lines- Part transfer methods and mechanisms, types of Flow lines, flow line with/without buffer storage, Quantitative analysis of flow lines. Assembly line balancing: Assembly process and systems assembly line, line balancing methods, ways of improving line balance, flexible assembly lines.

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UNIT – III Introduction to Industrial Robotics

Introduction to Industrial Robotics, Classification of Robot Configurations, functional line diagram, degrees of freedom. Components common types of arms, joints grippers, factors to be considered in the design of grippers.

Robot actuators and Feedback components: Actuators, Pneumatic, Hydraulic actuators, Electric Stepper motors, comparison. Position sensors - potentiometers, resolvers, encoders - velocity & sensors, Tactile sensors, Proximity sensors.

UNIT – IV Manipulator Kinematics

Manipulator Kinematics, Homogenous transformations as applicable to rotation and transition - D-H notation, Forward inverse kinematics **Manipulator Dynamics:** Differential transformations, Jacobians, Lagrange - Euler and Newton – Euler formations. Trajectory Planning: Trajectory Planning and avoidance of obstacles path planning, skew motion, joint integrated motion - straight line motion

UNIT – V Robot Programming

Robot Programming, Methods of programming - requirements and features of programming languages, software packages. Problems with programming languages.

Robot Application in manufacturing: Material Transfer - Material handling, loading and unloading - Process - spot and continuous arc welding & spray painting - Assembly and Inspection.

TEXT BOOK

1. M. P. Groover, *Automation, Production Systems and Computer-Integrated Manufacturing*, Pearson Education.
2. M. P. Groover, *Industrial Robotics*, Tata McGraw-Hill (TMH).

REFERENCE BOOK

1. Fu K. S., *Robotics*, 4th Edition, McGraw Hill, 2010.
2. P. Coiffet and M. Chaironze, *An Introduction to Robot Technology*, Kogan Page Ltd., London, 1983.
3. Ashitava Ghosal, *Robotics: Fundamental Concepts and Analysis*, 1st Edition, Oxford University Press, 2006.
4. Mittal R. K. and Nagrath I. J. , *Robotics and Control*, Tata McGraw-Hill (TMH).

ONLINE REFERENCE

1. https://www.youtube.com/watch?v=yxZm9WQJUA0&list=PLRLB5WCqU54UJG45UnazSYmnmhl-gt76o
2. https://www.youtube.com/watch?v=6f3bvIhSWyM&list=PLRLB5WCqU54X5Vy4DwjfSODT3ZJ gwEjyE

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(23EC0441) DIGITAL ELECTRONICS
Open Elective course –II

COURSE OBJECTIVES

The objectives of this course is

1. *To Learn Boolean algebra, logic simplification techniques, and combinational circuit design.*
2. *To analyze combinational circuits like adders, subtractors, and code converters.*
3. *To explore combinational logic circuits and their applications in digital design.*
4. *To understand sequential logic circuits, including latches, flip-flops, counters, and shift registers.*
5. *To gain knowledge about programmable logic devices and digital IC's.*

COURSE OUTCOMES

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

1. *Apply Boolean algebra and Karnaugh Maps to simplify and analyze logic expressions.*
2. *Design basic logic gates like AND, OR, NAND, NOR, XOR..*
3. *Analyze and design combinational circuits like adders, subtractors, and perform code conversions.*
4. *Design and implement logic functions using multiplexers, decoders, encoders, and comparators.*
5. *Understand sequentiall logic circuits, including latches, flipflops, counters, and shift registers.*
6. *Implement logic circuits using ROM, PLA,PAL, and standard digital ICs like 74-series.*

UNIT-I

Logic Simplification and Combinational Logic Design: Review of Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Canonical forms, Introduction to Logic Gates, Ex-OR, Ex- NOR operations, Minimization of Switching Functions: Karnaugh map method, Logic function realization: AND-OR, OR-AND and NAND/NOR realizations.

UNIT-II

Introduction to Combinational Design 1: Binary Adders, Subtractors and BCD adder, Code converters - Binary to Gray, Gray to Binary, BCD to excess3, BCD to Seven Segment display.

UNIT-III

Combinational Logic Design 2: Decoders, Encoders, Priority Encoder, Multiplexers, Demultiplexers, Comparators, Implementations of Logic Functions using Decoders and Multiplexers.

UNIT-IV

Sequential Logic Design: Latches, Flip-flops, S-R, D, T, JK and Master-Slave JK FF, Edge triggered FF, set up and hold times, Ripple counters, Shift registers.

UNIT-V

Programmable Logic Devices: ROM, Programmable Logic Devices (PLA and PAL).Digital IC's:Decoder (74x138), Priority Encoder (74x148), multiplexer (74x151) and de-multiplexer (74x155), comparator (74x85).

TEXT BOOKS

1. M. Morris Mano and Michel D. Ciletti, *Digital Design*, 5th Edition, Pearson Education, 1999.
2. Zvi Kohavi and Nirah K. Jha, *Switching Theory and Finite Automata Theory*, 2nd Edition, Tata McGraw-Hill, 2005.

REFERENCE BOOK

1. Charles H. Roth, Jr., *Fundamentals of Logic Design*, 5th Edition, Brooks/Cole Cengage Learning, 2004.

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(23HS0853) OPTIMIZATION TECHNIQUES FOR ENGINEERS
Open Elective course –II

COURSE OBJECTIVES
The objectives of this course is

1. *To provide the basic knowledge about Optimization, importance, application areas of in the industry, Linear Programming.*
2. *To impart different optimization models under typical situations in the business organization like transportation, assignment.*
3. *To understand the process of sequencing in a typical industry.*
4. *To describe different game strategies under cut-throat competitive business environment*

COURSE OUTCOMES
After successful completion of this course, the students should be able to:

1. *Understand the meaning, purpose, tools of Operations Research and linear programming in solving practical problems in industry.*
2. *Interpret the transportation models' solutions and infer solutions to the real-world problems.*
3. *Develop mathematical skills to analyze and solve nonlinear programming models arising from a wide range of applications.*
4. *Understand theoretical concepts, formulating problems, applying various methods, and analyzing their performance.*
5. *Apply the concept of non-linear programming for solving the problems involving non-linear constraints and objectives.*
6. *Apply the concept of unconstrained geometric programming for solving the problems involving non-linear constraints and objectives.*

UNIT-1 Linear programming I
Introduction, Applications of Linear Programming, Standard form of a Linear Programming Problem, Geometry of Linear Programming Problems, Basic Definitions in Linear Programming. Simplex Method, Simplex Algorithm and Two phase Simplex Method, Big-M method.

UNIT – II Linear programming II: Duality in Linear Programming
Symmetric Primal-Dual Relations, General Primal-Dual Relations, Duality Theorem, Dual Simplex Method, Transportation Problem and assignment problem, Complementary slackness Theorem

UNIT – III Non-linear programming: Unconstrained optimization techniques
Introduction: Classification of Unconstrained minimization methods,

Direct Search Methods: Random Search Methods: Descent Method and Fletcher Powell Method, Grid Search Method

UNIT – IV Non-linear programming: Constrained optimization technique

Introduction, Characteristics of a constrained problem, Random Search Methods, complex method, Sequential linear programming, Basic approach in methods of Feasible directions, Zoutendijk's method of feasible directions: direction finding problem, determination of step length, Termination criteria

UNIT-V Geometric Programming

Unconstrained Minimization Problems: solution of unconstrained geometric programming using differential calculus and arithmetic-geometric inequality.

Constrained minimization Problems: Solution of a constrained geometric programming problem, primal-dual programming in case of less-than inequalities, geometric programming with mixed inequality constraints.

TEXT BOOK

1. Singiresu S. Rao, *Engineering Optimization: Theory and Practices*, New Age International (P) Ltd. Publishers, New Delhi.
2. J. C. Panth, *Introduction to Optimization Techniques*, 7th Edition, Jain Brothers, New Delhi.

REFERENCES

1. Harvey M. Wagner, Principles of Operation Research, Printice-Hall of India Pvt. Ltd. New Delhi.
2. Peressimi A.L., Sullivan F.E., Vhl, J. J. Mathematics of Non-linear Programming, Springer – Verlag.

WEB REFERENCE

1. https://onlinecourses.nptel.ac.in/noc24_ee122/preview
2. https://archive.nptel.ac.in/courses/111/105/111105039/
3. https://onlinecourses.nptel.ac.in/noc21_ce60/preview

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(23HS0858) MATHEMATICAL FOUNDATION OF QUANTUM TECHNOLOGIES
Open Elective course –II

COURSE OBJECTIVES

The objectives of this course is

1. *To provide students with essential linear algebra foundations including vector spaces, inner products, and operators for quantum mechanical applications.*
2. *To develop understanding of the transition from finite-dimensional systems to infinite-dimensional function spaces and Hilbert space concepts.*
3. *To establish quantum mechanical formalism including measurement theory, uncertainty relations, and time evolution principles.*
4. *To enable students to apply quantum mechanical principles to solve problems in simple quantum systems and understand statistical interpretation.*
5. *To introduce advanced concepts in composite systems, measurement processes, and modern perspectives in quantum mechanics.*

COURSE OUTCOMES

After successful completion of this course, the students should be able to:

1. *Apply linear algebra concepts to function spaces and analyze the transition from finite to infinite dimensional systems.*
2. *Understand vector spaces, inner products, and linear operators with applications to quantum systems.*
3. *Analyze quantum mechanical formalism including measurement theory, uncertainty relations, and time evolution.*
4. *Apply quantum mechanical principles to solve problems in simple quantum systems and evaluate statistical interpretations.*
5. *Understand statistical applications and interpretation with measurement processes..*
6. *Evaluate advanced concepts in composite systems and synthesize understanding of measurement processes and modern quantum theory.*

UNIT I

Linear Algebra Foundation for Quantum Mechanics - Vector spaces definition and examples (R^2, R^3, function spaces), Inner products (dot product, orthogonality, normalization), Linear operators (matrices, eigenvalues, eigenvectors), Finite-dimensional examples (2×2 matrices, spin-1/2 systems), Dirac notation introduction ($|\psi\rangle$, $\langle \varphi|$, $\langle \varphi|\psi\rangle$), Change of basis (transformations, unitary matrices).

UNIT II

From Finite to Infinite Dimensions - Function spaces (L^2 space, square-integrable functions), Inner products for functions ($\int \phi^* \phi \, dx$), Orthogonal function sets (Fourier series, basis functions), Introduction to Hilbert space concept (complete inner product spaces), Position and momentum representations (wave functions), Operators on functions (d/dx, multiplication by x).

UNIT III

Quantum Mechanical Formalism - Mathematical formulation (states as vectors, observables as operators), Measurement theory (Born rule, expectation values, probabilities), Uncertainty relations (mathematical derivation from commutators), Time evolution (Schrödinger equation, unitary evolution).

UNIT IV

Applications and Statistical Interpretation - Simple applications (infinite square well, harmonic oscillator), Statistical interpretation (ensembles, pure vs mixed states), Measurement process (von Neumann measurement scheme).

UNIT V

Advanced Topics - Composite systems (tensor products basic introduction), Reversibility and irreversibility (unitary evolution vs measurement), Thermodynamic connections (equilibrium states, entropy), Modern perspectives (decoherence, measurement problem conceptual).

TEXT BOOKS

1. David J. Griffiths, Darrell F. Schroeter, —*Introduction to Quantum Mechanics*, 3rd Edition, Cambridge University Press (2018).
2. R. Shankar, *Principles of Quantum Mechanics*, 2nd Edition, Kluwer Academy/Plenum Publishers (1994).

REFERENCES

1. George. F. Simmons, —*Introduction to Topology and Modern Analysis*, MedTech Science Press.
2. Gilbert Strang, *Linear Algebra and Its Applications*, 4th Edition, Cengage Learning (2006).
3. John von Neumann and Robert T Beyer, *Mathematical Foundations of Quantum Mechanics*,Princeton Univ. Press (1996).

WEB RESOURCES

1. https://eclass.uoa.gr/modules/document/file.php/CHEM248/Griffiths%20-%20Introduction%20to%20Quantum%20Mechanics%203rd%20ed%202018.pdf
2. https://fisica.net/mecanica-quantica/Shankar%20-%20Principles%20of%20quantum%20mechanics.pdf

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(23HS0843) PHYSICS OF ELECTRONIC MATERIALS AND DEVICES
Open Elective course –II

COURSE OBJECTIVES
The objectives of this course is

1. *To make the students to understand the concept of crystal growth, defects in crystals and thin films.*
2. *To provide insight into various semiconducting materials and their properties.*
3. *To develop a strong foundation in semiconductor physics and device engineering.*
4. *To elucidate excitonic and luminescent processes in solid-state materials.*
5. *To understand the principles, technologies, and applications of modern display systems.*

COURSE OUTCOMES:
After successful completion of this course, the students should be able to:

1. *Understand crystal growth and thin film preparation*
2. *Summarize the basic concepts of semiconductors*
3. *Illustrate the working of various semiconductor devices.*
4. *Explain the different types of Transistors.*
5. *Analyze various luminescent phenomena and the devices based on these concepts*
6. *Explain the working of different display devices*

UNIT-I
Fundamentals of Materials Science

Introduction, Phase rule, Phase Diagram, Elementary idea of Nucleation and Growth, Methods of crystal growth. The basic idea of point, line, and planar defects. Concept of thin films, preparation of thin films, Deposition of thin film using sputtering methods (RF and glow discharge)

UNIT II
Semiconductors

Introduction, charge carriers in semiconductors, effective mass, Diffusion and drift, Diffusion and recombination, Diffusion length. The Fermi level & Fermi-Dirac distribution, Electron and Hole in quantum well, Change of electron-hole concentration- Qualitative analysis, Temperature dependency of carrier concentration, Conductivity and mobility, Effects of temperature and doping on mobility, High field effects.

UNIT III
Physics of Semiconductor Devices:

Introduction, Band structure, PN junctions and their typical characteristics under equilibrium and under bias, Heterojunctions, Transistors, MOSFETs.

UNIT IV

Excitons and Luminescence:

Luminescence: Different types of luminescence, basic definitions, Light emission in solids, Inter-band luminescence, Direct and indirect gap materials.

Photoluminescence: General Principles of photoluminescence, Excitation and relaxation, OLED, Quantum-dot.

Electro-luminescence: General Principles of electroluminescence, light emitting diode, diode laser.

UNIT V

Display devices:

LCD, three-dimensional display: Holographic display, light-field displays: Head-mounted display, MOEMS (Micro-Opto-Electro-Mechanical Systems) and MEMS displays

TEXTBOOKS

1. S. O. Kasap, *Principles of Electronic Materials and Devices*, 4th Edition, McGraw-Hill Education (India) Pvt. Ltd., 2021.
2. Donald A. Neamen, *Semiconductor Physics & Devices: Basic Principles*, 4th Edition, McGraw-Hill, 2012.

REFERENCE BOOKS

1. B. G. Streetman and S. Banerjee, *Solid State Electronic Devices*, 6th Edition, PHI Learning.
2. Eugene A. Irene, *Electronic Materials Science*, Wiley, 2005.
3. Grover and Jamwal, *Electronic Components and Materials*, Dhanpat Rai and Co., New Delhi, 2012.
4. Wei Gao, Zhengwei Li, and Nigel Sammes, *An Introduction to Electronic Materials for Engineers*, 2nd Edition, World Scientific Publishing Co. Pvt. Ltd., 2011.

NPTEL COURSE LINKS

1. https://nptel.ac.in/courses/113/106/113106062/
2. https://onlinecourses.nptel.ac.in/noc20_ph24/preview

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(23HS0807) CHEMISTRY OF POLYMERS AND APPLICATIONS
Open Elective course –II

COURSE OBJECTIVES
The objectives of this course is

1. *To understand the basic principles of polymers*
2. *To understand natural polymers and their applications.*
3. *To impart knowledge to the students about synthetic polymers, their preparation and importance.*
4. *To enumerate the applications of hydogel polymers*
5. *To enumerate applications of conducting and degradable polymers in engineering.*

COURSE OUTCOMES
After successful completion of this course, the students should be able to:

1. *Understand fundamentals of polymers and moulding of plastics.*
2. *Analyze the chemical and physical properties of natural polymers and their applications.*
3. *Apply the knowledge of thermoplastic and thermoset polymers in practical situations.*
4. *Evaluate the environmental and industrial relevance of synthetic polymers and their applications.*
5. *Understand the fundamental principles of hydrogel in polymer networks.*
6. *Analyze the preparation and mechanism of conducting and degradable polymers.*

UNIT – I
Polymers-Basics and Characterization

Basic concepts of Polymers, Average molecular weight concepts: number, weight and viscosity average molecular weights, polydispersity and molecular weight distribution. Measurement of molecular weight: End group, viscosity, light scattering, osmotic and ultracentrifugation methods, analysis and testing of polymers.

UNIT – II
Natural Polymers & Modified cellulosics

Natural Polymers: Chemical & Physical structure, properties, source, important chemical modifications, applications of polymers such as cellulose, lignin, starch, rosin, shellac, latexes, vegetable oils and gums, proteins

Modified cellulosics: Cellulose esters and ethers such as Ethyl cellulose, CMC, HPMC, cellulose acetals, Liquid crystalline polymers; specialty plastics- PES, PAES, PEEK, PEA.

UNIT – III Synthetic Polymers

Addition and condensation polymerization processes– Bulk, Solution, Suspension and Emulsion polymerization. Preparation and significance, classification of polymers based on physical

properties. Thermoplastics, Thermosetting plastics, Fibers and elastomers, General Applications. Preparation of Polymers based on different types of monomers, Olefin polymers(PE,PVC), Butadiene polymers(BUNA-S,BUNA-N), nylons, Urea-formaldehyde, phenol – formaldehyde, Melamine Epoxy and Ion exchange resins.

UNIT -IV

Hydrogels of Polymer networks

Definitions of Hydrogel, polymer networks, Types of polymer networks, Methods involved in hydrogel preparation, Classification, Properties of hydrogels, Applications of hydrogels in drug delivery.

UNIT – V

Conducting and Degradable Polymers:

Conducting polymers: Introduction, Classification, Mechanism of conduction in Poly Acetylene, Poly Aniline, Poly Thiophene, Doping, Applications.

Degradable polymers: Introduction, Classifications, Examples, Mechanism of degradation, poly lactic acid, Nylon-6, Polyesters, applications.

TEXT BOOKS

1. F. W. Billmeyer, *A Textbook of Polymer Science*.
2. G. S. Mishra, *Polymer Chemistry*.
3. V. R. Gowariker, *Polymer Chemistry*.

REFERENCE BOOKS

1. K. J. Saunders, *Organic Polymer Chemistry*, Chapman and Hall.
2. B. Miller, *Advanced Organic Chemistry*, Prentice Hall.
3. Premamoy Ghosh, *Polymer Science and Technology*, 3rd Edition, McGraw-Hill, 2011.

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(23HS0823) ACADEMIC WRITING AND PUBLIC SPEAKING
Open Elective course –II

COURSE OBJECTIVES

The objectives of this course is

1. *To encourage all round development of the students by focusing on writing skills*
2. *To make the students aware of non-verbal skills*
3. *To develop analytical skills*
4. *To deliver effective public speeches*

COURSE OUTCOMES (CO)

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

1. *Understand various elements of Academic Writing*
2. *Identify sources and avoid plagiarism*
3. *Demonstrate the knowledge in writing a Research paper*
4. *Analyse different types of essays*
5. *Assess the speeches of others and know the positive strengths of speakers*
6. *Build confidence in giving an impactful presentation to the audience*

UNIT - I

Introduction to Academic Writing - Introduction to Academic Writing – Essential Features of Academic Writing – Courtesy – Clarity – Conciseness – Correctness – Coherence – Completeness – Types – Descriptive, Analytical, Persuasive, Critical writing

UNIT - II

Academic Journal Article - Art of condensation- summarizing and paraphrasing - Abstract Writing, writing Project Proposal, writing application for internship, Technical/Research/Journal Paper Writing – Conference Paper writing - Editing, Proof Reading – Plagiarism

UNIT - III

Essay & Writing Reviews - Compare and Contrast – Argumentative Essay – Exploratory Essay – Features and Analysis of Sample Essays – Writing Book Report, Summarizing, Book/film Review- SoP

UNIT - IV

Public Speaking - Introduction, Nature, characteristics, significance of Public Speaking – Presentation – 4 Ps of Presentation – Stage Dynamics – Answering Strategies –Analysis of Impactful Speeches- Speeches for Academic events

UNIT - V

Public Speaking and Non-Verbal Delivery - Body Language – Facial Expressions-Kinesics – Oculesics – Proxemics – Haptics – Chronomics - Paralanguage – Signs

TEXTBOOKS

1. *Critical Thinking, Academic Writing and Presentation Skills: MG University Edition*, Pearson Education, First Edition, 1 January 2010.
2. Allan Pease and Barbara Pease, *The Definitive Book of Body Language*, RHUS Publishers, 2016.

REFERENCE BOOKS

1. Alice Savage and Masoud Shafiei, *Effective Academic Writing*, 2nd Edition, Oxford University Press, 2014.
2. Shalini Verma, *Body Language*, S. Chand Publications, 2011.
3. Sanjay Kumar and Pushp Lata, *Communication Skills*, 2nd Edition, Oxford University Press, 2015.
4. Sharon Gerson and Steven Gerson, *Technical Communication: Process and Product*, Pearson, New Delhi, 2014.
5. Peter Elbow, *Writing with Power*, Oxford University Press (OUP), USA, 1998.

ONLINE LEARNING RESOURCES

1. https://youtu.be/NNhTIT81nH8p
2. https://www.youtube.com/watch?v=478ccrWKY-A
3. https://www.youtube.com/watch?v=nzGo5ZC1gMw
4. https://www.youtube.com/watch?v=Qve0ZBmJMh4
5. https://onlinecourses.nptel.ac.in/noc21_hs76/preview
6. https://archive.nptel.ac.in/courses/109/107/109107172/#
7. https://archive.nptel.ac.in/courses/109/104/109104107/

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(23CS1105) BIG DATA ANALYTICS LAB

COURSE OBJECTIVES

The objectives of this course:

1. *To introduce the terminology, technology and its applications*
2. *To introduce the cocepts of Analytics for Business*
3. *To introduce the tools, technologies & programming languages this is used in day to Day analytics cycle*
4. *To understand the file management tasks using Hadoop*
5. *Gain knowledge of map reduce paradigm to solve problems.*

COURSE OUTCOMES (COs)

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

1. *Connect to hadoop cluster, experiment with various Linux and HDFS commands to store data.*
2. *Apply the knowledge of Map Reduce programming to process the stored data in HDFS*
3. *Make use of database operations to store results in tables and generate reports.*
4. *Connect to web data sources for data gathering*
5. *Integrate data sources with hadoop components to process streaming data*
6. *Generate reports using data visualization tools.*

LIST OF EXPERIMENTS

Experiment 1: Week 1, 2:

1. Implement the following Data structures in Java

a) Linked Lists b) Stacks c) Queues d) Set e) Map

Experiment 2: Week 3:

2. (i) Perform setting up and Installing Hadoop in its three operating modes:

Standalone, Pseudo distributed, fully distributed

(ii)Use web based tools to monitor your Hadoop setup.

Experiment 3: Week 4:

3. Implement the following file management tasks in Hadoop:

•Adding files and directories

•Retrieving files

•Deleting files

Hint: A typical Hadoop workflow creates data files (such as log files) elsewhere and copies them into HDFS using one of the above command line utilities.

Experiment 4: Week 5:

4. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.

Experiment 5: Week 6:

5. Write a map reduce program that mines weather data.

Weather sensors collecting data every hour at many locations across the globe gather a large volume of log data, which is a good candidate for analysis with Map Reduce, since it is semi structured and record-oriented.

Experiment 6: Week 7:

6. Use Map Reduce to find the shortest path between two people in a social graph.

Hint: Use an adjacency list to model a graph, and for each node store the distance from the original node, as well as a back pointer to the original node. Use the mappers to propagate the distance to the original node, and the reducer to restore the state of the graph. Iterate until the target node has been reached.

Experiment 7: Week 8:

7. Implement Friends-of-friends algorithm in Map Reduce**.**

Hint: Two Map Reduce jobs are required to calculate the FoFs for each user in a social network. The first job calculates the common friends for each user, and the second job sorts the common friends by the number of connections to your friends.

Experiment 8: Week 9:

8. Implement an iterative PageRank graph algorithm in Map Reduce.

Hint: PageRank can be implemented by iterating a Map Reduce job until the graph has converged. The mappers are responsible for propagating node PageRank values to their adjacent nodes, and the reducers are responsible for calculating new PageRank values for each node, and for re-creating the original graph with the updated PageRank values.

Experiment 9: Week 10:

9. Perform an efficient semi-join in Map Reduce**.**

Hint: Perform a semi-join by having the mappers load a Bloom filter from the Distributed Cache, and then filter results from the actual Map Reduce data source by performing membership queries against the Bloom filter to determine which data source records should be emitted to the reducers**.**

Experiment 10: Week 11:

10.Install and Run Pig then write Pig Latin scripts to sort, group, join, project, and filter your data.

Experiment 12: Week 12:

11. Install and Run Hive then use Hive to create, alter, and drop databases, tables, views, functions, and indexes.

REFERENCES

1. Big Data Analytics, Seema Acharya, Subhasini chellappan, Wiley 2015.
2. Intelligent Data Analysis.Michael Berthoid, David J, Hand, Springer, 2007.
3. Understanding Big data, Chris Eaton, Dirk derooset at., McGraw Hill, 2012.

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(23CS1106) DATA VISUALIZATION LAB

COURSE OBJECTIVES

The objectives of this course:

1. *Understand the importance of data visualization for business intelligence and decision making.*
2. *Know approaches to understand visual perception*
3. *Learn about categories of visualization and application areas*
4. *Familiarize with the data visualization tools*
5. *Gain knowledge of effective data visuals to solve workplace problems*

COURSE OUTCOMES (COs)

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

1. *Understand the importance of data visualization for business intelligence and decision making*
2. *Know approaches to understand visual perception*
3. *Learn about categories of visualization and application areas*
4. *Familiarize with the data visualization tools*
5. *Gain knowledge of effective data visuals to solve workplace problems*
6. *Conduct exploratory data analysis using visualization.*

LIST OF EXPERIMENTS

1. Understanding Data, what is data, where to find data, Foundations for building Data Visualizations, Creating Your First visualization?
2. Getting started with Tableau Software using Data file formats, connecting your Data to Tableau, Creating basic charts (line, bar charts, Tree maps), Using the Show me panel.
3. Tableau Calculations, Overview of SUM, AVR, and Aggregate features, Creating custom Calculations and fields.
4. Applying new data calculations to your visualizations, Formatting Visualizations, Formatting Tools and Menus, Formatting specific parts of the view.
5. Editing and Formatting Axes, Manipulating Data in Tableau data, Pivoting Tableau data.
6. Structuring your data, Sorting and filtering Tableau data, Pivoting Tableau data.
7. Advanced Visualization Tools: Using Filters, Using the Detail panel, using the Size panels, Customizing filters, Using and customizing tooltips, formatting your data with colors.
8. Creating Dashboards & Storytelling, creating your first dashboard and Story, Design for different displays, adding interactivity to your Dashboard, Distributing & Publishing your Visualization
9. Tableau file types, publishing to Tableau Online, Sharing your visualizations, printing, and Exporting.
10. Creating custom charts, cyclical data and circular area charts, Dual Axis charts.

REFERENCES

1. Data visualization with python: create an impact with meaningful data insights using interactive and engaging visuals, Mario Dobler, Tim Grobmann, Packt Publications, 2019.
2. Practical Tableau: 100 Tips, Tutorials, and Strategies from a Tableau Zen Master, Ryan Sleeper, Oreilly Publications, 2018.
3. Data Visualization with R: 111 Examples by Thomas Rahlf, Springer, 2020.

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(23HS0818) SOFT SKILLS
(Skill Enhancement course)

COURSE OBJECTIVES

The objectives of this course is

1. *To encourage all round development of the students by focusing on soft skills*
2. *To make the students aware of critical thinking and problem-solving skills*
3. *To enhance healthy relationship and understanding within and outside an organization*
4. *To function effectively with heterogeneous teams*

COURSE OUTCOMES (CO):

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

1. *List out various elements of soft skill*
2. *Describe methods for building professional image*
3. *Apply critical thinking skills in problem solving*
4. *Analyze the needs of an individual and team for well-being*
5. *Assess the situation and take necessary decisions*
6. *Create a productive work place atmosphere using social and work-life skills ensuring personal and emotional well-being*

UNIT – I Soft Skills & Communication Skills

Soft Skills - Introduction, Need - Mastering Techniques of Soft Skills – Communication Skills - Significance, process, types - Barriers of communication - Improving techniques

Activities:

Intrapersonal Skills- Narration about self- strengths and weaknesses- clarity of thought – self-expression – articulating with felicity

(The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes and literary sources)

Interpersonal Skills- Group Discussion – Debate – Team Tasks - Book and film Reviews by groups - Group leader presenting views (non- controversial and secular) on contemporary issues or on a given topic.

Verbal Communication- Oral Presentations- Extempore- brief addresses and speeches- convincing- negotiating- agreeing and disagreeing with professional grace.

Non-verbal communication – Public speaking – Mock interviews – presentations with an objective to identify non- verbal clues and remedy the lapses on observation

UNIT – II Critical Thinking

Active Listening – Observation – Curiosity – Introspection – Analytical Thinking – Open-mindedness – Creative Thinking - Positive thinking - Reflection

Activities:

Gathering information and statistics on a topic - sequencing – assorting – reasoning – critiquing issues – placing the problem – finding the root cause - seeking viable solution – judging with rationl evaluating the views of others - Case Study, Story Analysis

UNIT – III Problem Solving & Decision Making

Meaning & features of Problem Solving – Managing Conflict – Conflict resolution –Team building - Effective decision making in teams – Methods & Styles

Activities:

Placing a problem which involves conflict of interests, choice and views – formulating the problem – exploring solutions by proper reasoning – Discussion on important professional, career and organizational decisions and initiate debate on the appropriateness of the decision. Case Study & Group Discussion

UNIT – IV Emotional Intelligence & Stress Management

Managing Emotions – Thinking before Reacting – Empathy for Others – Self-awareness – Self-Regulation – Stress factors – Controlling Stress – Tips

Activities:

Providing situations for the participants to express emotions such as happiness, enthusiasm, gratitude, sympathy, and confidence, compassion in the form of written or oral presentations.

Providing opportunities for the participants to narrate certain crisis and stress –ridden situations caused by failure, anger, jealousy, resentment and frustration in the form of written and oral presentation, Organizing Debates

UNIT – V Corporate Etiquette

Etiquette- Introduction, concept, significance - Corporate etiquette - meaning, modern etiquette, benefits - Global and local culture sensitivity - Gender Sensitivity - Etiquette in interaction- Cell phone etiquette - Dining etiquette - Netiquette - Job interview etiquette -Corporate grooming tips - Overcoming challenges

Activities

Providing situations to take part in the Role Plays where the students will learn about bad and good manners and etiquette - Group Activities to showcase gender sensitivity, dining etiquette etc. - Conducting mock job interviews - Case Study - Business Etiquette Games

TEXTBOOKS

1. Mitra, Barun K., *Personality Development and Soft Skills*, Oxford University Press, Pap/Cdr edition, 2012.
2. Kapoor, Shikha, *Personality Development and Soft Skills: Preparing for Tomorrow*, KI International Publishing House, 2018.

REFERENCES

1. Sharma, Prashant, *Soft Skills: Personality Development for Life Success*, BPB Publications, 2018.
2. Alex, K., *Soft Skills*, S. Chand & Co., Revised Edition, 2012.

3. Chauhan, Gajendra Singh and Sharma, Sangeetha, *Soft Skills: An Integrated Approach to Maximise Personality*, Wiley, 2013.
4. Pillai, Sabina and Fernandez, Agna, *Soft Skills and Employability Skills*, Cambridge University Press, 2018.

ONLINE LEARNING RESOURCES:

1. https://youtu.be/-Y-R9hDl7lU
2. https://youtu.be/gkLsn4ddmTs
3. https://youtu.be/2bf9K2rRWwo
4. https://youtu.be/FchfE3c2jzc
5. https://www.businesstrainingworks.com/training-resource/five-free-business-etiquette-training-games/
6. https://onlinecourses.nptel.ac.in/noc24_hs15/preview
7. https://onlinecourses.nptel.ac.in/noc21_hs76/
8. https://youtu.be/DUlsNJtg2L8?list=PLLy_2iUCG87CQhELCytvXh0E_y- bOO1_q
9. https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7Kl J

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(23HS0816) TECHNICAL PAPER WRITING & IPR
(Audit Course)

COURSE OBJECTIVES

The objectives of this course is

1. *To enable the students to practice the basic skills of research paper writing*
2. *To make the students understand the importance of IP and to educate them on the basic concepts of Intellectual Property Rights.*
3. *To practice the basic skills of performing quality literature review*
4. *To help them in knowing the significance of real life practice and procedure of Patents.*
5. *To enable them learn the procedure of obtaining Patents, Copyrights, & Trade Marks*

COURSE OUTCOMES

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

1. *Identify key secondary literature related to their proposed technical paper writing*
2. *Explain various principles and styles in technical writing*
3. *Use the acquired knowledge in writing a research/technical paper*
4. *Analyse rights and responsibilities of holder of Patent, Copyright, trademark, International Trademark etc.*
5. *Evaluate different forms of IPR available at national & international Level*
6. *Develop skill of making search of various forms of IPR by using modern tools and techniques.*

UNIT – I

Principles of Technical Writing: Styles In Technical Writing; Clarity, Precision, Coherence And Logical Sequence in Writing-Avoiding Ambiguity- Repetition, And Vague Language- Highlighting Your Findings-Discussing Your Limitations -Hedging and Criticizing -Plagiarism and Paraphrasing.

UNIT – II

Technical Research Paper Writing: Abstract-Objectives-Limitations-Review of Literature- Problems and Framing Research Questions- Synopsis.

UNIT – III

Process of Research: Publication Mechanism: Types of Journals- Indexing-Seminars-Conferences-Proof Reading–Plagiarism Style; Seminar & Conference Paper Writing; Methodology-Discussion-Results- Citation Rules.

UNIT – IV

Introduction to Intellectual Property: Introduction, Types of Intellectual Property, International Organizations, Agencies and Treaties, Importance of Intellectual Property Rights: Purpose and Function of Trade-Marks, Acquisition of Trade-Mark Rights, Protectable Matter, Selecting Evaluating Trade Mark and Trade Mark Registration Processes.

UNIT – V

Law of Copy Rights: Fundamentals of Copy Right Law, Originality of Material, Rights of Reproduction, Rights to Perform the Work Publicly, Copy Right Ownership Issues, Copy Right Registration, Notice of Copy Right, International Copy Right Law, Law of Patents: Foundation of Patent Law, Patent Searching Process, Ownership Rights and Transfer. Patent Law and Intellectual Property Audits.

TEXTBOOKS

1. Deborah E. Bouchoux, Intellectual Property Rights, Cengage Learning India, 2013.
2. Meenakshi Raman and Sangeeta Sharma, Technical Communication: Principles and Practices, Oxford University Press.

REFERENCE BOOKS

1. R. Myneni, *Law of Intellectual Property*, 9th Edition, Asia Law House, 2019.
2. Prabuddha Ganguli, *Intellectual Property Rights*, Tata McGraw-Hill, 2001.
3. P. Narayan, *Intellectual Property Law*, 3rd Edition, Eastern Law House, 2007.
4. Adrian Wallwork, *English for Writing Research Papers*, 2nd Edition, Springer, Cham, Heidelberg, New York, 2016.
5. Dan Jones and Sam Dragga, *Technical Writing Style*.

ONLINE RESOURCES

1. https://theconceptwriters.com.pk/principles-of-technical-writing/
2. https://theconceptwriters.com.pk/principles-of-technical-writing/
3. https://www.ewh.ieee.org/soc/emcs/acstrial/newsletters/summer10/TechPaperWriting.html
4. https://www.ewh.ieee.org/soc/emcs/acstrial/newsletters/summer10/TechPaperWriting.html
5. https://www.manuscriptedit.com/scholar-hangout/process-publishing-research-paper-journal/
6. https://www.icsi.edu/media/website/IntellectualPropertyRightLaws&Practice.pdf
7. https://lawbhoomi.com/intellectual-property-rights-notes/
8. https://www.extension.purdue.edu/extmedia/ec/ec-723.pdf