SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

B.TECH. CSE (SPL. IN IOT WITH AUTOMATION)

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 Counselling	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 (CIA)

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 (CIA)

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 (CIA)

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	23CS0506	Digital Logic and Computer Organization	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 & 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 (CIA)

S.No.	Course Code	Subject	L	T	P	Credits
1	23HS0848 23HS0850 23HS0851	Managerial Economics and Financial Analysis Organizational Behavior Business Environment	2	0	0	2
2	23HS0838	Probability & Statistics	3	0	0	3
3	23CS0511	Operating Systems	3	0	0	3
4	23EC0458	Microprocessor and Microcontroller	3	0	0	3
5	23CS1001	Data Communications and Networking	3	0	0	3
6	23CS1002	Computer Networks & Operating Systems Lab	0	0	3	1.5
7	23EC0459	Microprocessor and Microcontroller 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 (CIA)

S.No.	Course Code	Subject	L	T	P	Credits
1	23CS1301	Sensors & Internet of Things	3	0	0	3
2	23CS0512	Database Management Systems	3	0	0	3
3	23CS1302	Embedded Systems	3	0	0	3
4	23CS0519	Introduction to Quantum Technologies and Applications	3	0	0	3
Professional Elective Course – I						
5	23CS0513	Software Engineering	3	0	0	3
	23CS1309	Wireless ad-hoc & Sensor Networks				
	23CS0516	Artificial Intelligence				
	23CS0525	Cryptography & Network Security				
Open Elective Course - 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	23CS1303	Internet of Things and Embedded Systems Lab	0	0	3	1.5
8	23CS0515	Database Management 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	23CS1304	Evaluation of Community Service Internship	0	0	0	2
Total			**15**	**1**	**10**	**26**

III B. Tech. – II Semester (CIA)

S.No.	Course Code	Subject	L	T	P	Credits
1	23CS1305	IoT Data Analytics	3	0	0	3
2	23CS0524	Cloud Computing	3	0	0	3
3	23CS0523	Machine Learning	3	0	0	3
Professional Elective Course – II						
4	23CS0537	DevOps	3	0	0	3
	23CS1311	IOT Security				
	23CS1312	Multi Agent Systems				
	23CS0518	Automata Theory & Compiler Design				
Professional Elective Course – III						
5	23CS0543	Block Chain Technologies	3	0	0	3
	23CS0540	Natural Language Processing				
	23CS1313	Security Assessment and Risk Analysis				
	23CS1314	Android application development				
Open Elective Course - 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	23CS1306	IoT Data Analytics Lab	0	0	3	1.5
8	23CS1202	Cloud Computing Lab	0	0	3	1.5
9	23HS0818	**Skill Enhancement Course** Soft skills	0	1	2	2
10	23HS0816	**Audit Course** Technical Paper Writing & IPR	2	0	0	0
Total			**20**	**1**	**8**	**23**
Mandatory Industry Internship of 08 weeks duration during summer vacation						

NOTE: L-Lecture, T-Tutorial, P-Practical, Drg-Drawing, C-Credit

COURSES OFFERED FOR HONOURS DEGREE IN
B.Tech. CSE (WITH SPL IN IOT AND AUTOMATION)

S.No.	Course Code	Subject	Contact Hours per week			Credits
			L	T	P	
1	20CS1319	Social Media Security	3	0	0	3
2	20CS1320	Cloud Computing Security	3	0	0	3
3	20CS1321	Machine Learning for Cyber security	3	0	0	3
4	23CS1311	IOT security	3	0	0	3
5	20CS1322	Cyber Physical Systems and Security	3	0	0	3
6	20CS1323	IOT security Lab	0	0	3	1.5
7	20CS1324	Cyber Physical Systems and Security Lab	0	0	3	1.5
Total						**18**

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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.

L	T	P	C
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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.

L	T	P	C
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(23ME0301) ENGINEERING WORKSHOP
(Common to all branches of Engineering)

COURSE OBJECTIVES

The objectives of this course is to

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 to

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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0	0	2	1

(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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I B.Tech. – II Sem.

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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

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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 AND 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.

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(23CS0506) DIGITAL LOGIC AND COMPUTER ORGANIZATION
(Common to CSE, CSIT & 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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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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(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

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II B.Tech – I Sem.

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(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

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II B.Tech – I Sem.

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(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.

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(23HS0848) MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS
(Common to CSE, CIC, CAD, CCC, CIA)

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)

At the end of the course, Student 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.

TEXT BOOKS

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:

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

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II B.Tech – II Sem.

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(23HS0850) ORGANISATIONAL BEHAVIOUR
(Common to CSE, CIC, CAD, CCC, CIA)

COURSE OBJECTIVES:

The objectives of this course

1. *To enable student's comprehension of organizational behaviour*
2. *To offer knowledge to students on self-motivation, leadership and management*
3. *To facilitate them to become powerful leaders*
4. *To Impart knowledge about group dynamics*
5. *To make them understand the importance of change and development*

COURSE OUTCOMES (COs)

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

1. *Define the Organizational Behaviour, its nature and scope.*
2. *Understand the nature and concept of Organizational behaviour*
3. *Apply theories of motivation to analyse the performance problems*
4. *Analyse the different theories of leadership*
5. *Evaluate group dynamics*
6. *Develop as powerful leader*

UNIT-I

Introduction to Organizational Behavior : Meaning, definition, nature, scope and functions - Organizing Process – Making organizing effective -Understanding Individual Behaviour – Attitude -Perception - Learning – Personality.

UNIT-II

Motivation and Leading : Theories of Motivation- Maslow's Hierarchy of Needs - Hertzberg's Two Factor Theory - Vroom's theory of expectancy – Mc Cleland's theory of needs–Mc Gregor's theory X and theory Y– Adam's equity theory.

UNIT-III

Organizational Culture: Introduction – Meaning, scope, definition, Nature - Organizational Climate - Leadership - Traits Theory–Managerial Grid - Transactional Vs Transformational Leadership - Qualities of good Leader - Conflict Management -Evaluating Leader.

UNIT-IV

Group Dynamics: Introduction – Meaning, scope, definition, Nature- Types of groups - Determinants of group behaviour - Group process – Group Development - Group norms - Group cohesiveness - Small Groups - Group decision making - Team building - Conflict in the organization– Conflict resolution.

UNIT-V

Organizational Change and Development: Introduction –Nature, Meaning, scope, definition and functions- Organizational Culture - Changing the Culture – Change Management – Work Stress Management - Organizational management – Managerial implications of organization's change and development.

TEXTBOOKS

1. Luthans, Fred, *Organisational Behaviour*, McGraw-Hill, 12 Th edition.
2. P Subba Ran, *Organisational Behaviour*, Himalya Publishing House.

REFERENCE BOOKS

1. McShane, *Organizational Behaviour*, TMH
2. Nelson, *Organisational Behaviour*, Thomson.
3. Robbins, P. Stephen, Timothy A. Judge, *Organisational Behaviour*, Pearson.
4. Aswathappa, *Organisational Behaviour*, Himalaya.

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II B.Tech – II Sem.

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(23HS0851) BUSINESS ENVIRONMENT
(Common to CSE, CIC, CAD, CCC, CIA)

COURSE OBJECTIVES
The objectives of this course

1. *To make the student to understand about the business environment*
2. *To enable them in knowing the importance of fiscal and monitory policy*
3. *To facilitate them in understanding the export policy of the country*
4. *To Impart knowledge about the functioning and role of WTO*
5. *To Encourage the student in knowing the structure of stock markets*

COURSE OUTCOMES (COs)
At the end of the course, Student will be able to

1. *Define Business Environment and its Importance.*
2. *Understand various types of business environment.*
3. *Apply the knowledge of Money markets in future investment*
4. *Analyse India's Trade Policy*
5. *Evaluate fiscal and monitory policy*
6. *Develop a personal synthesis and approach for identifying business opportunities*

UNIT-I
Overview of Business Environment: Introduction – meaning Nature, Scope, significance, functions and advantages. Types- Internal &External, Micro and Macro. Competitive structure of industries -Environmental analysis- advantages & limitations of environmental analysis.

UNIT-II
Fiscal & Monetary Policy: Introduction – Nature, meaning, significance, functions and advantages. Public Revenues - Public Expenditure - Evaluation of recent fiscal policy of GOI. Highlights of Budget- Monetary Policy - Demand and Supply of Money –RBI -Objectives of monetary and credit policy - Recent trends- Role of Finance Commission.

UNIT-III
India's Trade Policy: Introduction – Nature, meaning, significance, functions and advantages. Magnitude and direction of Indian International Trade - Bilateral and Multilateral Trade Agreements - EXIM policy and role of EXIM bank -Balance of Payments– Structure & Major components - Causes for Disequilibrium in Balance of Payments - Correction measures

UNIT-IV

World Trade Organization: Introduction – Nature, significance, functions and advantages. Organization and Structure - Role and functions of WTO in promoting world trade - GATT - Agreements in the Uruguay Round –TRIPS, TRIMS - Disputes Settlement Mechanism - Dumping and Anti-dumping Measures.

UNIT-V

Money Markets and Capital Markets: Introduction – Nature, meaning, significance, functions and advantages. Features and components of Indian financial systems - Objectives, features and structure of money markets and capital markets - Reforms and recent development – SEBI – Stock Exchanges - Investor protection and role of SEBI, Introduction to international finance.

TEXTBOOKS

1. Francis Cherunilam, *International Business: Text and Cases*, Prentice Hall of India.
2. K. Aswathappa, *Essentials of Business Environment: Texts and Cases & Exercises* 13th Revised Edition.HPH

REFERENCE BOOKS

1. K. V. Sivayya, V. B. M Das, *Indian Industrial Economy,* Sultan Chand Publishers, New Delhi, India.
2. Sundaram, Black, *International Business Environment Text and Cases*, Prentice Hall of India, New Delhi, India.
3. Chari. S. N, *International Business*, Wiley India.
4. E. Bhattacharya, *International Business*, Excel Publications, New Delhi.

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II B.Tech – II Sem.

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(23HS0838) PROBABILITY & STATISTICS
(Common to CSE, CSM, CIC, CCC, CIA and CAI)

COURSE OBJECTIVES

The objectives of this course

1. *To familiarize the students with the foundations of probability and statistical methods.*
2. *To help the students in getting a thorough understanding of fundamentals of probability and usage of statistical techniques like testing of hypothesis.*

COURSE OUTCOMES (COs)

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

1. *Acquire knowledge in finding the analysis of categorically and various statistical elementary tools*
2. *Develop skills in designing mathematical models involving probability, random variables and the critical thinking in the theory of probability and its applications in real life problems.*
3. *Apply binomial and Poisson distributions for real data to compute probabilities, theoretical frequencies*
4. *Interpret the properties of normal distributions and its applications.*
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

Descriptive statistics

Statistics Introduction, Population vs Sample, Collection of data, primary and secondary data, Measures of Central tendency, Measures of Variability (spread or variance) Skewness, Kurtosis, correlation, correlation coefficient, rank correlation, regression coefficients, method of least squares, regression lines.

UNIT - II

Probability

Probability, probability axioms, addition law and multiplicative law of probability, conditional probability, Baye's theorem, random variables (discrete and continuous), probability density functions, properties, mathematical expectation.

UNIT III

Probability distributions

Probability distributions: Binomial, Poisson and Normal-their properties (Chebyshevs inequality). Approximation of the binomial distribution to normal distribution.

UNIT IV

Estimation and Testing of hypothesis, large sample tests

Estimation-parameters, statistics, sampling distribution, point estimation, Formulation of null hypothesis, alternative hypothesis, the critical and acceptance regions, level of significance, two types of errors and power of the test. Large Sample Tests: Test for single proportion, difference of proportions, test for single mean and difference of means. Confidence interval for parameters in one sample and two sample problems

UNIT V

Small sample tests

Student t-distribution (test for single mean, two means and paired t-test), testing of equality of variances (F-test), $\chi 2$ - test for goodness of fit, $\chi 2$ - test for independence of attributes.

TEXTBOOKS

1. Miller and Freunds, *Probability and Statistics for Engineers*,7/e, Pearson, 2008.
2. S.C. Gupta and V.K. Kapoor, *Fundamentals of Mathematical Statistics*, 11/e, Sultan Chand &; Sons Publications, 2012.

REFERENCES

1. S. Ross, *a First Course in Probability*, Pearson Education India, 2002.
2. W. Feller, *an Introduction to Probability Theory and its Applications*, 1/e, Wiley, 1968.
3. B. V. Ramana, *Higher Engineering Mathematics*, Mc Graw Hill Education.

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

REFERENCES

1. Stallings W, *Operating Systems -Internals and Design Principles*, 9th edition, Pearson, 2018
2. D.M Dhamdhere, *Operating Systems: A Concept Based Approach*, 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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(23EC0458) MICROPROCESSORS AND MICROCONTROLLERS

COURSE OBJECTIVES

The objectives of this course

1. *To introduce fundamental architectural concepts of microprocessors and Microcontrollers.*
2. *To impart knowledge on addressing modes and instruction set of 8086 and 8051.*
3. *To introduce assembly language programming concepts.*
4. *To acquire the knowledge on interfacing various peripherals, configure and develop programs to interface peripherals/sensors..*
5. *To develop programs efficiently on ARM Cortex processors and debug.*

COURSE OUTCOMES (COs)

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

1. *Distinguish between microprocessors & microcontrollers.*
2. *Develop the ALP programs using various instruction set.*
3. *Demonstrate programming skills in assembly language for processors and Controllers.*
4. *Design electrical circuitry to the Microprocessor I/O ports in order to interface the processor to external devices.*
5. *Analyze various interfacing techniques.*
6. *Apply the techniques for the design of processor / Controller based systems.*

UNIT - I

Introduction: Basic Microprocessor architecture, Harvard and Von Neumann architectures with examples, Microprocessor Unit versus Microcontroller Unit, CISC and RISC architectures.

8086 Architecture: Main features, pin diagram/description, 8086 microprocessor family, internal architecture, bus interfacing unit, execution unit, interrupts and interrupt response, 8086 system timing, minimum mode and maximum mode configuration.

UNIT - II

8086 Programming: Program development steps, instructions, addressing modes, assembler directives, writing simple programs with an assembler, assembly language program development tools.

UNIT III

8086 Interfacing: Semiconductor memories interfacing (RAM, ROM), Intel 8255 programmable peripheral interface, Interfacing switches and LEDS, interfacing seven segment displays, software and hardware interrupt applications, Intel 8251 USART architecture and interfacing, Intel 8237a DMA controller, stepper motor, A/D and D/A

converters, Need for 8259 programmable interrupt controllers.

UNIT IV

Intel 8051 MICROCONTROLLER: Architecture, Hardware concepts, Input/output ports and circuits, external memory, counters/timers, serial data input/output, interrupts. Assembly language programming: Instructions, addressing modes, simple programs. Interfacing to 8051: A/D and D/A Convertors, Stepper motor interface, keyboard, LCD Interfacing, Traffic light control.

UNIT V

ARM Architectures and Processors: ARM Architecture, ARM Processors Families, ARM Cortex-M Series Family, ARM Cortex-M3 Processor Functional Description, functions and Interfaces Programmers Model – Modes of operation and execution, Instruction set summary, System address map, write buffer, bit-banding, processor core register summary, exceptions.
ARM Cortext-M3 programming – Software delay, Programming techniques, Loops, Stack and Stack pointer, subroutines and parameter passing, parallel I/O, Nested Vectored Interrupt Controller – functional description and NVIC programmers' model.

TEXTBOOKS

1. V Hall, SSSP Rao, *Microprocessors and Interfacing – Programming and Hardware* by Douglas, Tata McGraw Hill Education Private Limited, 3rd Edition, 1994.
2. Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; *The 8051 Microcontrollers and Embedded systems Using Assembly and C*., Pearson 2-Edition, 2011.
3. Joseph You., *The Definitive Guide to ARM Cortex-M3 and Cortex-M4 Processors*

REFERENCES

1. Dr. Alexander G. Dean, *Embedded Systems Fundamentals with Arm Cortex-M based Microcontrollers: A Practical Approach in English*, Published by Arm Education Media,2017.
2. Cortex - *M3 Technical Reference Manual.*

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(23CS1001) DATA COMMUNICATIONS AND NETWORKING
(Common to CIC & CIA)

COURSE OBJECTIVES

The objectives of this course

1. *To introduce the fundamental various types of computer networks.*
2. *To demonstrate the TCP/IP and OSI models with merits and demerits*
3. *To explore the various layers of OSI Model*
4. *To introduce UDP and TCP Models.*

COURSE OUTCOMES (COs)

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

1. *Understand the software and hardware components of a Computer network*
2. *Analyze the Data link layer for error detection and correction.*
3. *Apply the network layer routing algorithms for solving routing issues.*
4. *Analyze the congestion control algorithms and internet protocols.*
5. *Analyze the Transport layer protocol for managing the flow control.*
6. *Understand the Application layer protocols like HTTP, SMTP.*

UNIT - I

Data Communications: Components – Direction of Data flow – Networks – Components and Categories – Types of Connections – Topologies –Protocols and Standards – ISO / OSI model, Example Networks such as ATM, Frame Relay, ISDN Physical layer: Transmission modes, Multiplexing, Transmission Media, Switching, Circuit Switched Networks, Datagram Networks, Virtual Circuit Networks.

UNIT - II

Data link layer: Introduction, Framing, and Error – Detection and Correction – Parity – LRC – CRC Hamming code, Flow and Error Control, Noiseless Channels, Noisy Channels, HDLC, Point to Point Protocols. 111 Medium Access sub layer: ALOHA, CSMA/CD, LAN – Ethernet IEEE 802.3, IEEE 802.5 – IEEE 802.11, Random access, Controlled access, Channelization.

UNIT III

Network Layer: Logical Addressing, Internetworking, Tunneling, Address mapping, ICMP, IGMP, Forwarding, Uni-Cast Routing Protocols, Multicast Routing Protocols.

UNIT IV

Transport Layer: Process to Process Delivery, UDP and TCP protocols, Data Traffic, Congestion, Congestion Control, QoS, Integrated Services, Differentiated Services, QoS in Switched Networks.

UNIT V

Application Layer: Domain name space, DNS in internet, electronic mail, SMTP, FTP, WWW, HTTP, SNMP. GATE SYLLABUS Concept of layering. LAN technologies (Ethernet).flow and error control techniques, switching. IPV4/IPV6, routers and routing algorithms (distance vector, link state).TCP/UDP and sockets, congestion control. Application layer protocols (DNS, SMTP, POP, FTP, HTTP).Basics of Wi-Fi.

TEXTBOOKS

1. Behrouz A. Forouzan, *Data Communications and Networking*, 5th Edition, McGraw Hill Publication, 2017.
2. Andrew S Tanenbaum, *Computer Networks*, 4th Edition. Pearson Education, PHI.

REFERENCES

1. P.C .Gupta, *Data Communications and Computer Networks*, PHI.
2. S. Keshav, *An Engineering Approach to Computer Networks*, 2nd Edition, Pearson Education.
3. W.A. Shay, *Understanding communications and Networks*, 3rd Edition, Cengage Learning.
4. Jame F.Kurose & Keith W. Ross, *Computer Networking: A Top-Down Approach Featuring the Internet. s* 3 rd Edition, Pearson Education.
5. William Stallings, *Data and Computer Communication*,Sixth Edition, Pearson Education, 2000

ONLINE LEARNING RESOURCES

1. https://nptel.ac.in/courses/106105183/25
2. http://www.nptelvideos.in/2012/11/computer-networks.html
3. https://nptel.ac.in/courses/106105183/3

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(23CS1002) COMPUTER NETWORKS & OPERATING SYSTEMS LAB
(Common to CIC & CIA)

COURSE OBJECTIVES

The objectives of this course

1. *To understand 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 (COs)

At the end of the course, Student 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*

1. **List of Activities/Experiments - Computer Networks:**

a. 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.

2. 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.
3. 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.

a. Work with the commands Ping, Tracert, Ipconfig, pathping, telnet, ftp, getmac, ARP, Hostname, Nbtstat, netdiag, and Nslookup

b. Use Packet tracer software to build network topology and configure using Distance vector routing protocol.

c. Use Packet tracer software to build network topology and configure using Link State routing protocol.

d. Using JAVA RMI Write a program to implement Basic Calculator.

e. Implement a Chatting application using JAVA TCP and UDP sockets.

f. 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.

g. Using Wireshark perform the following operations:
4. Inspect HTTP Traffic
5. 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. Silberschatz A, Galvin P B, Gagne G, *Operating System Concepts*, 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.
3. Tanenbaum A S, *Modern Operating Systems*, 4th Edition, Pearson, 2016

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(23EC0459) MICROPROCESSORS AND MICROCONTROLLERS LAB

COURSE OBJECTIVES

The objectives of this course

1. *To acquire the knowledge on microprocessors and microcontrollers, interfacing various peripherals, configure and develop programs to interface peripherals/sensors.*
2. *To develop the quality of assessing and analyzing the obtained data.*

COURSE OUTCOMES (COs)

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

1. *Formulate problems and implement algorithms using Assembly language.*
2. *Develop programs for different applications.*
3. *Develop testing and experimental procedures on Microprocessor and Microcontroller analyze their operation under different cases.*
4. *Interface peripheral devices with Processors and Controllers.*
5. *Use Assembly/Embedded C programming approach for solving real world problems*
6. *Develop a program for ARM CORTEX M3 processor*

List of Experiments:

PART- A: (Minimum of 5 Experiments has to be performed)
8086 Assembly Language Programming and Interfacing

1. Programs for 16 -bit arithmetic operations (using Various Addressing Modes).
a. Addition of n-BCD numbers.
b. Multiplication and Division operations.
2. Program for sorting anarray.
3. Program for Factorial of givenn-numbers.
4. Interfacing ADC to8086
5. Interfacing DAC to8086.
6. Interfacing stepper motor to8086.

PART-B: (Minimum of 5 Experiments has to be performed)
8051 Assembly Language Programming and Interfacing

1. Finding number of 1’s and number of 0’s in a given 8-bit number
2. Average of n-numbers.
3. Program and verify Timer/ Counter in8051.
4. Interfacing Traffic Light Controller to8051.
5. UART operation in8051 6. Interfacing LCD to8051

PART-C (Minimum of 2 Experiments has to be performed)
Conduct the following experiments using ARM CORTEX M3 PROCESSOR USING KEIL MDK ARM

1. Write an assembly program to multiply of 2 16-bit binary numbers.
2. Write an assembly program to find the sum of first 10 integers numbers.
3. Write a program to toggle LED every second using timer interrupt.

Equipment Required:
1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. 8086 Microprocessor kits
4. 8051 microcontroller kits
5. ADC module
6. DAC module
7. Stepper motor module
8. Keyboard module
9. LED, 7-Segemt Units
10. Digital Multimeters
11. ROM/RAM Interface module
12. Bread Board etc.
13. ARM CORTEX M3
14. KEIL MDKARM

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(23CS0550) FULL STACK DEVELOPMENT – 1
(Common to All CSE, CSIT & 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 FOR 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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(23CS1301) SENSORS & INTERNET OF THINGS

COURSE OBJECTIVES

The objectives of this course is to

1. *To understand the basic concepts of sensors, actuators, and their roles in IoT systems.*
2. *To explore IoT reference architectures and key industrial use cases.*
3. *To apply knowledge of sensor integration in industrial environments.*
4. *To analyze communication protocols and data exchange methods in IoT.*
5. *To evaluate data processing techniques and storage solutions for IoT data.*

COURSE OUTCOMES (COs)

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

1. *Explain the types, functions, and architecture of sensors and actuators used in IoT.*
2. *Apply edge computing and data stream processing concepts in IoT architectures.*
3. *Demonstrate the integration of sensors and data acquisition systems in industrial settings.*
4. *Describe the different types of networking protocols used in IoT networks.*
5. *Compare various communication protocols and their suitability in IoT networks.*
6. *Implement basic time-series analytics and anomaly detection techniques on IoT data.*

UNIT– I

Introduction to Sensors: Transducers, Classification, Roles of sensors in IOT, Various types of sensors, Design of sensors, sensor architecture, Role of actuators, Types of actuators

Introduction to IoT and Use cases: Understanding basic concepts of IoT, Consumer IoT vs Industrial Internet, Fundamental building blocks, Use Cases of IoT in various industry domains.

UNIT- II

Architecture: IoT reference architectures, Industrial Internet Reference Architecture, Edge Computing, IoT Gateways, Data Ingestion and Data Processing Pipelines, Data Stream Processing.

UNIT-III

Sensors and Industrial Systems: Introduction to sensors and transducers, integrating sensors to sensor processing boards, introduction to industrial data acquisition systems, industrial control systems and their functions.

UNIT–IV

Networking and Communication for IoT: Recap of OSI 7 layer architecture and mapping to IoT architecture, Introduction to proximity networking technologies (ZigBee, Bluetooth, Serial

Communication), Industrial network protocols (Modbus, CANbus), Communicating with cloud applications (web services, REST, TCP/IP and UDP/IP sockets, MQTT, WebSockets, protocols. Message encoding (JSON, Protocol Buffers).

UNIT –V

IoT Data Processing and Storage: Time Series Data and their characteristics, time series databases, basic time series analytics, data summarization and sketching, dealing with noisy and missing data, anomaly and outlier detection.

IoT Seminars: Selected topics in IoT should be handled via student seminars. Recommended that students form a group do research on at least one of the following topics and present it through seminars. They are expected to do a literature survey of the topic and present their survey paper to the class. The suggested topics are –

a) IoT Applications
•Smart Cities
•Connected Vehicles and Telematics
•Smart Grids
•Smart Homes
b) IoT data visualization
c) Survey of cloud based IoT platforms
d) Low power wide area networks for IoT
e) IoT device management
f) Survey of chips, embedded modules and development boards for IoT devices
g) Embedded and real-time operating systems for IoT
h) IoT Security
•Security risks in IoT
•Securing IoT endpoint devices and secure communication protocols for IoT
•Security and Privacy of IoT data

TEXTBOOK

1. Samuel Greengard, *The Internet* of Things, MIT Press Essential Knowledge Series,

REFERENCE BOOKS / LINKS

1. Industrial Internet Reference Architecture - http://www.iiconsortium.org/IIRA.htm
2. World Economic Forum Report on Industrial Internet of Things – https://www.weforum.org/reports/industrial-internet-things
3. 50 Sensor Applications for a Smarter World – http://www.libelium.com/resources/top_50_iot_sensor_applications_ranking/
4. Visualizing Data-Exploring and Explaining Data with the Processing Environment, By Ben Fry, Publisher: O'Reilly Media
5. Raspberry Pi Computer Architecture Essentials, by Andrew K Dennis
6. Getting Started with Arduino, M. Banzi, O Reilly Media
7. GSMA IoT Security Guidelines & Assessment - https://www.gsma.com/iot/future-iot-networks/iot-security-guidelines/

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III B.Tech. – I Sem.

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(23CS0512) DATABASE MANAGEMENT SYSTEMS
(Common to All CSE & CSE Allied branches)

COURSE OBJECTIVES

The objectives of this course is to

6. *Introduce database management systems and to give a good formal foundation on the relational model of data and usage of Relational Algebra*
7. *Introduce the concepts of basic SQL as a universal Database language*
8. *Demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization*
9. *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

7. *Understand the basic concepts of database management systems*
8. *Analyze a given database application scenario to use ER model for conceptual design of the database*
9. *Develop relational algebra expressions to query and optimize the database using SQL*
10. *Utilize SQL proficiently to address diverse query challenges*
11. *Employ normalization methods to enhance database structure*
12. *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

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

REFERENCES

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
5. Donald E Knuth, Addison-Wesley, *The Art of Computer Programming*, Vol.1: Fundamental Algorithms, 1997.
6. Langsam, Augenstein & Tanenbaum, *Data Structures using C & C++:* Pearson, 1995
7. N.Wirth, *Algorithms + Data Structures & Programs*, PHI
8. Horowitz Sahni & Mehta, *Fundamentals of Data Structures in C++*, Galgottia Pub.
9. Thomas Standish, *Data structures in Java*, Pearson Education Asia
10. C J Date, *Introduction to Database Systems,* 8th edition, Pearson.
11. 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

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(23CS1302) EMBEDDED SYSTEMS

COURSE OBJECTIVES

The objectives of this course is to

1. *To understand the fundamentals, purpose, and classification of embedded systems.*
2. *To explore the hardware components and memory systems used in embedded designs.*
3. *To describe the structure and function of embedded firmware and development tools.*
4. *To analyze real-time operating systems and their role in embedded system design.*
5. *To examine inter-task communication, synchronization, and RTOS selection methods*

COURSE OUTCOMES (COs)

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

1. *Differentiate embedded systems from general-purpose systems based on features and applications.*
2. *Analyze various suitable processors to be used in typical embedded systems.*
3. *Identify key components like memory, and interfaces used in typical embedded systems.*
4. *Explain firmware development techniques, circuits, and design approaches.*
5. *Demonstrate the use of RTOS concepts such as tasks, scheduling, and multitasking.*
6. *Apply task communication and synchronization mechanisms in embedded systems.*

UNIT-I

Introduction to Embedded Systems: Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

UNIT-II

Typical Embedded System: Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces.

UNIT-III

Embedded Firmware: Reset Circuit, Brown-out Protection Circuit, Oscillator UNIT-, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

UNIT-IV

RTOS Based Embedded System Design: Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

UNIT-V

Task Communication: Shared Memory, Message Passing, Remote Procedure Call and Sockets,

Task Synchronization: Task Communication/Synchronization Issues, Task Synchronization Techniques, Device Drivers, Methods to Choose an RTOS.

TEXT BOOK

1. Shibu K.V, *Introduction to Embedded Systems*, Mc Graw Hill.

REFERENCE BOOKS

1. Embedded Systems - Raj Kamal, TMH.
2. Embedded System Design - Frank Vahid, Tony Givargis, John Wiley.
3. Embedded Systems – Lyla, Pearson, 2013
4. An Embedded Software Primer - David E. Simon, Pearson Education.

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(23CS0519) INTRODUCTION TO QUANTUM TECHNOLOGIES AND APPLICATIONS
(Common to all branches)

COURSE OBJECTIVES

The objectives of this course is to

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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(23CS0513) SOFTWARE ENGINEERING
Professional Elective Course – I
(Common to All CSE & CSE Allied branches)

COURSE OBJECTIVES

The objectives of this course is to

5. *Software life cycle models, Software requirements and SRS document.*
6. *Project Planning, quality control and ensuring good quality software.*
7. *Software Testing strategies, use of CASE tools, Implementation issues, validation & verification procedures.*

COURSE OUTCOMES (COs)

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

7. *Perform various life cycle activities like Analysis, Design, Implementation, Testing and Maintenance*
8. *Analyze various software engineering models and apply methods for design and development of software projects.*
9. *Illustrate the design process and architectural design*
10. *Develop system designs using appropriate techniques.*
11. *Understand various testing techniques for a software project.*
12. *Apply standards, CASE tools and techniques for engineering software projects.*

UNIT - I

Introduction: Evolution, Software development projects, Exploratory style of software developments, Emergence of software engineering, Notable changes in software development practices, Computer system engineering.

Software Life Cycle Models: Basic concepts, Waterfall model and its extensions, Rapid application development, Agile development model, Spiral model.

UNIT - II

Software Project Management: Software project management complexities, Responsibilities of a software project manager, Metrics for project size estimation, Project estimation techniques, Empirical Estimation techniques, COCOMO, Halstead's software science, risk management.

Requirements Analysis And Specification: Requirements gathering and analysis, Software Requirements Specification (SRS), Formal system specification, Axiomatic specification, Algebraic specification, Executable specification and 4GL.

UNIT III

Software Design: Overview of the design process, How to characterize a good software design? Layered arrangement of modules, Cohesion and Coupling. approaches to software design.

Agility: Agility and the Cost of Change, Agile Process, Extreme Programming (XP), Other Agile Process Models, Tool Set for the Agile Process (Text Book 2)

Function-Oriented Software Design: Overview of SA/SD methodology, Structured analysis, Developing the DFD model of a system, Structured design, Detailed design, and Design Review.

User Interface Design: Characteristics of a good user interface, Basic concepts, Types of user interfaces, Fundamentals of component-based GUI development, and user interface design methodology.

UNIT IV

Coding And Testing: Coding, Code review, Software documentation, Testing, Black-box testing, White-Box testing, Debugging, Program analysis tools, Integration testing, Testing object-oriented programs, Smoke testing, and Some general issues associated with testing.

Software Reliability And Quality Management: Software reliability. Statistical testing, Software quality, Software quality management system, ISO 9000. SEI Capability maturity model, Few other important quality standards, and Six Sigma.

UNIT V

Computer-Aided Software Engineering (Case): CASE and its scope, CASE environment, CASE support in the software life cycle, other characteristics of CASE tools, Towards second generation CASE Tool, and Architecture of a CASE Environment.

Software Maintenance: Characteristics of software maintenance, Software reverse engineering, Software maintenance process models and Estimation of maintenance cost.

Software Reuse: reuse- definition, introduction, reason behind no reuse so far, Basic issues in any reuse program, A reuse approach, and Reuse at organization level.

TEXTBOOKS

1. Rajib Mall, *Fundamentals of Software Engineering*, 5th Edition, PHI.
2. Roger S. Pressman, *Software Engineering A practitioner's Approach*, 9th Edition, Mc-Graw Hill International Edition.

REFERENCES

3. Ian Sommerville, *Software Engineering,* 10th Edition, Pearson.
4. Deepak Jain, *Software Engineering, Principles and Practices*, Oxford University Press.

ONLINE LEARNING RESOURCES

6. https://nptel.ac.in/courses/106/105/106105182/
7. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01260589506387148827_shared/overview
8. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01338269041100390473 5_shared/overview

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(23CS1309) WIRELESS AD-HOC & SENSOR NETWORKS
Professional Elective Course – I

COURSE OBJECTIVES

The objectives of this course is to

1. *To acquire the knowledge about various architectures and applications of Sensor Networks*
2. *To understand issues, challenges and emerging technologies for wireless sensor networks*
3. *To learn about various routing protocols and MAC Protocols*
4. *To understand various data gathering and data dissemination methods*
5. *To Study about design principals, node architectures, hardware and software required for implementation of wireless sensor networks.*

COURSE OUTCOMES (COs)

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

1. *Describe the architecture, types, and applications of wireless sensor networks.*
2. *Compare mobile ad hoc networks and wireless sensor networks along with their challenges.*
3. *Classify routing and MAC protocols and explain standards like IEEE 802.15.4 and ZigBee.*
4. *Analyze data dissemination, gathering, and fusion techniques in large sensor networks.*
5. *Evaluate quality of service and security mechanisms in real-time sensor networks.*
6. *Design WSN architectures with gateway concepts, OS support, and platforms like Tiny OS.*

UNIT-I

Introduction to Sensor Networks, unique constraints and challenges, Advantage of Sensor Networks, Applications of Sensor Networks, Types of wireless sensor networks

UNIT-II

Mobile Adhoc Networks (MANETs) and Wireless Sensor Networks, Enabling technologies for Wireless Sensor Networks. Issues and challenges in wireless sensor networks

UNIT-III

Routing protocols, MAC protocols: Classification of MAC Protocols, S-MAC Protocol, B-MAC protocol, IEEE 802.15.4 standard and ZigBee

UNIT-IV

Dissemination protocol for large sensor network. Data dissemination, data gathering, and data

fusion; Quality of a sensor network; Real-time traffic support and security protocols.

UNIT-V

Design Principles for WSNs, Gateway Concepts Need for gateway, WSN to Internet Communication and Internet to WSN Communication. Single –node architecture, Hardware components & design constraints, Operating systems and execution environments, introduction to Tiny OS and nesC.

TEXT BOOKS

1. C.Siva Ram Murthy, B.S.Manoj, *Ad-Hoc Wireless Sensor Networks*, Pearson
2. KavehPahLaven and P.KrishnaMurthy, *Principles of Wireless Networks*, 2002,PE

REFERENCE BOOKS

1. Wireless Digital Communications – Kamilo Feher, 1999, PHI.
2. Wireless Communications – Andrea Gold smith, 2005 Cambridge University Press.
3. Mobile Cellular Communication – Gottapu Sasibhushana Rao,Pearson Education, 2012.
4. Wireless Communication and Networking–William Stallings, 2003, PHI.

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(23CS0516) ARTIFICIAL INTELLIGENCE
Professional Elective Course – I

COURSE OBJECTIVES

The objectives of this course is to

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. *Describe AI foundations, agent architectures, and environment types.*
2. *Apply search strategies to solve classical and complex problems.*
3. *Represent knowledge using logic and implement basic inference and planning.*
4. *Understand reinforcement learning and natural language applications.*
5. *Explain the principles of robotics and vision, and discuss AI ethics*
6. *Design and evaluate a small AI-driven project or application*

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.

TEXT BOOKS

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

REFERENCE BOOKS

1. David Poole, Alan Mack worth, 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. Saroj Kaushik, *Artificial Intelligence,* CENGAGE Learning.

ONLINE LEARNING RESOURCES

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

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(23CS0525) CRYPTOGRAPHY & NETWORK SECURITY
Professional Elective Course – I

COURSE OBJECTIVES

The objectives of this course is to

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 OUTCOMES (COs)

At the end of the course, Student 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

UNIT-IV 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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(23CE0150) GREEN BUILDINGS
Open Elective Course - I

COURSE OBJECTIVES

The objectives of this course is to

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/

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

III B.Tech – I Sem.

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(23CE0151) CONSTRUCTION TECHNOLOGY AND MANAGEMENT
Open Elective Course – I

COURSE OBJECTIVES

The objectives of this course is to

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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III B.Tech – I Sem.

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

COURSE OBJECTIVES

The objectives of this course is to

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.

TEXT BOOKS

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=Apf jx6oDfz1Rb_N3
4. https://youtu.be/zx04Kl8y4dE?si=VmOvp_OgqisILTAF

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(23EC0406) ELECTRONIC CIRCUITS
Open Elective Course - I

COURSE OBJECTIVES

The objectives of this course is to

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 to

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 the right optimization algorithm*
5. *Utilize vector calculus and transformations in AI-based models.*
6. *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 to

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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III B.Tech – I Sem.

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(23HS0846) INTRODUCTION TO QUANTUM MECHANICS
Open Elective Course - I

COURSE OBJECTIVES

The objectives of this course is to

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 to

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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(23HS0821) ENGLISH FOR COMPETITIVE EXAMINATIONS
(Open Elective Course - I)

COURSE OBJECTIVES

The objectives of this course is to

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

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-Sequence of 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 to

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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(23CS1303) INTERNET OF THINGS AND EMBEDDED SYSTEMS LAB

COURSE OBJECTIVES

The objectives of this course is to

1. *To learn the internal architecture and programming of an embedded processor.*
2. *To introduce interfacing and I/O devices to the processor.*
3. *To introduce the evolution of the Internet of Things (IoT).*
4. *To build a small, low-cost embedded IoT system using Arduino/Raspberry Pi/open platform.*
5. *To apply the concept of the Internet of Things in real-world scenarios.*

COURSE OUTCOMES (COs)

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

1. *Explain the architecture of embedded processors.*
2. *Write embedded C programs.*
3. *Design simple embedded applications.*
4. *Compare the communication models in IoT.*
5. *Interface sensors with Arduino/Raspberry*
6. *Design IoT applications using Arduino/Raspberry Pi/open platform.*

LIST OF EXPERIMENTS

1. Write 8051 Assembly Language experiments using a simulator.
2. Test data transfer between registers and memory.
3. Perform ALU operations.
4. Write basic and arithmetic programs using Embedded C.
5. Introduction to Arduino platform and programming.
6. Explore different communication methods with IoT devices (Zigbee, GSM, Bluetooth).
7. Introduction to Raspberry Pi platform and Python programming.
8. Interface sensors with Raspberry Pi.
9. Communicate between Arduino and Raspberry Pi using any wireless medium.
10. Set up a cloud platform to log the data.
11. Log data using Raspberry Pi and upload to the cloud platform.
12. Design an IoT-based system.

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

COURSE OBJECTIVES

The objectives of this course is to

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

COURSE OUTCOMES (COs)

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

7. *Utilizing Data Definition Language (DDL), Data Manipulation Language (DML), and Data Control Language (DCL) commands effectively within a database environment*
8. *Constructing and execute queries to manipulate and retrieve data from databases.*
9. *Develop application programs using PL/SQL.*
10. *Determine the transaction atomicity, consistency, isolation, and durability for a given transaction-processing system.*
11. *Analyze requirements and design custom Procedures, Functions, Cursors, and Triggers, leveraging their capabilities to automate tasks and optimize database functionality*
12. *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
2. http://vlabs.iitb.ac.in/vlabs-dev/labs/dblab/index.php

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(23CS0551) FULL STACK DEVELOPMENT- II
(Skill Enhancement Course)

COURSE OBJECTIVES

The objectives of this course is to

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

3. 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.

4. 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

5. 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 to

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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(23CS1304) EVALUATION OF COMMUNITY SERVICE INTERNSHIP

Mandatory Community Service Project / Internship of 08 weeks duration during summer vacation

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(23CS1305) IoT DATA ANALYTICS

COURSE OBJECTIVES

The objectives of this course is to

1. *To understand big data platforms and their role in enabling IoT interoperability and smart applications.*
2. *To explore authentication challenges and intelligent systems using adaptive neural networks in IoT.*
3. *To examine fog computing and metadata management for large-scale IoT analytics.*
4. *To analyze web-enabled systems and emerging technologies in smart cities and healthcare.*
5. *To apply sustainability analytics and social network data in building smart environments.*

COURSE OUTCOMES (COs)

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

1. *Explain big data platforms, protocols, and interoperability issues in IoT environments.*
2. *Analyze RFID false authentications and apply adaptive neural networks in IoT systems.*
3. *Evaluate the role of fog computing and metadata management in distributed IoT analytics.*
4. *Demonstrate web-based automation and assess technologies used in smart cities and healthcare.*
5. *Interpret sustainability data and analytics in cloud-based M2M systems for smarter decisions.*
6. *Apply social network analysis and social media data to enhance smart environments.*

UNIT-I

BIG DATA PLATFORMS FOR THE INTERNET OF THINGS: Big Data Platforms for the Internet of Things: network protocol- data dissemination –current state of art- Improving Data and Service Interoperability with Structure, Compliance, Conformance and Context Awareness: interoperability problem in the IoT context- Big Data Management Systems for the Exploitation of Pervasive Environments - Big Data challenges and requirements coming from different Smart City applications

UNIT-II

RFID FALSE AUTHENTICATIONS: On RFID False Authentications: YA TRAP – Necessary and sufficient condition forfalse authentication prevention - Adaptive Pipe lined Neural Network Structure in Self-aware Internet of Things: self-healing systems- Role of adaptive neural network-Spatial Dimensions of Big Data: Application of Geographical Concepts and Spatial Technology to the Internet of Things- Applying spatial relationships,

functions, and models

UNIT-III

FOG COMPUTING: Fog Computing: A Platform for Internet of Things and Analytics: a massively distributed number of sources - Big Data Metadata Management in Smart Grids: semantic inconsistencies – role of metadata

UNIT-IV

WEB ENHANCED BUILDING : Toward Web Enhanced Building Automation Systems: heterogeneity between existing installations and native IP devices - loosely-coupled Web protocol stack –energy saving in smart building- Intelligent Transportation Systems and Wireless Access in Vehicular Environment Technology for Developing Smart Cities: advantages and achievements- Emerging Technologies in Health Information Systems: Genomics Driven Wellness Tracking and Management System (GO-WELL) – predictive care – personalized medicine

UNIT-V

SUSTAINABILITY DATA AND ANALYTICS : Sustainability Data and Analytics in Cloud-Based M2M Systems – potential stakeholders and their complex relationships to data and analytics applications – Social Networking Analysis - Building a useful understanding of a social network – Leveraging Social Media and IoT to Bootstrap Smart Environments: lightweight Cyber Physical Social Systems - citizen actuation

TEXT BOOKS

1. Stackowiak, R., Licht, A., Mantha, V., Nagode, L., "*Big Data and The Internet of Things Enterprise Information Architecture for A New Age*", Apress, 2015.
2. Dr. John Bates , "*Thingalytics - Smart Big Data Analytics for the Internet of Things*", john Bates, 2015.6) Web Hosting for Dummies, Peter Pollock, John Wiley Brand

REFERENCE BOOKS

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, "IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things",Cisco Press, 2017
2. Olivier Hersent, David Boswarthick ,OmarElloum,"The Internet of Things–Key applications and Protocols", Wiley,2012.
3. Michael Miller,"The Internet of Things",Pearson Education,2015.

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(23CS0524) CLOUD COMPUTING

COURSE OBJECTIVE

The objectives of this course is to

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. *Use and Examine different cloud computing services.*
5. *Apply different cloud programming model as perneed.*
6. *Explore emerging trends and technologies in cloud computing such as serverless architecture, edge computing*

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 Cluster set 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, Control flow, Function, Modules, Packages, File handling, Date/Time Operations, 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.
6. K. Chandrasekaran, *Essentials of Cloud Computing*, CRC Press.

ONLINE LEARNING RESOURCES:

1. Cloud computing – Course (nptel.ac.in)

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(23CS0523) MACHINE LEARNING

COURSE OBJECTIVES

The objectives of this course is to

1. *To introduce the fundamental concepts and types of machine learning.*
2. *To develop a deep understanding of supervised and unsupervised learning algorithms.*
3. *To understand mathematical foundations of learning models and algorithms.*
4. *To evaluate model performance using appropriate statistical and analytical tools.*
5. *To apply machine learning techniques to solve real-world problems using tools such as Scikit- learn.*

COURSE OUTCOMES (CO)

After completion of the course, students will be able to

1. *Understand and distinguish among different types of learning methods.*
2. *Apply supervised and unsupervised learning algorithms to datasets.*
3. *Analyze model performance using cross-validation and error metrics.*
4. *Build, test, and improve machine learning models for classification and prediction.*
5. *Use Python-based libraries (e.g., Scikit-learn) to implement ML algorithms*
6. *Evaluate machine learning models using appropriate validation techniques*

UNIT-I

Introduction to Machine Learning and Linear Models

Definition and Scope of Machine Learning, Applications and Types of Learning: Supervised, Unsupervised, Reinforcement, Linear Regression: Least Squares, Cost Function, Gradient Descent, Polynomial Regression and Overfitting, Evaluation Metrics: RMSE, MAE, R^2 Score, Bias-Variance Trade off

UNIT-II

Classification Algorithms

Classification Overview and Decision Boundaries, Logistic Regression: Sigmoid Function and Cost, K- Nearest Neighbors (KNN), Naïve Bayes Classifier, Decision Trees and Random Forests, Model Evaluation: Confusion Matrix, Precision, Recall, F1-Score

UNIT-III

Support Vector Machines and Ensemble Methods

Support Vector Machines: Concepts, Kernels, Hyperplane and Margin Concepts, Kernel Tricks: RBF and Polynomial, Ensemble Learning: Bagging, Boosting, and Voting, Gradient Boosting, AdaBoost, and XGBoost, Model Tuning and Hyperparameter Optimization

UNIT-IV

Unsupervised Learning Techniques

Clustering Overview: Applications, K-Means Clustering Algorithm, Hierarchical Clustering, DBSCAN and Density-Based Methods, Principal Component Analysis (PCA) for Dimensionality Reduction, Silhouette Score, Davies-Bouldin Index for Cluster Validation.

UNIT-V

Advanced Topics and Applications

Reinforcement Learning Basics and Markov Decision Processes, Introduction to Neural Networks and Deep Learning, Cross-Validation Techniques: k-Fold, Leave-One-Out, Feature Engineering and Feature Selection, Deployment of ML Models (Flask, Streamlit, etc.), Case Studies: Medical Diagnosis, Spam Detection, Credit Scoring

TEXTBOOKS

1. Tom Mitchell, Machine Learning, McGraw-Hill Education.
2. Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, O'Reilly Media.
3. Ethem Alpaydin, Introduction to Machine Learning, MIT Press

REFERENCE BOOKS

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer.
2. Kevin P. Murphy, Machine Learning: A Probabilistic Perspective, MIT Press.
3. Christopher Bishop, Pattern Recognition and Machine Learning, Springer

ONLINE LEARNING RESOURCES:

1. Coursera – Machine Learning by Andrew Ng (Stanford University)
2. Scikit-learn Documentation
3. Kaggle Learn – Machine Learning
4. Google's Machine Learning Crash Course

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(23CS0537) DevOps
Professional Elective III

COURSE OBJECTIVES

The objectives of this course is to

1. *Understand collaboration and productivity by automating infrastructure and workflows*
2. *Familiarize with continuous measuring applications performance*

COURSE OUTCOMES

After completion of the course, students will be able to

1. *Enumerate the principles of continuous development and deployment, automation of configuration management, inter-team collaboration, and IT service alibi*
2. *Describe Dev Ops &Dev Sec Ops methodologies and their key concepts*
3. *Illustrate the types of version control systems, continuous integration tools, continuous monitoring tools, and cloud models*
4. *Set up complete private infrastructure using version control systems and CI/CD tools*
5. *Apply DevOps tools to automate the software development lifecycle from code integration to deployment.*
6. *Implement end-to-end DevOps lifecycle by integrating automated testing, containerization, and deployment in real-time scenarios*

UNIT I

Dev Ops: An Overview, Dev Ops: Origins, Dev Ops: Roots, Dev Ops: Practices Dev Ops: Culture. **Adopting Dev Ops:** Developing the Playbook. Developing a Business Case for a Dev Ops: Developing the Business Case

UNIT II

Completing the Business Model Canvas, Customer Segments, Value Segments, Value Propositions, Channels, Customer Relationships, Revenue Streams, Key Resources, Key Activities, Key Partnerships, Cost Structures. Dev Ops Plays for Optimizing the delivery Pipeline: Dev Ops as an optimization Exercise, Core Themes, The Dev Ops Plays, Specializing Core Plays

UNIT III

Dev Ops Plays for Driving Innovation: Optimize to Innovate, The Uber Syndrome, Innovation and the Role of Technology, Core Themes, play: Build a Dev Ops Platform, play: Deliver Micro services Architectures, play: DevOps an API Economy, play: Organizing for Innovation.

UNIT IV

Scaling Dev Ops for the Enterprise: Core Themes, play: DevOps Center of Competency, play: Developing Culture of Innovation at Scale, play: Developing a Culture of continuous

Improvement, play: Team Models for DevOps, play: Standardization of Tools and Process, play: Security Considerations for DevOps, Play: DevOps and Outsourcing.

UNIT V

Leading Dev Ops Adoption in the Enterprise: Play: Dev Ops as a transformation Exercise, play: Developing a Culture of Collaboration and Trust, play: Dev Ops Thinking for the Line of Business, play: starting with Pilot Projects, Play: Rearing Unicorns on an Aircrafts Carrier. Appendix Case Study: Example Dev Ops Adoption Roadmap Organization Background, Roadmap Structure, Adoption Roadmap.

TEXT BOOKS

1. Sanjeev Sharma, *The DevOps Adoption Playbook*, John Wiley & Sons, Inc., 2017.
2. Sanjeev Sharma & Bernie Coyne, *DevOps for Dummies*, John Wiley & Sons, Inc.

REFERENCE BOOKS

1. Gene Kim, Jez Humble, Patrick Debois, and John Willis, *The DevOps Handbook: How to Create World-Class Agility, Reliability, & Security in Technology Organizations*, IT Revolution Press, 2016.
2. Michael Huttermann, *DevOps for Developers*, Apress, 2012.

ONLINE LEARNING RESOURCES

1. Learning DevOps *with* Terra form Infrastructure Automation Course Udemy

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(23CS1311) IoT SECURITY
Professional Elective – II

COURSE OBJECTIVES

The objectives of this course is to

1. *To learn about the secwity issues in IoT and cloud computing.*
2. *To learn about the cryptography solutions and issues in IoT.*
3. *To learn about the security measures taken in IoT and Cloud systems to improve security.*

COURSE OUTCOMES

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

1. *Understand the fundamental security issues in Intenet of things.*
2. *Demonstrate different Frameworks and Hardware Architecture of IoT D evice.*
3. *Analyze different loT Protocols and Layer Functioning.*
4. *Protect and secure the network connecting IoT devices to back-end systems on the internet.*
5. *Demonstrate different authentication mechanism such as digital certificates, biometrics, etc.*
6. *Demonstrate collecting, aggregating, monitoring, and normalizing data from loT devices and providing actionable reporting and alerting on specific activities or when activities fall outside established policies.*

UNIT-I

FUNDAMENTALS OF IoT ECOSYSTEM

lot security issues, how to design an IoT system, Hardware, softwareand network security related to loT systems – Basics of cryptographic solutions to loT systems.

UNIT–II

OVERVIEWOFCLOUDCOMPUTINGANDITSSERVICES

Cloud Computing Fundamental: Cloud computing definition, private, public and hybrid cloud - Cloud types; IaaS, PaaS, SaaS.

UNIT–III

CHALLENGES IN CLOUD COMPUTING

Benefits and challenges of cloud computing - Public vs. Private clouds, Role of virtualization in enabling the cloud

UNIT-IV

SECURITY CONCEPTS IN CONTEXT TO IoT DEVICES

Security Concepts, Confidentiality, privacy, integrity, authentication, non-repudiation, Virtualization

UNIT-V

loT SECURITY THREATS AND COUNTER MEASURES

System-Specific Attacks: Guest hopping, attacks on the VM (delete the **VM,** attack on the control of the **VM,** code or file injection into the virtualized file structure), **VM** migration attack, hyper jacking.

TEXT / REFERENCE BOOKS

1. David Etter, "loT Security: Practical guide book "Create Space,1st Edition, 2016.
2. Drew Van Duren, Brian Russell, "Practical Internet of Things Security", Packt, 1st Edition,2016.
3. Sean Smith, "The Internet of Risky Things", O'Reilly Media,1st Edition, 2017.
4. Brian Russell, Drew Van Duren, "Practical Internet of Things Security: Design a security framework for an Internet connected ecosystem", 2nd Edition, 2018.

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(23CS1312) MULTI AGENT SYSTEMS
Professional Elective – II

COURSE OBJECTIVES
The objectives of this course is to

1. *To understand the fundamental concepts of agents, agent-based systems, and their applications.*
2. *To analyze and design intelligent agent architectures.*
3. *To explore multi-agent interactions, coordination, and communication mechanisms.*
4. *To understand multi-agent decision-making, game-theoretic principles, and computational social choice.*
5. *To apply logical foundations and practical approaches to multi-agent resource allocation and negotiation.*

COURSE OUTCOMES (COs)
At the end of the course, Student will be able to

1. *Define the concept of agents and distinguish them from objects, expert systems, and distributed systems.*
2. *Describe different architectures and reasoning approaches used in intelligent agents.*
3. *Analyze communication protocols, interaction languages, and coordination in multi-agent systems.*
4. *Apply game-theoretic concepts like Nash equilibrium and Pareto efficiency in multi-agent decision-making.*
5. *Evaluate cooperation models, voting protocols, and coalition formation techniques in agent systems.*
6. *Demonstrate resource allocation, bargaining strategies, and logical reasoning in multi-agent environments.*

UNIT-I
Introduction to Agent Systems: what is an agent? agents and objects; agents and expert systems; agents and distributed systems; typical application areas for agent systems

UNIT-II
Intelligent Agents: Abstract Architectures for Agents, Tasks for Agents, Designing Intelligent Agents, Reasoning Agents, Reactive Agents, Hybrid Agents, Layered Agents.

UNIT-III
Multi-Agent Systems and Communication: Ontologies: OWL, KIF, RDF. Interaction Languages and Protocols, Speech Acts, KQML/KIF, The FIPA Framework. Cooperation in Multi-Agent Systems- Cooperative Distributed Problem Solving (CDPS), Partial Global

Planning, Coherence and Coordination, Applications of Multi-Agent Systems.

UNIT-IV

Multi-Agent Decision-Making: Multi-Agent Interactions and Solution Concepts-Nash Equilibria (Pure and Mixed Strategies), Pareto Efficiency, Cooperative vs. Non-Cooperative Strategies, Zero-Sum and Other Interactions. Cooperation Models- The Prisoner's Dilemma and Axelrod's Experiments, Program Equilibria. Computational Social Choice-Voting Protocols, Arrow's Theorem, Gibbard-Satterthwaite Theorem, Strategic Manipulation and Complexity Prevention. Coalition Formation-The Core, The Shapley Valuem, Coalition Structure Generation.

UNIT-V

Resource Allocation, Bargaining, and Logical Foundations: Allocating Scarce Resources, Auction Types (English, Dutch, Vickrey), Combinatorial Auctions and Winner Determination, The VCG Mechanism, Bargaining Strategies- The Alternating Offers Protocol, Task-Oriented Negotiation, Resource Allocation via Bargaining. Logical Foundations of Multi-Agent Systems-Modal Logics for Epistemic Reasoning, Reasoning about Mental States, Cooperation Logics and Their Applications, Model Checking and Verification.

TEXTBOOKS

1. Michael Wooldridge – *An Introduction to Multi-Agent Systems*, Wiley, 2009.
2. Yoav Shoham, Kevin Leyton-Brown – *Multiagent Systems: Algorithmic, Game-Theoretic, and Logical Foundations*, Cambridge University Press, 2009.

REFERENCE BOOKS

1. Stuart Russell, Peter Norvig – Artificial Intelligence: A Modern Approach, Pearson, 3rd Edition, 2015.
2. Gerhard Weiss – Multiagent Systems: A Modern Approach to Distributed Artificial Intelligence, MIT Press, 2000.
3. Jeffrey S. Rosenschein, Michael Wooldridge – Reasoning About Rational Agents, MIT Press, 2000.

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(23CS0518) AUTOMATA THEORY AND COMPILER DESIGN
Professional Elective – II

COURSE OBJECTIVES
The objectives of this course is 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 :
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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(23CS0543) BLOCK CHAIN TECHNOLOGY
Professional Elective –III

COURSE OBJECTIVES:

The objectives of this course is to

1. *Understand how block chain systems (mainly Bit coin and Ethereum) work and to securely interact with them.*
2. *Design, build, and deploy smart contracts and distributed applications.*
3. *Integrate ideas from block chain technology into their own projects.*

COURSE OUTCOMES (CO):

After completion of the course, students will be able to

1. *Demonstrate the foundation of the Block chain technology and understand the processes in payment and funding.*
2. *Identify the risks involved in building Block chain applications.*
3. *Review of legal implications using smart contracts.*
4. *Choose the present landscape of Blockchain implementations and Understand Crypto currency markets*
5. *Examine how to profit from trading crypto currencies*
6. *Design and develop decentralized applications (DApps) using blockchain platforms*

UNIT-I Introduction

Introduction, Scenarios, Challenges Articulated, Block chain, Block chain Characteristics, Opportunities Using Block chain, History of Block chain. Evolution of Block chain: Evolution of Computer Applications, Centralized Applications, Decentralized Applications, Stages in Block chain Evolution, Consortia, Forks, Public Block chain Environments, Type of Players in Block chain Ecosystem, Players in Market.

UNIT-II Block chain Concepts

Block chain Concepts: Introduction, Changing of Blocks, Hashing, Merkle-Tree, Consensus, Mining and Finalizing Blocks, Currency aka tokens, security on block chain, data storage on block chain, wallets, coding on block chain: smart contracts, peer-to-peer network, types of block chain nodes, risk associated with bloc chain solutions, life cycle of block chain transaction.

UNIT-III Architecting Block chain solutions

Architecting Block chain solutions: Introduction, Obstacles for Use of Block chain, Block chain Relevance Evaluation Framework, Block chain Solutions Reference Architecture, Types of Block chain Applications. Cryptographic Tokens, Typical Solution Architecture for Enterprise Use Cases, Types of Block chain Solutions, Architecture Considerations, Architecture with Block chain Platforms, Approach for Designing Block chain Applications

UNIT-IV Ethereum Block chain Implementation

Ethereum Block chain Implementation: Introduction, Tuna Fish Tracking Use Case, Ethereum Ecosystem, Ethereum Development, Ethereum Tool Stack, Ethereum Virtual Machine, Smart Contract Programming, Integrated Development Environment, Truffle Framework, Ganache, Unit

Testing, Ethereum Accounts, My Ether Wallet, Ethereum Networks/Environments, Infura, Ether scan, Ethereum Clients, Decentralized Application, Metamask, Tuna Fish Use Case Implementation, Open Zeppel in Contracts

UNIT - V Hyper ledger Block chain Implementation

Hyper ledger Implementation: Introduction, Use Case – Car Ownership Tracking, Hyper ledger Fabric, Hyper ledger Fabric Transaction Flow, FabCar Use Case Implementation, Invoking Chain code Functions Using Client Application.

Advanced Concepts in Block chain: Introduction, Inter Planetary File System (IPFS), Zero Knowledge Proofs, Oracles, Self-Sovereign Identity, Block chain with IoT and AI/ML Quantum Computing and Block chain, Initial Coin Offering, Block chain Cloud Offerings, Block chain and its Future Potential.

TEXTBOOKS

1. Ambadas, Arshad Sarfarz Ariff, and Sham, *Blockchain for Enterprise Application Developers*, Wiley, 2020.
2. Andreas M. Antonopoulos, *Mastering Bitcoin: Programming the Open Blockchain*, O'Reilly Media, 2017.

REFERENCE BOOKS

1. *Joseph Bambara and Paul R. Allen, Blockchain: A Practical Guide to Developing Business, Law, and Technology Solutions, McGraw Hill.*
2. *Melanie Swan, Blockchain: Blueprint for a New Economy, O'Reilly Media.*

ONLINE LEARNING RESOURCES:

1. https://github.com/blockchainedindia/resources

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(23CS0540) NATURAL LANGUAGE PROCESSING
Professional Elective–III

COURSE OBJECTIVE

The objectives of this course is to

1. *Explain and apply fundamental algorithms and techniques in the area of natural language processing(NLP)*
2. *Discuss approaches to syn tax and semantics in NLP.*
3. *Examine current methods for statistical approach esto machine translation.*
4. *Teach machine learning techniques used in NLP.*
5. *To provide insights into the challenges of multilingual NLP and ethical concerns*

COURSE OUT COMES:

After completion of the course, students will be able to

1. *Understand the various NLP Applications and Organization of Natural language, able to learn and implement realistic applications using Python.*
2. *Apply the various Parsing techniques, Bayes Rule, Shannongame, Entropy and Cross Entropy.*
3. *Understand the fundamentals of CFG and parsers and mechan is msin ATN's.*
4. *Apply Semantic Interpretation and Language Modelling.*
5. *Apply the concept of Machine Translation and multilingual Information Retrieval systems and Automatic Summarization.*
6. *Use NLP tools and libraries to analyze and interpret natural language data in real-world scenarios.*

UNIT- I Introduction to Natural language

The Study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different Levels of Language Analysis, Representations and Understanding, Organization of Natural language Under standing Systems, Linguistic Back ground: Anoutline of English Syn tax.

UNIT- II Grammars and Parsing

Grammars and Parsing – Top – Down and Bottom-Up Parsers, Transition Network Grammars, Feature Systems and Augmented Grammars, Morphologica l Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks, Bayees Rule, Shannongame, Entropy and Cross Entropy.

UNIT- III Grammars for Natural Language

Grammars for Natural Language, Movement Phenomenonin Language, Gap Threading,

Human Preferences in Parsing, Shift Reduce Parsers, Deterministic Parsers.

UNIT-IV

Semantic Interpretation

Semantic & Logical form, Word senses & ambiguity, The basic logical form language, Encoding ambiguity in the logical Form, Verbs & States in logical form, The maticroles, Speech acts & embedded sentences, Defining semantics structure model theory.

Language Modelling

Introduction- Gram Models, Language model Evaluation, Parameter Estimation, Language Model Adaption, Types of Language Models, Language Specific Modelling Problems, Multilingual and Cross lingual Language Modelling.

UNIT-V

Machine Translation

Survey: Introduction, Problems of Machine Translation, Is Machine Translation Possible, Brief History, Possible Approaches ,Current Status, Anusarakaor Language Accessor: Background, Cutting the GordianKnot, The Problem, Structure of Anusaraka System, User Interface, Linguistic Area, Giving up Agreement in Anusarsaka Output, Language Bridges.

Multilingual Information Retrieval

Introduction, Document Pre-processing, Monolingual Information Retrieval, CLIR, MLIR, Evaluation in Information Retrieval, Tools, Software and Resources.

Multilingual Automatic Summarization

Introduction, Approach esto Summarization, Evaluation, How to Build a Summarizer, Competitions and Datasets.

TEXT BOOKS

1. James Allen, *Natural Language Understanding*, 2nd Edition, Pearson Education, 2003.
2. Daniel M. Bikel and Imed Zitouni, *Multilingual Natural Language Processing Applications: From Theory to Practice*, Pearson Publications.
3. Akshar Bharathi and Vineet Chaitanya, *Natural Language Processing: A Paninian Perspective*, Prentice-Hall of India.

REFERENCE BOOKS

1. Eugene Charniack, *Statistical Language Learning*, MIT Press, 1993.
2. Dan Jurafsky and James Martin, *Speech and Language Processing*, 2nd Edition, Prentice Hall, 2008.
3. Christopher Manning and Hinrich Schütze, *Foundations of Statistical Natural Language Processing*, MIT Press, 1999.

ONLINE LEARNING RESOURCES

1. *https://nptel.ac.in/courses/106/105/106105158/*
2. *http://www.nptelvideos.in/2012/11/natural-language- processing.html*

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(23CS1313) SECURITY ASSESSMENT AND RISK ANALYSIS
Professional Elective – III

COURSE OBJECTIVES

The objectives of this course is to

1. *The course takes a software development perspective to the challenges of engineering software systems that are secure.*
2. *This course addresses design and implementation issues critical to producing secure software systems.*
3. *The course deals with the question of how to make the requirements for confidentiality, integrity, and availability integral to the software development process.*
4. *Secure software requirements gathering to design, development, configuration, deployment, and ongoing maintenance*
5. *Security of enterprise information systems.*

COURSE OUTCOMES (COs)

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

1. *Understand various aspects and principles of software security.*
2. *Understand the software design structures*
3. *Describe security models for implementation at the design level.*
4. *Identify and analyze the risks associated with s/w engineering and use relevant models to mitigate the risks.*
5. *Understand the various security algorithms to implement for secured computing and computer networks*
6. *Explain different security frameworks for different types of systems including electronic systems.*

UNIT-I

Introduction: Defining computer security, the principles of secure software, trusted computing base, etc, threat modeling, advanced techniques for mapping security requirements into design specifications. Secure software implementation, deployment and ongoing management.

UNIT-II

Software design and an introduction to hierarchical design representations. Difference between high-level and detailed design. Handling security with high-level design. General Design Notions. Security concerns designs at multiple levels of abstraction, Design patterns, quality assurance activities and strategies that support early vulnerability detection, Trust models, security Architecture & design reviews.

UNIT-III

Software Assurance Model: Identify project security risks & selecting risk management strategies, Risk Management Framework, Security Best practices/ Known Security Flaws, Architectural risk analysis, Security Testing & Reliability (Penn testing, Risk- Based Security Testing

UNIT-IV

Security in Enterprise Business: Identification and authentication, Enterprise Information Security, Symmetric and asymmetric cryptography, including public key cryptography, data encryption standard (DES), advanced encryption standard (AES), algorithms for hashes and message digests. Authentication, authentication schemes , access control models, Kerberos protocol, public key infrastructure (PKI), protocols specially designed for e-commerce and web applications, firewalls and VPNs.

UNIT-V

Security development frameworks. Security issues associated with the development and deployment of information systems, including Internet-based e-commerce, e-business, and e-service systems.

TEXT BOOKS

1. W. Stallings, *Cryptography and network security: Principles and practice*, 5 th Edition, Upper Saddle River, NJ: Prentice Hall., 2011
2. C. Kaufman, r. Perlman, & M. Speciner, *Network security: Private communication in a public world*, 2 nd Edition, Upper Saddle River, NJ:PrenticeHalL, 2002
3. C. P. Pfleeger, S. L. Pfleeger, *Security in Computing*, 4 th Edition, Upper Saddle River, NJ:Prentice Hall, 2007
4. T. M. Merkow, & J. Breithaupt, *Information security: Principles and practices*. Upper Saddle River, NJ:Prentice Hall, 2005

REFERENCE BOOK

1. Gary McGraw, Software Security: Building Security In, Addison-Wesley, 2006

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(23CS1314) ANDROID APPLICATION DEVELOPMENT
Professional Elective – III

COURSE OBJECTIVES
The objectives of this course is to

1. *To understand the fundamental principles of computer security and secure software development.*
2. *To explore software design approaches that integrate security across various abstraction levels.*
3. *To identify software project risks and apply assurance models and security testing techniques.*
4. *To examine cryptographic methods, authentication protocols, and enterprise security mechanisms.*
5. *To analyze security development frameworks for safe deployment of e-commerce and enterprise systems.*

COURSE OUTCOMES (COs)
At the end of the course, Student will be able to

1. *Describe the principles of secure software, threat modeling, and secure implementation practices.*
2. *Differentiate between high-level and detailed software design while addressing security concerns.*
3. *Identify project security risks and apply assurance models and risk-based testing techniques.*
4. *Explain cryptographic methods, authentication protocols, and access control models in enterprise systems.*
5. *Evaluate security mechanisms used in enterprise infrastructure such as firewalls, PKI, and VPNs.*
6. *Analyze security frameworks and address challenges in secure deployment of modern web-based systems.*

UNIT-I
Top Mobile Issues and Development Strategies: Top Issues Facing Mobile Devices, Physical Security , Secure Data Storage (on Disk), Strong Authentication with Poor Keyboards , Multiple-User Support with Security, Safe Browsing Environment , Secure Operating Systems, Application Isolation, Information Disclosure, Virus, Worms, Trojans, Spyware, and Malware , Difficult Patching/Update Process, Strict Use and Enforcement of SSL, Phishing, Cross-Site Request Forgery(CSRF), Location Privacy/Security, In secure Device Drivers, Multi Factor Authentication, Tips for Secure Mobile Application Development.

UNIT-II

WAP and Mobile: HTML Security WAP and Mobile HTML Basics, Authentication on WAP/Mobile HTML Sites, Encryption, Application Attacks on Mobile HTML Sites, Cross-Site Scripting, SQL Injection, Cross-Site Request Forgery, HTTP Redirects, Phishing, Session Fixation, Non-SSL Login, WAP and Mobile Browser Weaknesses, Lack of HTTP Only Flag Support, Lack of SECURE Flag Support, Handling Browser Cache, WAP Limitations.

UNIT-III

Bluetooth Security: Overview of the Technology, History and Standards, Common Uses, Alternatives, Future, Bluetooth Technical Architecture, Radio Operation and Frequency, Bluetooth Network Topology , Device Identification , Modes of Operation , Bluetooth Stack ,Bluetooth Profiles, Bluetooth Security Features , Pairing , Traditional Security Services in Bluetooth, Security "Non-Features" ,Threats to Bluetooth Devices and Networks, Bluetooth Vulnerabilities, Bluetooth Versions Priortov1.2, Bluetooth Versions Priortov2.1.

UNIT-IV

SMS Security: Overview of Short Message Service, Overview of Multimedia Messaging Service, Wireless Application Protocol (WAP), Protocol Attacks, Abusing Legitimate Functionality, Attacking Protocol Implementations, Application Attacks, iPhone Safari, Windows Mobile MMS, Motorola RAZRJPG Over flow, Walk throughs, Sending PDUs, Converting XML to WBXML.

UNIT-V

Enterprise Security on the Mobile OS: Device Security Options, PIN, Remote, 346 Secure Local Storage, Apple iPhone and Keychain, Security Policy Enforcement, Encryption, Full Disk Encryption, E-mail Encryption, File Encryption, Application Sand boxing, Signing, and Permissions, Applications and boxing, Application Signing, Permissions, Buffer Over flow Protection, Windows Mobile, iPhone, Android, BlackBerry, Security Feature Summary.

TEXT BOOK

1. Mobile Application Security, Himanshu Dwivedi, Chris Clark,David Thiel, TATA McGraw Hill.

REFERENCE BOOKS

1. Mobile and Wireless Network Security and Privacy, Kami S. Makki, et al, Springer.
2. Android Security Attacks Defenses, Abhishek Dubey, CRC Press.

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(23CE0152) DISASTER MANAGEMENT
(Open Elective course (OE) –II)

COURSE OBJECTIVES

The objectives of this course is to

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 (OE) –II)

COURSE OBJECTIVES

The objectives of this course is to

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

https://archive.nptel.ac.in/courses/105/105/105105157/

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(23EE0262) RENEWABLE ENERGY SOURCES
(Open Elective course (OE) –II)

COURSE OBJECTIVES

The objectives of this course is to

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 (OE) –II)

COURSE OBJECTIVES

The objectives of this course is to

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 (OE) –II)

COURSE OBJECTIVES

The objectives of this course is to

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 (OE) –II)

COURSE OBJECTIVES

The objectives of this course is to

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 (OE) –II)

COURSE OBJECTIVES

The objectives of this course is to

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 (OE) –II)

COURSE OBJECTIVES

The objectives of this course is to

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 (OE) –II)

COURSE OBJECTIVES

The objectives of this course is to

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*.

REFERENCES 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 (OE) –II)

COURSE OBJECTIVES

The objectives of this course is to

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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(23CS1306) IoT DATA ANALYTICS LAB

COURSE OBJECTIVES

The objectives of this course is to

1. *To implement foundational data structures using Java for efficient data handling.*
2. *To set up and manage Hadoop in various modes and monitor distributed systems.*
3. *To develop and run MapReduce programs for large-scale data processing and analytics.*
4. *To explore graph algorithms, PageRank, and social network analysis using MapReduce.*
5. *To use high-level tools like Pig and Hive for querying and analyzing big data sets.*

COURSE OUTCOMES (COs)

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

1. *Implement linked lists, stacks, queues, sets, and maps in Java for data processing.*
2. *Set up and monitor Hadoop in standalone, pseudo-distributed, and fully distributed modes.*
3. *Manage HDFS file operations and execute MapReduce programs for word count and data mining.*
4. *Apply MapReduce to solve real-world problems such as shortest path and friends-of-friends.*
5. *Design and run iterative algorithms like PageRank and semi-join using MapReduce.*
6. *Use Pig and Hive to perform data transformation, aggregation, and querying on big datasets.*

SOFTWARE REQUIREMENTS

1. Hadoop: https://hadoop.apache.org/release/2.7.6.html
2. Java: https://www.oracle.com/java/technologies/javase/javase8u211-later-archive-downloads.html
3. Eclipse: https://www.eclipse.org/downloads/

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:

1. Run a basic Word Count MapReduce program to understand MapReduce Paradigm.

Experiment 5: Week 6:

2. 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:

3. Use MapReduce 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:

4. Implement Friends-of-friends algorithm in MapReduce.

Hint: Two MapReduce 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:

5. Implement an iterative PageRank graph algorithm in MapReduce.

Hint: PageRank can be implemented by iterating a MapReduce 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:

6. Perform an efficient semi-join in MapReduce.

Hint: Perform a semi-join by having the mappers load a Bloom filter from the Distributed Cache, and then filter results from the actual MapReduce 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:

7. Install and Run Pig then write Pig Latin scripts to sort, group, join, project, and filter your data.

Experiment 12: Week 12:

8. Install and Run Hive then use Hive to create, alter, and drop databases, tables, views, functions, and indexes

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(23HS1202) CLOUD COMPUTING LAB

COURSE OBJECTIVES

The objectives of this course is to

1. Be familiar with utilizing web services/Applications
2. Be exposed to tool kits for cloud environment.
3. Learn to run virtual machines of different configuration.

COURSE OUTCOMES (COs)

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

1. Understand the implementation of cloud computing environment.
2. Analyze the usage of Cloud computing environment in terms of application.
3. Design and Implement applications on the Cloud.
4. Use the cloud tool kits.
5. Develop and run cloud virtual environment.

LIST OF EXPERIMENTS:

Programs on SaaS

1. Create an word document of your class time table and store locally and on the cloud with doc,and pdf format . (use www.zoho.com and docs.google.com)
2. Create a spread sheet which contains employee salary information and calculate gross and total sal using the formula
   DA=10% OF BASIC
   HRA=30% OF BASIC
   PF=10% OF BASIC IF BASIC<=3000
   12% OF BASIC IF BASIC>3000
   TAX=10% OF BASIC IF BASIC<=1500
   =11% OF BASIC IF BASIC>1500 AND BASIC<=2500
   =12% OF BASIC IF BASIC>2500 (use www.zoho.com and docs.google.com)
   NET_SALARY=BASIC_SALARY+DA+HRA-PF-TAX
3. Prepare a ppt on cloud computing –introduction , models, services ,and architecture Ppt should contain explanations, images and at least 20 pages
   (use www.zoho.com and docs.google.com)
4. Create your resume in a neat format using google and zoho cloud

Programs on PaaS

5. Write a Google app engine program to generate n even numbers and deploy it to Google cloud
6. Google app engine program multiply two matrices
7. Google app engine program to validate user ; create a database login(username, password) in mysql and deploy to cloud
8. Write a Google app engine program to display nth largest no from the given list of numbers and deploy it into google cloud
9. Google app engine program to validate the user Use mysql to store user info and deploy on to the cloud
10. Implement Program 1-5 using AWS

Cloud Virtual Environment

1. Install Virtualbox/VMware Workstation with different flavours of linux or windows OS on top of windows7 or8.
2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
3. Find a procedure to tansfer the files from one virtual machine to another virtual machine. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim

TEXT BOOKS

1. Kris Jamsa, MBA, PhD Cloud Computing with Cloud Labs SECOND EDITION
2. Kunal Meher Cloud Computing Lab Manual Kindle Edition

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(23HS0818) SOFT SKILLS
(Skill Enhancement course)

COURSE OBJECTIVES

The objectives of this course is to

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 to

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 ools and techniques.*

UNIT – I Introduction to Academic Writing

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 Academic Journal Article

Technical Research Paper Writing: Abstract- Objectives-Limitations-Review of Literature-Problems and Framing Research Questions- Synopsis

UNIT – III: Essay & Writing Reviews

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 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. MG University Edition, Critical Thinking, Academic Writing and Presentation Skills, Pearson Education; First edition, January 2010.
2. Allan Pease & Barbara Pease, The Definitive Book of Body Language, RHUS Publishers, 2016

REFERENCES

1. Alice Savage & Masoud Shafiei, *Effective Academic Writing* (2nd Ed.), Oxford University Press, 2014.
2. Shalini Verma, *Body Language*, S. Chand Publications, 2011.
3. Sanjay Kumar & Pushpalata, *Communication Skills* (2nd Ed.), Oxford University Press, 2015.
4. Sharon Gerson & Steven Gerson, *Technical Communication: Process and Product*, Pearson, New Delhi, 2014.
5. Peter Elbow, *Writing with Power*, Oxford University Press (OUP) USA, 1998.