



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA – 533 003, Andhra Pradesh, India

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE STRUCTURE AND SYLLABUS

For UG –R20

B. TECH - COMPUTER SCIENCE & ENGINEERING

(Applicable for batches admitted from 2020-2021)



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA - 533 003, Andhra Pradesh, India



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE STRUCTURE

I Year – I SEMESTER

S. No	Course Code	Courses	L	T	P	Credits
1	HS	Communicative English	3	0	0	3
2	BS	Mathematics - I (Calculus And Differential Equations)	3	0	0	3
3	BS	Applied Physics	3	0	0	3
4	ES	Programming for Problem Solving using C	3	0	0	3
5	ES	Computer Engineering Workshop	1	0	4	3
6	HS	English Communication Skills Laboratory	0	0	3	1.5
7	BS	Applied Physics Lab	0	0	3	1.5
8	ES	Programming for Problem Solving using C Lab	0	0	3	1.5
Total Credits			19.5			

I Year – II SEMESTER

S. No	Course Code	Courses	L	T	P	Credits
1	BS	Mathematics – II (Linear Algebra And Numerical Methods)	3	0	0	3
2	BS	Applied Chemistry	3	0	0	3
3	ES	Computer Organization	3	0	0	3
4	ES	Python Programming	3	0	0	3
5	ES	Data Structures	3	0	0	3
6	BS	Applied Chemistry Lab	0	0	3	1.5
7	ES	Python Programming Lab	0	0	3	1.5
8	ES	Data Structures Lab	0	0	3	1.5
9	MC	Environment Science	2	0	0	0
Total Credits			19.5			



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II Year – I SEMESTER

S. No	Course Code	Courses	L	T	P	Credits
1	BS	Mathematics III	3	0	0	3
2	CS	Object Oriented Programming through C++	3	0	0	3
3	CS	Operating Systems	3	0	0	3
4	CS	Software Engineering	3	0	0	3
5	CS	Mathematical Foundations of Computer Science	3	0	0	3
6	CS	Object Oriented Programming through C++ Lab	0	0	3	1.5
7	CS	Operating Systems Lab	0	0	3	1.5
8	CS	Software Engineering Lab	0	0	3	1.5
9	SO	Skill oriented Course - I 1) Applications of Python-NumPy 2) Web Application Development Using Full Stack -Frontend Development –Module -I	0	0	4	2
10	MC	Constitution of India	2	0	0	0
Total Credits			21.5			

II Year – II SEMESTER

S. No	Course Code	Courses	L	T	P	Credits
1	BS	Probability and Statistics	3	0	0	3
2	CS	Database Management Systems	3	0	0	3
3	CS	Formal Languages and Automata Theory	3	0	0	3
4	ES	Java Programming	3	0	0	3
5	HS	Managerial Economics and Financial Accountancy	3	0	0	3
6	CS	Database Management Systems Lab	0	0	2	1
7	CS	R Programming Lab	0	1	2	2
8	ES	Java Programming Lab	0	0	3	1.5
9	SO	Skill Oriented Course - II 1) Applications of Python-Pandas 2) Web Application Development Using Full Stack -Frontend Development –Module -II	0	0	4	2
Total Credits			21.5			



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I Year - I Semester		L	T	P	C
		3	0	0	3
COMMUNICATIVE ENGLISH					

Introduction

The course is designed to train students in receptive (listening and reading) as well as productive and interactive (speaking and writing) skills by incorporating a comprehensive, coherent and integrated approach that improves the learners' ability to effectively use English language in academic/ workplace contexts. The shift is from *learning about the language* to *using the language*. On successful completion of the compulsory English language course/s in B.Tech., learners would be confident of appearing for international language qualification/proficiency tests such as IELTS, TOEFL, or BEC, besides being able to express themselves clearly in speech and competently handle the writing tasks and verbal ability component of campus placement tests. Activity based teaching-learning methods would be adopted to ensure that learners would engage in actual use of language both in the classroom and laboratory sessions.

Course Objectives:

- Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
- Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
- Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
- Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
- Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

Course Outcomes:

At the end of the module, the learners will be able to

- understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information
- ask and answer general questions on familiar topics and introduce oneself/others
- employ suitable strategies for skimming and scanning to get the general idea of a text and locate specific information
- recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs
- form sentences using proper grammatical structures and correct word forms

Unit 1:

Lesson-1: A Drawer full of happiness from “**Infotech English**”, Maruthi Publications

Lesson-2: Deliverance by Premchand from “**The Individual Society**”, Pearson Publications. (Non-detailed)

Listening: Listening to short audio texts and identifying the topic. Listening to prose, prose and conversation.

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

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



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Reading for Writing: Paragraph writing (specific topics) using suitable cohesive devices; linkers, sign posts and transition signals; mechanics of writing - punctuation, capital letters.

Vocabulary: Technical vocabulary from across technical branches (20) GRE Vocabulary (20) (Antonyms and Synonyms, Word applications) Verbal reasoning and sequencing of words.

Grammar: Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countables and uncountables; singular and plural basic sentence structures; simple question form - wh-questions; word order in sentences.

Pronunciation: Vowels, Consonants, Plural markers and their realizations

Unit 2:

Lesson-1: Nehru's letter to his daughter Indira on her birthday from "Infotech English", Maruthi Publications

Lesson-2: Bosom Friend by Hira Bansode from "The Individual Society", Pearson Publications.(Non-detailed)

Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts, both in speaking and writing.

Speaking: Discussion in pairs/ small groups on specific topics followed by short structured talks. Functional English: Greetings and leave takings.**Reading:** Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.

Reading for Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions.

Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary Analogies (20 words) (Antonyms and Synonyms, Word applications)

Grammar: Use of articles and zero article; prepositions.

Pronunciation: Past tense markers, word stress-di-syllabic words

Unit 3:

Lesson-1: Stephen Hawking-Positivity 'Benchmark' from "Infotech English", Maruthi Publications

Lesson-2: Shakespeare's Sister by Virginia Woolf from "The Individual Society", Pearson Publications.(Non-detailed)

Listening: Listening for global comprehension and summarizing what is listened to, both in speaking and writing.

Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed. Functional English: Complaining and Apologizing.

Reading: Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text clues for comprehension.Critical reading.

Reading for Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions. Letter writing-types, format and principles of letter writing.E-mail etiquette, Writing CV's.

Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Association, sequencing of words

Grammar: Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.

Pronunciation: word stress-poly-syllabic words.



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Unit 4:

Lesson-1: Liking a Tree, Unbowed: Wangari Maathai-biography from “Infotech English”, Maruthi Publications

Lesson-2: Telephone Conversation-Wole Soyinka from “The Individual Society”, Pearson Publications.(Non-detailed)

Listening: Making predictions while listening to conversations/ transactional dialogues without video (only audio); listening to audio-visual texts.

Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions. Functional English: Permissions, Requesting, Inviting.

Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicative process or display complicated data.

Reading for Writing: Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables. Writing SOP, writing for media.

Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Cloze Encounters.

Grammar: Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison; use of antonyms

Pronunciation: Contrastive Stress

Unit 5:

Lesson-1: Stay Hungry-Stay foolish from “Infotech English”, Maruthi Publications

Lesson-2: Still I Rise by Maya Angelou from “The Individual Society”, Pearson Publications.(Non-detailed)

Listening: Identifying key terms, understanding concepts and interpreting the concepts both in speaking and writing.

Speaking: Formal oral presentations on topics from academic contexts - without the use of PPT slides. Functional English: Suggesting/Opinion giving.

Reading: Reading for comprehension. RAP Strategy Intensive reading and Extensive reading techniques.

Reading for Writing: Writing academic proposals- writing research articles: format and style.

Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Coherence, matching emotions.

Grammar: Editing short texts – identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)

Pronunciation: Stress in compound words

Text Books:

1. “Infotech English”, Maruthi Publications. (Detailed)
2. “The Individual Society”, Pearson Publications.(Non-detailed)

Prescribed text book for Laboratory for Semesters-I & II:

1. “Infotech English”, Maruthi Publications. (with Compact Disc)



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Reference Books

1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
4. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.



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I Year - I Semester		L	T	P	C
		3	0	0	3
MATHEMATICS-I (Calculus And Differential Equations)					

Course Objectives:

- To familiarize a variety of well-known sequences and series, with a developing intuition about the behaviour of new ones.
- To enlighten the learners in the concept of differential equations and multivariable calculus.
- 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: At the end of the course, the student will be able to

- utilize mean value theorems to real life problems (L3)
- solve the differential equations related to various engineering fields (L3)
- familiarize with functions of several variables which is useful in optimization (L3)
- apply double integration techniques in evaluating areas bounded by region (L3)
- students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional and 3-dimensional coordinate systems(L5)

UNIT – I: Sequences, Series and Mean value theorems: (10hrs)

Sequences and Series: Convergences and divergence – Ratio test – Comparison tests – Integral test – Cauchy’s root test – Alternate series– Leibnitz’s rule.

Mean Value Theorems (without proofs): Rolle’s Theorem – Lagrange’s mean value theorem – Cauchy’s mean value theorem – Taylor’s and Maclaurin’s theorems with remainders, Problems and applications on the above theorem.

UNIT – II: Differential equations of first order and first degree: (10hrs)

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– Orthogonal trajectories– Electrical circuits.

UNIT – III: Linear differential equations of higher order: (10hrs)

Homogeneous and Non-homogeneous differential equations of higher order with constant coefficients – with non-homogeneous term of the type e^{ax} , $\sin ax$, $\cos ax$, polynomials in x^n , $e^{ax}V(x)$ and $x^nV(x)$ – Method of Variation of parameters, Cauchy and Legendre’s linear equations.

Applications: LCR circuit, Simple Harmonic motion.

UNIT – IV: Partial differentiation: (10hrs)

Introduction – Homogeneous function – Euler’s theorem– Total derivative– Chain rule– Jacobian – Functional dependence –Taylor’s and MacLaurin’s series expansion of functions of two variables.

Applications: Maxima and Minima of functions of two variables without constraints and Lagrange’s method.



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UNIT – V: Multiple integrals:

(8 hrs)

Double and Triple integrals – Change of order of integration in double integrals – Change of variables to polar, cylindrical and spherical coordinates.

Applications: Finding Areas and Volumes.

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna Publishers.
2. B. V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley-India.
2. Joel Hass, Christopher Heil and Maurice D. Weir, Thomas calculus, 14th Edition, Pearson.
3. Lawrence Tury, Advanced Engineering Mathematics, CRC Press, 2013.
4. Srimantha Pal, S C Bhunia, Engineering Mathematics, Oxford University Press.



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I Year - I Semester		L	T	P	C
		3	0	0	3
APPLIED PHYSICS (For All Circuital Branches like ECE, EEE, CSE etc)					

Course Objectives:

1. Bridging the gap between the physics in school at 10+2 level and UG level engineering courses.
2. To identify the importance of the optical phenomenon i.e. interference, diffraction and polarization related to its Engineering applications
3. Understand the mechanism of emission of light, utilization of lasers as coherent light sources for low and high energy applications, study of propagation of light through optical fibers and their implications in optical communications.
4. Enlightenment of the concepts of Quantum Mechanics and to provide fundamentals of deBroglie matter waves, quantum mechanical wave equation and its application, the importance of free electron theory for metals and band theory for crystalline solids. Metals-Semiconductors-Insulators concepts utilization of transport phenomenon of charge carriers in semiconductors.
5. To explain the significant concepts of dielectric and magnetic materials that leads to potential applications in the emerging micro devices.
6. To Understand the physics of Semiconductors and their working mechanism. To give an impetus on the subtle mechanism of superconductors using the concept of BCS theory and their fascinating applications.

Course Outcomes:

1. Explain the need of coherent sources and the conditions for sustained interference (L2). Identify the applications of interference in engineering (L3). Analyze the differences between interference and diffraction with applications (L4). Illustrate the concept of polarization of light and its applications (L2). Classify ordinary refracted light and extraordinary refracted rays by their states of polarization (L2)
2. Explain various types of emission of radiation (L2). Identify the role of laser in engineering applications (L3). Describe the construction and working principles of various types of lasers (L1). Explain the working principle of optical fibers (L2). Classify optical fibers based on refractive index profile and mode of propagation (L2). Identify the applications of optical fibers in medical, communication and other fields (L2). Apply the fiber optic concepts in various fields (L3).
3. Describe the dual nature of matter (L1). Explain the significance of wave function (L2). Identify the role of Schrodinger's time independent wave equation in studying particle in one-dimensional infinite potential well (L3). Identify the role of classical and quantum free electron theory in the study of electrical conductivity (L3). Classify the energy bands of solids (L2).



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4. Explain the concept of dielectric constant and polarization in dielectric materials (L2). Summarize various types of polarization of dielectrics (L2). Interpret Lorentz field and Claussius-Mosotti relation in dielectrics (L2). Classify the magnetic materials based on susceptibility and their temperature dependence (L2). Explain the applications of dielectric and magnetic materials (L2). Apply the concept of magnetism to magnetic devices (L3)
5. Outline the properties of charge carriers in semiconductors (L2). Identify the type of semiconductor using Hall effect (L2). Identify applications of semiconductors in electronic devices (L2). Classify superconductors based on Meissner's effect (L2). Explain Meissner's effect, BCS theory & Josephson effect in superconductors (L2).

Unit-I: Wave Optics

12hrs

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

Diffraction: Introduction - Fresnel and Fraunhofer diffraction - 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 Outcomes:

The students will be able to

- **Explain** the need of coherent sources and the conditions for sustained interference (L2)
- **Identify** engineering applications of interference (L3)
- **Analyze** the differences between interference and diffraction with applications (L4)
- **Illustrate** the concept of polarization of light and its applications (L2)
- **Classify** ordinary polarized light and extraordinary polarized light (L2)

Unit-II: Lasers and Fiber optics

8hrs

Lasers: Introduction – Characteristics of laser – Spontaneous and Stimulated emissions of radiation – Einstein's coefficients – Population inversion – Lasing action - Pumping mechanisms – Ruby laser – He-Ne laser - Applications of lasers.

Fiber optics: Introduction –Principle of optical fiber- Acceptance Angle - Numerical Aperture - Classification of optical fibers based on refractive index profile and modes – Propagation of electromagnetic wave through optical fibers - Applications.

Unit Outcomes:

The students will be able to

- **Understand** the basic concepts of LASER light Sources (L2)
- **Apply** the concepts to learn the types of lasers (L3)
- **Identifies** the Engineering applications of lasers (L2)
- **Explain** the working principle of optical fibers (L2)
- **Classify** optical fibers based on refractive index profile and mode of propagation (L2)



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- **Identify** the applications of optical fibers in various fields (L2)

Unit III: Quantum Mechanics, Free Electron Theory and Band theory **10hrs**

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– Equation for electrical conductivity based on quantum free electron theory- Fermi-Dirac distribution- Density of states (3D) - Fermi energy.

Band theory of Solids: Bloch’s Theorem (Qualitative) - Kronig - Penney model (Qualitative)- E vs K diagram - v vs K diagram - effective mass of electron – Classification of crystalline solids– concept of hole.

Unit Outcomes:

The students will be able to

- **Explain** the concept of dual nature of matter (L2)
- **Understand** the significance of wave function (L2)
- **Interpret** the concepts of classical and quantum free electron theories (L2)
- **Explain** the importance of K-P model
- **Classify** the materials based on band theory (L2)
- **Apply** the concept of effective mass of electron (L3)

Unit-IV: Dielectric and Magnetic Materials

8hrs

Dielectric Materials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility and Dielectric constant - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field- Clausius-Mossotti equation- Piezoelectricity.

Magnetic Materials: Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability - Origin of permanent magnetic moment - Classification of magnetic materials: Dia, para, Ferro, antiferro & Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials- Eddy currents- Engineering applications.

Unit Outcomes: *The students will be able to*

- **Explain** the concept of dielectric constant and polarization in dielectric materials (L2)
- **Summarize** various types of polarization of dielectrics (L2)
- **Interpret** Lorentz field and Clausius- Mosotti relation in dielectrics(L2)
- **Classify** the magnetic materials based on susceptibility and their temperature dependence (L2)
- **Explain** the applications of dielectric and magnetic materials (L2)
- **Apply** the concept of magnetism to magnetic data storage devices (L3)

Unit – V: Semiconductors and Superconductors

10hrs

Semiconductors: Introduction- 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 – Hall coefficient –Applications of Hall effect.



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Superconductors: Introduction – Properties of superconductors – Meissner effect – Type I and Type II superconductors – BCS theory (Qualitative) – Josephson effects (AC and DC) – SQUIDS – High T_c superconductors – Applications of superconductors.

Unit Outcomes:

The students will be able to

- **Classify** the energy bands of semiconductors (L2)
- **Interpret** the direct and indirect band gap semiconductors (L2)
- **Identify** the type of semiconductor using Hall effect (L2)
- **Identify** applications of semiconductors in electronic devices (L2)
- **Classify** superconductors based on Meissner's effect (L2)
- **Explain** Meissner's effect, BCS theory & Josephson effect in superconductors (L2)

Text books:

1. M. N. Avadhanulu, P.G.Kshirsagar & TVS Arun Murthy” A Text book of Engineering Physics”- S.Chand Publications, 11th Edition 2019.
2. Engineering Physics” by D.K.Bhattacharya and Poonam Tandon, Oxford press (2015).
3. Applied Physics by P.K.Palanisamy SciTech publications.

Reference Books:

1. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley & Sons
2. Engineering Physics by M.R.Srinivasan, New Age international publishers (2009).
3. Shatendra Sharma, Jyotsna Sharma, “ Engineering Physics”, Pearson Education, 2018
4. Engineering Physics - Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press
5. Semiconductor physics and devices- Basic principle – Donald A, Neamen, Mc Graw Hill
6. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning



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I Year - I Semester		L	T	P	C
		3	0	0	3
PROGRAMMING FOR PROBLEM SOLVING USING C					

Course Objectives:

The objectives of Programming for Problem Solving Using C are

- To learn about the computer systems, computing environments, developing of a computer program and Structure of a C Program
- To gain knowledge of the operators, selection, control statements and repetition in C
- To learn about the design concepts of arrays, strings, enumerated structure and union types and their usage.
- To assimilate about pointers, dynamic memory allocation and know the significance of Preprocessor.
- To assimilate about File I/O and significance of functions

Course Outcomes:

Upon the completion of the course the student will learn

- To write algorithms and to draw flowcharts for solving problems
- To convert flowcharts/algorithms to C Programs, compile and debug programs
- To use different operators, data types and write programs that use two-way/ multi-way selection
- To select the best loop construct for a given problem
- To design and implement programs to analyze the different pointer applications
- To decompose a problem into functions and to develop modular reusable code
- To apply File I/O operations

UNIT I

Introduction to Computers: Creating and running Programs, Computer Numbering System, Storing Integers, Storing Real Numbers

Introduction to the C Language: Background, C Programs, Identifiers, Types, Variable, Constants, Input/output, Programming Examples, Scope, Storage Classes and Type Qualifiers.

Structure of a C Program: Expressions Precedence and Associativity, Side Effects, Evaluating Expressions, Type Conversion Statements, Simple Programs, Command Line Arguments.

UNIT II

Bitwise Operators: Exact Size Integer Types, Logical Bitwise Operators, Shift Operators.

Selection & Making Decisions: Logical Data and Operators, Two Way Selection, Multiway Selection, More Standard Functions.

Repetition: Concept of Loop, Pretest and Post-test Loops, Initialization and Updating, Event and Counter Controlled Loops, Loops in C, Other Statements Related to Looping, Looping Applications, Programming Examples.

UNIT III

Arrays: Concepts, Using Array in C, Array Application, Two Dimensional Arrays, Multidimensional Arrays, Programming Example – Calculate Averages

Strings: String Concepts, C String, String Input / Output Functions, Arrays of Strings, String Manipulation Functions String/ Data Conversion, A Programming Example – Morse Code

Enumerated, Structure, and Union: The Type Definition (Type def), Enumerated Types, Structure, Unions, and Programming Application.



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UNIT IV

Pointers: Introduction, Pointers to pointers, Compatibility, L value and R value

Pointer Applications: Arrays, and Pointers, Pointer Arithmetic and Arrays, Memory Allocation Function, Array of Pointers, Programming Application.

Processor Commands: Processor Commands.

UNIT V

Functions: Designing, Structured Programs, Function in C, User Defined Functions, Inter-Function Communication, Standard Functions, Passing Array to Functions, Passing Pointers to Functions, Recursion

Text Input / Output: Files, Streams, Standard Library Input / Output Functions, Formatting Input / Output Functions, Character Input / Output Functions

Binary Input / Output: Text versus Binary Streams, Standard Library, Functions for Files, Converting File Type.

Text Books:

- 1) Programming for Problem Solving, Behrouz A. Forouzan, Richard F. Gilberg, CENGAGE.
- 2) The C Programming Language, Brian W. Kernighan, Dennis M. Ritchie, 2e, Pearson.

Reference Books:

- 1) Computer Fundamentals and Programming, Sumithabha Das, Mc Graw Hill.
- 2) Programming in C, Ashok N. Kamthane, Amit Kamthane, Pearson.
- 3) Computer Fundamentals and Programming in C, Pradip Dey, Manas Ghosh, OXFORD.



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I Year - I Semester		L	T	P	C
		1	0	4	3
COMPUTER ENGINEERING WORKSHOP					

Course Objectives:

The objective of this course is to

- Explain the internal parts of a computer, peripherals, I/O ports, connecting cables
- Demonstrate basic command line interface commands on Linux
- Teach the usage of Internet for productivity and self paced lifelong learning
- Describe about Compression, Multimedia and Antivirus tools
- Demonstrate Office Tools such as Word processors, Spreadsheets and Presentation tools

Course Outcomes:

Students should be able to:

- Assemble and disassemble components of a PC
- Construct a fully functional virtual machine, Summarize various Linux operating system commands,
- Recognize characters & extract text from scanned images, Create audio files and podcasts

Computer Hardware:

Experiment 1: Identification of peripherals of a PC, Laptop, Server and Smart Phones: Prepare a report containing the block diagram along with the configuration of each component and its functionality, Input/ Output devices, I/O ports and interfaces, main memory, cache memory and secondary storage technologies, digital storage basics, networking components and speeds.

Operating Systems:

Experiment 2: Virtual Machine setup:

- Setting up and configuring a new Virtual Machine
- Setting up and configuring an existing Virtual Machine
- Exporting and packaging an existing Virtual Machine into a portable format

Experiment 2: Operating System installation:

- Installing an Operating System such as Linux on Computer hardware.

Experiment 3: Linux Operating System commands:

- General command syntax
- Basic *help* commands
- Basic File system commands
- Date and Time
- Basic Filters and Text processing
- Basic File compression commands
- Miscellaneous: apt-get, vi editor

Networking and Internet:

Experiment 4: Networking Commands:

- ping, ssh, ifconfig, scp, netstat, ipstat, nslookup, traceroute, telnet, host, ftp, arp, wget, route

Experiment 5: Internet Services:

- Web Browser usage and advanced settings like LAN, proxy, content, privacy, security, cookies, extensions/ plugins



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- Antivirus installation, configuring a firewall, blocking pop-ups
- Email creation and usage, Creating a Digital Profile on LinkedIn

Productivity Tools:

Experiment 6: Basic HTML tags, Introduction to HTML5 and its tags, Introduction to CSS3 and its properties. Preparation of a simple website/ homepage,

Assignment: Develop your home page using HTML Consisting of your photo, name, address and education details as a table and your skill set as a list.

Features to be covered:- Layouts, Inserting text objects, Editing text objects, Inserting Tables, Working with menu objects, Inserting pages, Hyper linking, Renaming, deleting, modifying pages, etc.,

Internet of Things (IoT): IoT fundamentals, applications, protocols, communication models, architecture, IoT devices

Office Tools:

Experiment 7: Demonstration and Practice on Text Editors like Notepad++, Sublime Text, Atom, Brackets, Visual code, etc

Experiment 8: Demonstration and practice on Microsoft Word, Power Point, Microsoft Excel

Experiment 10: Demonstration and practice on LaTeX and produce professional pdf documents.

Text Books:

- 1) Computer Fundamentals, Anita Goel, Pearson Education, 2017
- 2) PC Hardware Trouble Shooting Made Easy, TMH

References Books:

- 1) Essential Computer and IT Fundamentals for Engineering and Science Students, Dr.N.B.Vekateswarlu, S.Chand

e-Resources:

- 1) https://explorersposts.grc.nasa.gov/post631/2006-2007/computer_basics/ComputerPorts.doc



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - I Semester		L	T	P	C
		0	0	3	1.5
ENGLISH COMMUNICATION SKILLS LABORATORY					

UNIT I:

Vowels, Consonants, Pronunciation, Phonetic Transcription, Common Errors in Pronunciation,

UNIT II:

Word stress-di-syllabic words, poly-syllabic words, weak and strong forms, contrastive stress
(Homographs)

UNIT III: Stress in compound words,rhythm, intonation,accent neutralisation.

UNIT IV: Listening to short audio texts and identifying the context and specific pieces of information to answer a series of questions in speaking.

UNIT V: Newspapers reading;Understanding and identifying key terms and structures useful for writing reports.

Text Book:

1.“Infotech English”, Maruthi Publications.

Reference Books:

1. Exercises in Spoken English Part 1,2,3,4, OUP and CIEFL.
2. English Pronunciation in use- Mark Hancock, Cambridge University Press.
3. English Phonetics and Phonology-Peter Roach, Cambridge University Press.
4. English Pronunciation in use- Mark Hewings, Cambridge University Press.
5. English Pronunciation Dictionary- Daniel Jones, Cambridge University Press.
6. English Phonetics for Indian Students- P. Bala Subramanian, Mac Millan Publications.



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I Year - I Semester		L	T	P	C
		0	0	3	1.5
APPLIED PHYSICS LAB					

(For All Circuital Branches like CSE, ECE, EEE etc.)
 (Any 10 of the following listed experiments)

List of Applied Physics Experiments

1. Determination of thickness of thin object by wedge method.
2. Determination of radius of curvature of a given plano convex lens by Newton's rings.
3. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
4. Determination of dispersive power of the prism.
5. Determination of dielectric constant using charging and discharging method.
6. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
7. Determination of numerical aperture and acceptance angle of an optical fiber.
8. Determination of wavelength of Laser light using diffraction grating.
9. Estimation of Planck's constant using photoelectric effect.
10. Determination of the resistivity of semiconductor by four probe method.
11. To determine the energy gap of a semiconductor using p-n junction diode.
12. Magnetic field along the axis of a current carrying circular coil by Stewart & Gee's Method
13. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall Effect .
14. Measurement of resistance of a semiconductor with varying temperature.
15. Resistivity of a Superconductor using four probe method & Meissner effect.

References:

1. S. Balasubramanian, M.N. Srinivasan "A Text Book of Practical Physics"- S Chand Publishers, 2017.



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I Year - I Semester		L	T	P	C
		0	0	3	1.5
PROGRAMMING FOR PROBLEM SOLVING USING C LAB					

Course Objectives:

- Apply the principles of C language in problem solving.
- To design flowcharts, algorithms and knowing how to debug programs.
- To design & develop of C programs using arrays, strings pointers & functions.
- To review the file operations, preprocessor commands.

Course Outcomes:

By the end of the Lab, the student

- Gains Knowledge on various concepts of a C language.
- Able to draw flowcharts and write algorithms.
- Able design and development of C problem solving skills.
- Able to design and develop modular programming skills.
- Able to trace and debug a program

Exercise 1:

1. Write a C program to print a block F using hash (#), where the F has a height of six characters and width of five and four characters.
2. Write a C program to compute the perimeter and area of a rectangle with a height of 7 inches and width of 5 inches.
3. Write a C program to display multiple variables.

Exercise 2:

1. Write a C program to calculate the distance between the two points.
2. Write a C program that accepts 4 integers p, q, r, s from the user where r and s are positive and p is even. If q is greater than r and s is greater than p and if the sum of r and s is greater than the sum of p and q print "Correct values", otherwise print "Wrong values".

Exercise 3:

1. Write a C program to convert a string to a long integer.
2. Write a program in C which is a Menu-Driven Program to compute the area of the various geometrical shape.
3. Write a C program to calculate the factorial of a given number.

Exercise 4:

1. Write a program in C to display the n terms of even natural number and their sum.
2. Write a program in C to display the n terms of harmonic series and their sum.
 $1 + 1/2 + 1/3 + 1/4 + 1/5 \dots 1/n$ terms.
3. Write a C program to check whether a given number is an Armstrong number or not.

Exercise 5:

1. Write a program in C to print all unique elements in an array.
2. Write a program in C to separate odd and even integers in separate arrays.
3. Write a program in C to sort elements of array in ascending order.



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Exercise 6:

1. Write a program in C for multiplication of two square Matrices.
2. Write a program in C to find transpose of a given matrix.

Exercise 7:

1. Write a program in C to search an element in a row wise and column wise sorted matrix.
2. Write a program in C to print individual characters of string in reverse order.

Exercise 8:

1. Write a program in C to compare two strings without using string library functions.
2. Write a program in C to copy one string to another string.

Exercise 9:

1. Write a C Program to Store Information Using Structures with Dynamically Memory Allocation
2. Write a program in C to demonstrate how to handle the pointers in the program.

Exercise 10:

1. Write a program in C to demonstrate the use of & (address of) and *(value at address) operator.
2. Write a program in C to add two numbers using pointers.

Exercise 11:

1. Write a program in C to add numbers using call by reference.
2. Write a program in C to find the largest element using Dynamic Memory Allocation.

Exercise 12:

1. Write a program in C to swap elements using call by reference.
2. Write a program in C to count the number of vowels and consonants in a string using a pointer.

Exercise 13:

1. Write a program in C to show how a function returning pointer.
2. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc() function.

Exercise 14:

1. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc() function. Understand the difference between the above two programs
2. Write a program in C to convert decimal number to binary number using the function.

Exercise 15:

1. Write a program in C to check whether a number is a prime number or not using the function.
2. Write a program in C to get the largest element of an array using the function.

Exercise 16:

1. Write a program in C to append multiple lines at the end of a text file.
2. Write a program in C to copy a file in another name.
3. Write a program in C to remove a file from the disk.



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - II Semester		L	T	P	C
		3	0	0	3
MATHEMATICS-II (Linear Algebra And Numerical Methods)					

Course Objectives:

- To instruct the concept of Matrices in solving linear algebraic equations
- To elucidate the different numerical methods to solve nonlinear algebraic equations
- To disseminate the use of different numerical techniques for carrying out numerical integration.
- 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: At the end of the course, the student will be able to

- develop the use of matrix algebra techniques that is needed by engineers for practical applications (L6)
- solve system of linear algebraic equations using Gauss elimination, Gauss Jordan, Gauss Seidel (L3)
- evaluate the approximate roots of polynomial and transcendental equations by different algorithms (L5)
- apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals (L3)
- apply numerical integral techniques to different Engineering problems (L3)
- apply different algorithms for approximating the solutions of ordinary differential equations with initial conditions to its analytical computations (L3)

UNIT – I: Solving systems of linear equations, Eigen values and Eigen vectors: (10hrs)

Rank of a matrix by echelon form and normal form – Solving system of homogeneous and non-homogeneous linear equations – Gauss Elimination method – Eigenvalues and Eigen vectors and properties (article-2.14 in text book-1).

Unit – II: Cayley–Hamilton theorem and Quadratic forms: (10hrs)

Cayley-Hamilton theorem (without proof) – Applications – Finding the inverse and power of a matrix by Cayley-Hamilton theorem – Reduction to Diagonal form – Quadratic forms and nature of the quadratic forms – Reduction of quadratic form to canonical forms by orthogonal transformation. Singular values of a matrix, singular value decomposition (text book-3).

UNIT – III: Iterative methods: (8 hrs)

Introduction– Bisection method–Secant method – Method of false position– Iteration method – Newton-Raphson method (One variable and simultaneous Equations) – Jacobi and Gauss-Seidel methods for solving system of equations numerically.

UNIT – IV: Interpolation: (10 hrs)

Introduction– Errors in polynomial interpolation – Finite differences– Forward differences– Backward differences –Central differences – Relations between operators – Newton's forward and backward formulae for interpolation – Interpolation with unequal intervals – Lagrange's interpolation formula– Newton's divide difference formula.



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UNIT – V: Numerical differentiation and integration, Solution of ordinary differential equations with initial conditions: (10 hrs)

Numerical differentiation using interpolating polynomial – Trapezoidal rule– Simpson's $1/3^{\text{rd}}$ and $3/8^{\text{th}}$ rule– Solution of initial value problems by Taylor's series– Picard's method of successive approximations– Euler's method –Runge-Kutta method (second and fourth order).

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna Publishers.
2. B. V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.
3. David Poole, Linear Algebra- A modern introduction, 4th Edition, Cengage.

Reference Books:

1. Steven C. Chapra, Applied Numerical Methods with MATLAB for Engineering and Science, Tata Mc. Graw Hill Education.
2. M. K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International Publications.
3. Lawrence Turyan, Advanced Engineering Mathematics, CRC Press.



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - II Semester		L	T	P	C
		3	0	0	3
APPLIED CHEMISTRY					

Course Objectives

- Importance of usage of plastics in household appliances and composites (FRP) in aerospace and automotive industries.
- Outline the basics for the construction of electrochemical cells, batteries and fuel cells. Understand the mechanism of corrosion and how it can be prevented.
- Explain the preparation of semiconductors and nanomaterials, engineering applications of nanomaterials, superconductors and liquid crystals.
- Recall the increase in demand for power and hence alternative sources of power are studied due to depleting sources of fossil fuels. Advanced instrumental techniques are introduced.
- Outline the basics of computational chemistry and molecular switches

UNIT I: POLYMER TECHNOLOGY

8 hrs

Polymerisation:- Introduction, methods of polymerization (emulsion and suspension), mechanical properties.

Plastics: Compounding, fabrication (compression, injection, blown film and extrusion), preparation, properties and applications (PVC, polycarbonates and Bakelite), mention some examples of plastic materials used in electronic gadgets, recycling of e-plastic waste (waste to wealth).

Elastomers:- Introduction, preparation, properties and applications (Buna S, thiokol and polyurethanes).

Composite materials: Fiber reinforced plastics, conducting polymers, biodegradable polymers, biopolymers, biomedical polymers.

Course Outcomes: At the end of this unit, the students will be able to

- Analyze the different types of composite plastic materials and interpret the mechanism of conduction in conducting polymers.

UNIT II: ELECTROCHEMICAL CELLS AND CORROSION

10 hrs

Single electrode potential, electrochemical series and uses of series, standard hydrogen electrode, calomel electrode, construction of glass electrode, batteries (Dry cell, Li ion battery and zinc air cells), fuel cells (H₂-O₂, CH₃OH-O₂, phosphoric acid and molten carbonate).

Corrosion:- Definition, theories of corrosion (chemical and electrochemical), galvanic corrosion, differential aeration corrosion, stress corrosion, galvanic series, factors influencing rate of corrosion, corrosion control (proper designing and cathodic protection), Protective coatings (surface preparation, cathodic coatings, anodic coatings, electroplating and electroless plating [nickel]), Paints (constituents, functions and special paints).

Course Outcomes: At the end of this unit, the students will be able to

- Utilize the theory of construction of electrodes, batteries and fuel cells in redesigning new engineering products and categorize the reasons for corrosion and study methods to control corrosion.



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UNIT III: MATERIAL CHEMISTRY

10 hrs

Part I : Non-elemental semiconducting materials:- Stoichiometric, controlled valency & chalcogen photo/semiconductors-preparation of semiconductors (distillation, zone refining, Czochralski crystal pulling, epitaxy, diffusion, ion implantation) - Semiconductor devices (p-n junction diode as rectifier, junction transistor).

Insulators & magnetic materials: electrical insulators-ferro and ferri magnetism-Hall effect and its applications.

Part II: Nano materials:- Introduction, sol-gel method, characterization by (Brunauer Emmet Teller [BET]), (scanning electron microscopy [SEM]) and (transmission electron microscopy [TEM]), applications of graphene and fullerenes, carbon nanotubes (types, preparation and applications)

Liquid crystals:- Introduction-types-applications.

Super conductors:-Type –I, Type II-characteristics and applications

Course Outcomes: At the end of this unit, the students will be able to

- Synthesize nanomaterials for modern advances of engineering technology.
- Summarize the preparation of semiconductors; analyze the applications of liquid crystals and superconductors.

UNIT IV: SPECTROSCOPIC TECHNIQUES & NON-CONVENTIONAL ENERGY SOURCES

10 hrs

Part A: SPECTROSCOPIC TECHNIQUES

Electromagnetic spectrum-UV (laws of absorption, instrumentation, theory of electronic spectroscopy, Frank-condon principle, chromophores and auxochromes, intensity shifts, applications), FT-IR [instrumentation and differentiation of sp, sp², sp³ and IR stretching of functional groups (alcohols, carbonyls, amines) applications], magnetic resonance imaging and CT scan (procedure & applications).

Part B: NON-CONVENTIONAL ENERGY SOURCES

Design, working, schematic diagram, advantages and disadvantages of photovoltaic cell, hydropower, geothermal power, tidal and wave power, ocean thermal energy conversion.

Course Outcomes: At the end of this unit, the students will be able to

- Analyze the principles of different analytical instruments and their applications.
- Design models for energy by different natural sources.

UNIT V: ADVANCED CONCEPTS/TOPICS IN CHEMISTRY

8 hrs

Computational chemistry: Introduction to computational chemistry, molecular modelling and docking studies

Molecular switches: characteristics of molecular motors and machines, Rotaxanes and Catenanes as artificial molecular machines, prototypes – linear motions in rotaxanes, an acid-base controlled molecular shuttle, a molecular elevator, an autonomous light-powered molecular motor

Course Outcomes: At the end of this unit, the students will be able to

- Obtain the knowledge of computational chemistry and molecular machines

Text Books:

1. P.C. Jain and M. Jain “Engineering Chemistry”, 15/e, Dhanpat Rai & Sons, Delhi, (Latest edition).
2. Shikha Agarwal, “Engineering Chemistry”, Cambridge University Press, New Delhi, (2019).
3. S.S. Dara, “A Textbook of Engineering Chemistry”, S.Chand & Co, (2010).
4. Shashi Chawla, “Engineering Chemistry”, Dhanpat Rai Publishing Co. (Latest edition).



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Reference Books:

1. K. Sesa Maheshwaramma and Mridula Chugh, “Engineering Chemistry”, Pearson India Edn.
2. O.G. Palana, “Engineering Chemistry”, Tata McGraw Hill Education Private Limited, (2009).
3. CNR Rao and JM Honig (Eds) “Preparation and characterization of materials” Academic press, New York (latest edition)
4. B. S. Murthy, P. Shankar and others, “Textbook of Nanoscience and Nanotechnology”, University press (latest edition)



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year - II Semester		L	T	P	C
		3	0	0	3
COMPUTER ORGANIZATION					

Course Objectives:

The purpose of the course is to introduce principles of computer organization and the basic architectural concepts. It provides an in depth understanding of basic organization, design, programming of a simple digital computer, computer arithmetic, instruction set design, microprogrammed control unit, pipelining and vector processing, memory organization and I/O systems.

Course Outcomes:

By the end of the course the student will be able to

- Demonstrate and understanding of the design of the functional units of a digital computer system.
- Relate Postulates of Boolean algebra and minimize combinational functions
- Recognize and manipulate representations of numbers stored in digital computers
- Build the logic families and realization of logic gates.
- Design and analyze combinational and sequential circuits
- Recall the internal organization of computers, CPU, memory unit and Input/Outputs and the relations between its main components
- Solve elementary problems by assembly language programming

UNIT I:

Digital Computers and Data Representation: Introduction ,Numbering Systems, Decimal to Binary Conversion, Binary Coded Decimal Numbers, Weighted Codes, Self-Complementing Codes, Cyclic Codes, Error Detecting Codes, Error Correcting Codes, Hamming Code for Error Correction, Alphanumeric Codes, ASCII Code

Data Representation: Data types, Complements, Fixed Point Representation, Floating Point Representation.

Boolean Algebra and Logical gates:

Boolean Algebra :Theorems and properties, Boolean functions, canonical and standard forms , minimization of Boolean functions using algebraic identities; Karnaugh map representation and minimization using two and three variable Maps ;Logical gates ,universal gates and Two-level realizations using gates : AND-OR, OR-AND, NAND-NAND and NOR-NOR structures

UNIT II:

Digital logic circuits: Combinatorial Circuits: Introduction, Combinatorial Circuit Design Procedure, Implementation using universal gates, Multi-bit adder, Multiplexers, Demultiplexers, Decoders

Sequential Switching Circuits: Latches and Flip-Flops, Ripple counters using T flip-flops; Synchronous counters: Shift Registers; Ring counters



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UNIT III:

Computer Arithmetic: Addition and subtraction, multiplication Algorithms, Booth multiplication algorithm, Division Algorithms, Floating – point Arithmetic operations.

Register Transfer language and microinstructions : Bus memory transfer, arithmetic and logical micro-operations, shift and rotate micro-operations

Basic Computer Organization and Design: Stored program concept, computer Registers, common bus system, Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input–Output configuration and program Interrupt.

UNIT IV:

Microprogrammed Control: Control memory, Address sequencing, microprogram example, design of control unit.

Central Processing Unit: General Register Organization, Instruction Formats, Addressing modes, Data Transfer and Manipulation, Program Control: conditional Flags and Branching

UNIT V:

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory.

Input-Output Organization: Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt Direct memory Access.

Text Books:

1. Digital Logic and Computer Design, Moriss Mano, 11th Edition, Pearson Education.
2. Computer System Architecture, 3rd ed., M. Morris Mano, PHI

Reference Books:

1. Digital Logic and Computer Organization, Rajaraman, Radhakrishnan, PHI, 2006
2. Computer Organization, 5th ed., Hamacher, Vranesic and Zaky, TMH, 2002
3. Computer Organization & Architecture : Designing for Performance, 7th ed., William Stallings, PHI, 2006



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year – II Semester		L	T	P	C
		3	0	0	3
PYTHON PROGRAMMING					

Course Objectives:

The Objectives of Python Programming are

- To learn about Python programming language syntax, semantics, and the runtime environment
- To be familiarized with universal computer programming concepts like data types, containers
- To be familiarized with general computer programming concepts like conditional execution, loops & functions
- To be familiarized with general coding techniques and object-oriented programming

Course Outcomes:

- Develop essential programming skills in computer programming concepts like data types, containers
- Apply the basics of programming in the Python language
- Solve coding tasks related conditional execution, loops
- Solve coding tasks related to the fundamental notions and techniques used in object-oriented programming

UNIT I

Introduction: Introduction to Python, Program Development Cycle, Input, Processing, and Output, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations, Operators. Type conversions, Expressions, More about Data Output.

Data Types, and Expression: Strings Assignment, and Comment, Numeric Data Types and Character Sets, Using functions and Modules.

Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures, Comparing Strings, Logical Operators, Boolean Variables. Repetition Structures: Introduction, while loop, for loop, Calculating a Running Total, Input Validation Loops, Nested Loops.

UNIT II

Control Statement: Definite iteration for Loop Formatting Text for output, Selection if and if else Statement Conditional Iteration The While Loop

Strings and Text Files: Accessing Character and Substring in Strings, Data Encryption, Strings and Number Systems, String Methods Text Files.

UNIT III

List and Dictionaries: Lists, Defining Simple Functions, Dictionaries

Design with Function: Functions as Abstraction Mechanisms, Problem Solving with Top Down Design, Design with Recursive Functions, Case Study Gathering Information from a File System, Managing a Program's Namespace, Higher Order Function.

Modules: Modules, Standard Modules, Packages.



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UNIT IV

File Operations: Reading config files in python, Writing log files in python, Understanding read functions, read(), readline() and readlines(), Understanding write functions, write() and writelines(), Manipulating file pointer using seek, Programming using file operations

Object Oriented Programming: Concept of class, object and instances, Constructor, class attributes and destructors, Real time use of class in live projects, Inheritance , overlapping and overloading operators, Adding and retrieving dynamic attributes of classes, Programming using Oops support

Design with Classes: Objects and Classes, Data modeling Examples, Case Study An ATM, Structuring Classes with Inheritance and Polymorphism

UNIT V

Errors and Exceptions: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, User-defined Exceptions, Defining Clean-up Actions, Redefined Clean-up Actions.

Graphical User Interfaces: The Behavior of Terminal Based Programs and GUI -Based, Programs, Coding Simple GUI-Based Programs, Other Useful GUI Resources.

Programming: Introduction to Programming Concepts with Scratch.

Text Books

- 1) Fundamentals of Python First Programs, Kenneth. A. Lambert, Cengage.
- 2) Python Programming: A Modern Approach, Vamsi Kurama, Pearson.

Reference Books:

- 1) Introduction to Python Programming, Gowrishankar.S, Veena A, CRC Press.
- 2) Introduction to Programming Using Python, Y. Daniel Liang, Pearson.

e-Resources:

https://www.tutorialspoint.com/python3/python_tutorial.pdf



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I Year – II Semester		L	T	P	C
		3	0	0	3
DATA STRUCTURES					

Course Objectives:

The objective of the course is to

- Introduce the fundamental concept of data structures and abstract data types
- Emphasize the importance of data structures in developing and implementing efficient algorithms
- Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms

Course Outcomes:

After completing this course a student will be able to:

- Summarize the properties, interfaces, and behaviors of basic abstract data types
- Discuss the computational efficiency of the principal algorithms for sorting & searching
- Use arrays, records, linked structures, stacks, queues, trees, and Graphs in writing programs
- Demonstrate different methods for traversing trees

UNIT I

Data Structures - Definition, Classification of Data Structures, Operations on Data Structures, Abstract Data Type (ADT), Preliminaries of algorithms. Time and Space complexity.

Searching - Linear search, Binary search, Fibonacci search.

Sorting- Insertion sort, Selection sort, Exchange (Bubble sort, quick sort), distribution (radix sort), merging (Merge sort) algorithms.

UNIT II

Linked List: Introduction, Single linked list, Representation of Linked list in memory, Operations on Single Linked list-Insertion, Deletion, Search and Traversal ,Reversing Single Linked list, Applications on Single Linked list- Polynomial Expression Representation ,Addition and Multiplication, Sparse Matrix Representation using Linked List, Advantages and Disadvantages of Single Linked list, Double Linked list-Insertion, Deletion, Circular Linked list-Insertion, Deletion.

UNIT III

Queues: Introduction to Queues, Representation of Queues-using Arrays and using Linked list, Implementation of Queues-using Arrays and using Linked list, Application of Queues-Circular Queues, Deques, Priority Queues, Multiple Queues.

Stacks: Introduction to Stacks, Array Representation of Stacks, Operations on Stacks, Linked list Representation of Stacks, Operations on Linked Stack, Applications-Reversing list, Factorial Calculation, Infix to Postfix Conversion, Evaluating Postfix Expressions.

UNIT IV

Trees: Basic Terminology in Trees, Binary Trees-Properties, Representation of Binary Trees using Arrays and Linked lists. Binary Search Trees- Basic Concepts, BST Operations: Insertion, Deletion, Tree Traversals, Applications-Expression Trees, Heap Sort, Balanced Binary Trees- AVL Trees, Insertion, Deletion and Rotations.



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UNIT V

Graphs: Basic Concepts, Representations of Graphs-Adjacency Matrix and using Linked list, Graph Traversals (BFT & DFT), Applications- Minimum Spanning Tree Using Prim's & Kruskal's Algorithm, Dijkstra's shortest path, Transitive closure, Warshall's Algorithm.

Text Books:

- 1) Data Structures Using C. 2nd Edition. Reema Thareja, Oxford.
- 2) Data Structures and algorithm analysis in C, 2nded, Mark Allen Weiss.

Reference Books:

- 1) Fundamentals of Data Structures in C, 2nd Edition, Horowitz, Sahni, Universities Press.
- 2) Data Structures: A PseudoCode Approach, 2/e, Richard F. Gilberg, Behrouz A. Forouzan, Cengage.
- 3) Data Structures with C, Seymour Lipschutz TMH

e-Resources:

- 1) <http://algs4.cs.princeton.edu/home/>
- 2) https://faculty.washington.edu/jstraub/dsa/Master_2_7a.pdf



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I Year - II Semester		L	T	P	C
		0	0	3	1.5
APPLIED CHEMISTRY LAB					

Introduction to Chemistry laboratory – Molarity, normality, primary, secondary standard solutions, volumetric titrations, quantitative analysis

1. Determination of HCl using standard Na₂CO₃ solution.
2. Determination of alkalinity of a sample containing Na₂CO₃ and NaOH.
3. Determination of Mn⁺² using standard oxalic acid solution.
4. Determination of ferrous iron using standard K₂Cr₂O₇ solution.
5. Determination of Cu⁺² using standard hypo solution.
6. Determination of temporary and permanent hardness of water using standard EDTA solution.
7. Determination of Fe⁺³ by a colorimetric method.
8. Determination of the concentration of acetic acid using sodium hydroxide (pH-metry method).
9. Determination of iso-electric point of amino acids using pH-metry method/conductometric method.
10. Determination of the concentration of strong acid vs strong base (by conductometric method).
11. Determination of strong acid vs strong base (by potentiometric method).
12. Determination of Mg⁺² present in an antacid.
13. Determination of CaCO₃ present in an egg shell.
14. Estimation of Vitamin C.
15. Determination of phosphoric content in soft drinks.
16. Adsorption of acetic acid by charcoal.
17. Preparation of nylon-6, 6 and Bakelite (demonstration only).

Of the above experiments at-least 10 assessment experiments should be completed in a semester.

Outcomes: The students entering into the professional course have practically very little exposure to lab classes. The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis. Thus at the end of the lab course, the student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

Reference Books

1. A Textbook of Quantitative Analysis, Arthur J. Vogel.



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I Year - II Semester		L	T	P	C
		0	0	3	1.5
PYTHON PROGRAMMING LAB					

Course Objectives:

The Objectives of Python Programming are

- *To learn about Python programming language syntax, semantics, and the runtime environment*
- *To be familiarized with universal computer programming concepts like data types, containers*
- *To be familiarized with general computer programming concepts like conditional execution, loops & functions*
- *To be familiarized with general coding techniques and object-oriented programming*

Course Outcomes:

- Develop essential programming skills in computer programming concepts like data types, containers
- Apply the basics of programming in the Python language
- Solve coding tasks related conditional execution, loops
- Solve coding tasks related to the fundamental notions and techniques used in object-oriented programming

List of Experiments:

- 1) Write a program that asks the user for a weight in kilograms and converts it to pounds. There are 2.2 pounds in a kilogram.
- 2) Write a program that asks the user to enter three numbers (use three separate input statements). Create variables called total and average that hold the sum and average of the three numbers and print out the values of total and average.
- 3) Write a program that uses a *for* loop to print the numbers 8, 11, 14, 17, 20, . . . , 83, 86, 89.
- 4) Write a program that asks the user for their name and how many times to print it. The program should print out the user's name the specified number of times.
- 5) Use a *for* loop to print a triangle like the one below. Allow the user to specify how high the triangle should be.


```
*
**
***
****
```
- 6) Generate a random number between 1 and 10. Ask the user to guess the number and print a message based on whether they get it right or not.
- 7) Write a program that asks the user for two numbers and prints *Close* if the numbers are within .001 of each other and *Not close* otherwise.
- 8) Write a program that asks the user to enter a word and prints out whether that word contains any vowels.
- 9) Write a program that asks the user to enter two strings of the same length. The program should then check to see if the strings are of the same length. If they are not, the program should print an appropriate message and exit. If they are of the same



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- length, the program should alternate the characters of the two strings. For example, if the user enters *abcde* and *ABCDE* the program should print out *AaBbCcDdEe*.
- 10) Write a program that asks the user for a large integer and inserts commas into it according to the standard American convention for commas in large numbers. For instance, if the user enters 1000000, the output should be 1,000,000.
 - 11) In algebraic expressions, the symbol for multiplication is often left out, as in $3x+4y$ or $3(x+5)$. Computers prefer those expressions to include the multiplication symbol, like $3*x+4*y$ or $3*(x+5)$. Write a program that asks the user for an algebraic expression and then inserts multiplication symbols where appropriate.
 - 12) Write a program that generates a list of 20 random numbers between 1 and 100.
 - (a) Print the list.
 - (b) Print the average of the elements in the list.
 - (c) Print the largest and smallest values in the list.
 - (d) Print the second largest and second smallest entries in the list
 - (e) Print how many even numbers are in the list.
 - 13) Write a program that asks the user for an integer and creates a list that consists of the factors of that integer.
 - 14) Write a program that generates 100 random integers that are either 0 or 1. Then find the longest run of zeros, the largest number of zeros in a row. For instance, the longest run of zeros in $[1,0,1,1,0,0,0,0,1,0,0]$ is 4.
 - 15) Write a program that removes any repeated items from a list so that each item appears at most once. For instance, the list $[1,1,2,3,4,3,0,0]$ would become $[1,2,3,4,0]$.
 - 16) Write a program that asks the user to enter a length in feet. The program should then give the user the option to convert from feet into inches, yards, miles, millimeters, centimeters, meters, or kilometers. Say if the user enters a 1, then the program converts to inches, if they enter a 2, then the program converts to yards, etc. While this can be done with if statements, it is much shorter with lists and it is also easier to add new conversions if you use lists.
 - 17) Write a function called *sum_digits* that is given an integer num and returns the sum of the digits of num.
 - 18) Write a function called *first_diff* that is given two strings and returns the first location in which the strings differ. If the strings are identical, it should return -1.
 - 19) Write a function called *number_of_factors* that takes an integer and returns how many factors the number has.
 - 20) Write a function called *is_sorted* that is given a list and returns True if the list is sorted and False otherwise.
 - 21) Write a function called *root* that is given a number x and an integer n and returns $x^{1/n}$. In the function definition, set the default value of n to 2.
 - 22) Write a function called *primes* that is given a number n and returns a list of the first n primes. Let the default value of n be 100.
 - 23) Write a function called *merge* that takes two already sorted lists of possibly different lengths, and merges them into a single sorted list.
 - (a) Do this using the sort method.
 - (b) Do this without using the sort method.
 - 24) Write a program that asks the user for a word and finds all the smaller words that can be made from the letters of that word. The number of occurrences of a letter in a smaller word can't exceed the number of occurrences of the letter in the user's word.
 - 25) Write a program that reads a file consisting of email addresses, each on its own line. Your program should print out a string consisting of those email addresses separated by semicolons.



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- 26) Write a program that reads a list of temperatures from a file called *temps.txt*, converts those temperatures to Fahrenheit, and writes the results to a file called *ftemps.txt*.
- 27) Write a class called *Product*. The class should have fields called *name*, *amount*, and *price*, holding the product's name, the number of items of that product in stock, and the regular price of the product. There should be a method *get_price* that receives the number of items to be bought and returns a the cost of buying that many items, where the regular price is charged for orders of less than 10 items, a 10% discount is applied for orders of between 10 and 99 items, and a 20% discount is applied for orders of 100 or more items. There should also be a method called *make_purchase* that receives the number of items to be bought and decreases amount by that much.
- 28) Write a class called *Time* whose only field is a time in seconds. It should have a method called *convert_to_minutes* that returns a string of minutes and seconds formatted as in the following example: if seconds is 230, the method should return '5:50'. It should also have a method called *convert_to_hours* that returns a string of hours, minutes, and seconds formatted analogously to the previous method.
- 29) Write a class called *Converter*. The user will pass a length and a unit when declaring an object from the class—for example, *c = Converter(9,'inches')*. The possible units are inches, feet, yards, miles, kilometers, meters, centimeters, and millimeters. For each of these units there should be a method that returns the length converted into those units. For example, using the *Converter* object created above, the user could call *c.feet()* and should get 0.75 as the result.
- 30) Write a Python class to implement *pow(x, n)*.
- 31) Write a Python class to reverse a string word by word.
- 32) Write a program that opens a file dialog that allows you to select a text file. The program then displays the contents of the file in a textbox.
- 33) Write a program to demonstrate *Try/except/else*.
- 34) Write a program to demonstrate *try/finally* and *with/as*.



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I Year – II Semester		L	T	P	C
		0	0	3	1.5
DATA STRUCTURES LAB					

Course Objectives:

The objective of this lab is to

- Demonstrate the different data structures implementation.

Course Outcomes:

By the end of this lab the student is able to

- Use basic data structures such as arrays and linked list.
- Programs to demonstrate fundamental algorithmic problems including Tree Traversals, Graph traversals, and shortest paths.
- Use various searching and sorting algorithms.

List of Experiments:

Exercise -1 (Searching)

- a) Write C program that use both recursive and non recursive functions to perform Linear search for a Key value in a given list.
- b) Write C program that use both recursive and non recursive functions to perform Binary search for a Key value in a given list.

Exercise -2 (Sorting-I)

- a) Write C program that implement Bubble sort, to sort a given list of integers in ascending order
- b) Write C program that implement Quick sort, to sort a given list of integers in ascending order
- c) Write C program that implement Insertion sort, to sort a given list of integers in ascending order

Exercise -3(Sorting-II)

- a) Write C program that implement radix sort, to sort a given list of integers in ascending order
- b) Write C program that implement merge sort, to sort a given list of integers in ascending order

Exercise -4(Singly Linked List)

- a) Write a C program that uses functions to create a singly linked list
- b) Write a C program that uses functions to perform insertion operation on a singly linked list
- c) Write a C program that uses functions to perform deletion operation on a singly linked list
- d) Write a C program to reverse elements of a single linked list.

Exercise -5(Queue)

- a) Write C program that implement Queue (its operations) using arrays.
- b) Write C program that implement Queue (its operations) using linked lists



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Exercise -6(Stack)

- a) Write C program that implement stack (its operations) using arrays
- b) Write C program that implement stack (its operations) using Linked list
- c) Write a C program that uses Stack operations to evaluate postfix expression

Exercise -7(Binary Tree)

- d) Write a recursive C program for traversing a binary tree in preorder, inorder and postorder.

Exercise -8(Binary Search Tree)

- a) Write a C program to Create a BST
- b) Write a C program to insert a node into a BST.
- c) Write a C program to delete a node from a BST.



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I Year – II Semester		L	T	P	C
		2	0	0	0
ENVIRONMENT SCIENCE					

Course Objectives:

The objectives of the course are to impart:

- Overall understanding of the natural resources.
- Basic understanding of the ecosystem and its diversity.
- Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities.
- An understanding of the environmental impact of developmental activities.
- Awareness on the social issues, environmental legislation and global treaties.

UNIT I

Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance – Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, acid rains, ozone layer depletion, population growth and explosion, effects. Role of information technology in environment and human health.

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 Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.

UNIT II

Natural Resources: Natural resources and associated problems.

Forest resources: Use and over – exploitation, deforestation – 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.

Food resources: World food problems, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.

Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources.

Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification; Role of an individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles.

UNIT III

Biodiversity and its conservation: Definition: genetic, species and ecosystem diversity-classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation - Hot-spots of biodiversity - Threats to biodiversity: habitat loss, man-wildlife conflicts. - Endangered and endemic species of India – Conservation of biodiversity: conservation of biodiversity.



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UNIT IV

Environmental Pollution: Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Sustainable Life Studies. Impact of Fire Crackers on Men and his well being.

Solid Waste Management: Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management.

UNIT V

Social Issues and the Environment: Urban problems related to energy -Water conservation, rain water harvesting-Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Environmental 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.

Environmental Management: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Ecotourism, Green Campus – Green business and Green politics.

The student should Visit an Industry / Ecosystem and submit a report individually on any **issues related to Environmental Studies course and make a power point presentation.**

Text Books:

- 1) Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada
- 2) Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.
- 3) Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai

Reference Books:

- 1) Text Book of Environmental Studies, Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.
- 2) A Textbook of Environmental Studies, Shaashi Chawla, TMH, New Delhi
- 3) Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi
- 4) Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New Age International Publishers, 2014



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II Year I Semester		L	T	P	C
		3	0	0	3
MATHEMATICS - III					

Course Objectives:

- To familiarize the techniques in partial differential equations
- 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:

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

- Interpret the physical meaning of different operators such as gradient, curl and divergence (L5)
- Estimate the work done against a field, circulation and flux using vector calculus (L5)
- Apply the Laplace transform for solving differential equations (L3)
- Find or compute the Fourier series of periodic signals (L3)
- Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms (L3)
- Identify solution methods for partial differential equations that model physical processes (L3)

UNIT I: Vector calculus: (10 hrs)

Vector Differentiation: Gradient – Directional derivative – Divergence – Curl – Scalar Potential.

Vector Integration: Line integral – Work done – Area – Surface and volume integrals – Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof).

UNIT II: Laplace Transforms: (10 hrs)

Laplace transforms of standard functions – Shifting theorems – Transforms of derivatives and integrals – Unit step function – Dirac’s delta function – Inverse Laplace transforms – Convolution theorem (without proof).

Applications: Solving ordinary differential equations (initial value problems) using Laplace transforms.

UNIT III: Fourier series and Fourier Transforms: (10 hrs)

Fourier Series: Introduction – Periodic functions – Fourier series of periodic function – Dirichlet’s conditions – Even and odd functions – Change of interval – Half-range sine and cosine series.

Fourier Transforms: Fourier integral theorem (without proof) – Fourier sine and cosine integrals – Sine and cosine transforms – Properties – inverse transforms – Finite Fourier transforms.

UNIT IV: PDE of first order: (8 hrs)

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations.



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UNIT V: Second order PDE and Applications: (10 hrs)

Second order PDE: Solutions of linear partial differential equations with constant coefficients

– RHS term of the type e^{ax+by} , $\sin(ax+by)$, $\cos(ax+by)$, $x^m y^n$.

Applications of PDE: Method of separation of Variables – Solution of One dimensional Wave, Heat and two-dimensional Laplace equation.

Text Books:

- 1) B. S. Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
- 2) B. V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

Reference Books:

- 1) Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley-India.
- 2) Dean. G. Duffy, Advanced Engineering Mathematics with MATLAB, 3rd Edition, CRC Press.
- 3) Peter O' Neil, Advanced Engineering Mathematics, Cengage.
- 4) Srimantha Pal, S C Bhunia, Engineering Mathematics, Oxford University Press.



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II Year – I Semester		L	T	P	C
		3	0	0	3
OBJECT ORIENTED PROGRAMMING THROUGH C++					

Course Objectives:

- Describe the procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects
- Understand dynamic memory management techniques using pointers, constructors, destructors
- Describe the concept of function overloading, operator overloading, virtual functions and polymorphism
- Classify inheritance with the understanding of early and late binding, usage of exception handling, generic programming
- Demonstrate the use of various OOPs concepts with the help of programs

Course Outcomes:

By the end of the course, the student

- Classify object oriented programming and procedural programming
- Apply C++ features such as composition of objects, operator overloads, dynamic memory allocation, inheritance and polymorphism, file I/O, exception handling
- Build C++ classes using appropriate encapsulation and design principles
- Apply object oriented or non-object oriented techniques to solve bigger computing problems

UNIT I

Introduction to C++: Difference between C and C++, Evolution of C++, The Object Oriented Technology, Disadvantage of Conventional Programming, Key Concepts of Object Oriented Programming, Advantage of OOP, Object Oriented Language.

UNIT II

Classes and Objects & Constructors and Destructor: Classes in C++, Declaring Objects, Access Specifiers and their Scope, Defining Member Function, Overloading Member Function, Nested class, Constructors and Destructors, Introduction, Constructors and Destructor, Characteristics of Constructor and Destructor, Application with Constructor, Constructor with Arguments parameterized Constructor, Destructors, Anonymous Objects.

UNIT III

Operator Overloading and Type Conversion & Inheritance: The Keyword Operator, Overloading Unary Operator, Operator Return Type, Overloading Assignment Operator (=), Rules for Overloading Operators, Inheritance, Reusability, Types of Inheritance, Virtual Base Classes- Object as a Class Member, Abstract Classes, Advantages of Inheritance, Disadvantages of Inheritance.



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UNIT IV

Pointers & Binding Polymorphisms and Virtual Functions: Pointer, Features of Pointers, Pointer Declaration, Pointer to Class, Pointer Object, The this Pointer, Pointer to Derived Classes and Base Class, Binding Polymorphisms and Virtual Functions, Introduction, Binding in C++, Virtual Functions, Rules for Virtual Function, Virtual Destructor.

UNIT V

Generic Programming with Templates & Exception Handling: Definition of class Templates, Normal Function Templates, Over Loading of Template Function, Bubble Sort Using Function Templates, Difference between Templates and Macros, Linked Lists with Templates, Exception Handling, Principles of Exception Handling, The Keywords try throw and catch, Multiple Catch Statements, Specifying Exceptions.

Overview of Standard Template Library, STL Programming Model, Containers, Sequence Containers, Associative Containers, Algorithms, Iterators, Vectors, Lists, Maps.

Text Books:

- 1) A First Book of C++, Gary Bronson, Cengage Learning.
- 2) The Complete Reference C++, Herbert Schildt, TMH.

Reference Books:

- 1) Object Oriented Programming C++, Joyce Farrell, Cengage.
- 2) C++ Programming: from problem analysis to program design, DS Malik, Cengage Learning
- 3) Programming in C++, Ashok N Kamthane, Pearson 2nd Edition

e- Resources:

- 1) <https://nptel.ac.in/courses/106/105/106105151/>
- 2) <https://github.com/topics/object-oriented-programming>



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – I Semester		L	T	P	C
		3	0	0	3
OPERATING SYSTEMS					

Course Objectives:

The objectives of this course is to

- Introduce to the internal operation of modern operating systems
- Define, explain, processes and threads, mutual exclusion, CPU scheduling, deadlock, memory management, and file systems
- Understand File Systems in Operating System like UNIX/Linux and Windows
- Understand Input Output Management and use of Device Driver and Secondary Storage (Disk) Mechanism
- Analyze Security and Protection Mechanism in Operating System

Course Outcomes:

After learning, the course the students should be able to:

- Describe various generations of Operating System and functions of Operating System
- Describe the concept of program, process and thread and analyze various CPU Scheduling Algorithms and compare their performance
- Solve Inter Process Communication problems using Mathematical Equations by various methods
- Compare various Memory Management Schemes especially paging and Segmentation in Operating System and apply various Page Replacement Techniques
- Outline File Systems in Operating System like UNIX/Linux and Windows

UNIT I

Operating Systems Overview: Operating system functions, Operating system structure, Operating systems operations, Computing environments, Open-Source Operating Systems.

System Structures: Operating System Services, User and Operating-System Interface, systems calls, Types of System Calls, system programs, operating system structure, operating system debugging, System Boot.

UNIT II

Process Concept: Process scheduling, Operations on processes, Inter-process communication, Communication in client server systems.

Multithreaded Programming: Multithreading models, Thread libraries, Threading issues.

Process Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling, Thread scheduling.

Inter-process Communication: Race conditions, Critical Regions, Mutual exclusion with busy waiting, Sleep and wakeup, Semaphores, Mutexes, Monitors, Message passing, Barriers, Classical IPC Problems - Dining philosophers problem, Readers and writers problem.



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UNIT III

Memory-Management Strategies: Introduction, Swapping, Contiguous memory allocation, Paging, Segmentation.

Virtual Memory Management: Introduction, Demand paging, Copy on-write, Page replacement, Frame allocation, Thrashing, Memory-mapped files, Kernel memory allocation.

UNIT IV

Deadlocks: Resources, Conditions for resource deadlocks, Ostrich algorithm, Deadlock detection and recovery, Deadlock avoidance, Deadlock prevention.

File Systems: Files, Directories, File system implementation, management and optimization.

Secondary-Storage Structure: Overview of disk structure, and attachment, Disk scheduling, RAID structure, Stable storage implementation.

UNIT V

System Protection: Goals of protection, Principles and domain of protection, Access matrix, Access control, Revocation of access rights.

System Security: Introduction, Program threats, System and network threats, Cryptography for security, User authentication, Implementing security defenses, Firewalling to protect systems and networks, Computer security classification.

Case Studies: Linux, Microsoft Windows.

Text Books:

- 1) Silberschatz A, Galvin P B, and Gagne G, Operating System Concepts, 9th edition, Wiley, 2013.
- 2) Tanenbaum A S, Modern Operating Systems, 3rd edition, Pearson Education, 2008. (for Interprocess Communication and File systems.)

Reference Books:

- 1) Dhamdhare D M, Operating Systems A Concept Based Approach, 3rd edition, Tata McGraw-Hill, 2012.
- 2) Stallings W, Operating Systems -Internals and Design Principles, 6th edition, Pearson Education, 2009
- 3) Nutt G, Operating Systems, 3rd edition, Pearson Education, 2004.

e-Resources:

- 1) <https://nptel.ac.in/courses/106/105/106105214/>



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – I Semester		L	T	P	C
		3	0	0	3
SOFTWARE ENGINEERING					

Course Objectives:

This course is designed to:

- Give exposure to phases of Software Development, common process models including Waterfall, and the Unified Process, and hands-on experience with elements of the agile process
- Give exposure to a variety of Software Engineering practices such as requirements analysis and specification, code analysis, code debugging, testing, traceability, and version control
- Give exposure to Software Design techniques

Course Outcomes:

Students taking this subject will gain software engineering skills in the following areas:

- Ability to transform an Object-Oriented Design into high quality, executable code
- Skills to design, implement, and execute test cases at the Unit and Integration level
- Compare conventional and agile software methods

UNIT I

The Nature of Software, The Unique Nature of WebApps, Software Engineering, The Software Process, Software Engineering Practice, Software Myths. A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialized Process Models, The Unified Process, Personal and Team Process Models, Process Technology.

UNIT II

Agility, Agility and the Cost of Change, Agile Process, Extreme Programming (XP), Other Agile Process Models, A Tool Set for the Agile Process, Software Engineering Knowledge, Core Principles, Principles That Guide Each Framework Activity, Requirements Engineering, Establishing the Groundwork, Eliciting Requirements, Developing Use Cases, Building the Requirements Model, Negotiating Requirements, Validating Requirements.

UNIT III

Requirements Analysis, Scenario-Based Modeling, UML Models That Supplement the Use Case, Data Modeling Concepts, Class-Based Modeling, Requirements Modeling Strategies, Flow-Oriented Modeling, Creating a Behavioral Model, Patterns for Requirements Modelling, Requirements Modeling for WebApps.

UNIT IV

Design within the Context of Software Engineering, The Design Process, Design Concepts, The Design Model, Software Architecture, Architectural Genres, Architectural Styles,



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Assessing Alternative Architectural Designs, Architectural Mapping Using Data Flow, Components, Designing Class-Based Components, Conducting Component-Level Design, Component-Level Design for WebApps, Designing Traditional Components, Component-Based Development.

UNIT V

The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, WebApp Interface Design, Design Evaluation, Elements of Software Quality Assurance, SQA Tasks, Goals & Metrics, Statistical SQA, Software Reliability, A Strategic Approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Test Strategies for Object-Oriented Software, Test Strategies for WebApps, Validation Testing, System Testing, The Art of Debugging, Software Testing Fundamentals, Internal and External Views of Testing, White-Box Testing, Basis Path Testing.

Text Books:

- 1) Software Engineering a practitioner's approach, Roger S. Pressman, Seventh Edition, McGraw Hill Higher Education.
- 2) Software Engineering, Ian Sommerville, Ninth Edition, Pearson.

Reference Books:

- 1) Software Engineering, A Precise Approach, PankajJalote, Wiley India, 2010.
- 2) Software Engineering, Ugrasen Suman, Cengage.

e-Resources:

- 1) <https://nptel.ac.in/courses/106/105/106105182/>



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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

II Year – I Semester		L	T	P	C
		3	0	0	3
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE					

Course Objectives:

This course is designed to:

- To introduce the students to the topics and techniques of discrete methods and combinatorial reasoning
- To introduce a wide variety of applications. The algorithmic approach to the solution of problems is fundamental in discrete mathematics, and this approach reinforces the close ties between this discipline and the area of computer science

Course Outcomes:

At the end of the course student will be able to

- Demonstrate skills in solving mathematical problems
- Comprehend mathematical principles and logic
- Demonstrate knowledge of mathematical modeling and proficiency in using mathematical software
- Manipulate and analyze data numerically and/or graphically using appropriate Software
- Communicate effectively mathematical ideas/results verbally or in writing

UNIT I

Mathematical Logic: Propositional Calculus: Statements and Notations, Connectives, Well Formed Formulas, Truth Tables, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications, Normal Forms, Theory of Inference for Statement Calculus, Consistency of Premises, Indirect Method of Proof, Predicate Calculus: Predicates, Predicative Logic, Statement Functions, Variables and Quantifiers, Free and Bound Variables, Inference Theory for Predicate Calculus.

UNIT II

Set Theory: Sets: Operations on Sets, Principle of Inclusion-Exclusion, Relations: Properties, Operations, Partition and Covering, Transitive Closure, Equivalence, Compatibility and Partial Ordering, Hasse Diagrams, Functions: Bijective, Composition, Inverse, Permutation, and Recursive Functions, Lattice and its Properties, Algebraic Structures: Algebraic Systems, Properties, Semi Groups and Monoids, Group, Subgroup and Abelian Group, Homomorphism, Isomorphism.

UNIT III

Combinatorics: Basis of Counting, Permutations, Permutations with Repetitions, Circular and Restricted Permutations, Combinations, Restricted Combinations, Binomial and Multinomial Coefficients and Theorems, Number Theory: Properties of Integers, Division Theorem,



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Greatest Common Divisor, Euclidean Algorithm, Least Common Multiple, Testing for Prime Numbers, The Fundamental Theorem of Arithmetic, Modular Arithmetic, Fermat's and Euler's Theorems

UNIT IV

Recurrence Relations: Generating Functions, Function of Sequences, Partial Fractions, Calculating Coefficient of Generating Functions, Recurrence Relations, Formulation as Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions, Method of Characteristic Roots, Solving Inhomogeneous Recurrence Relations

UNIT V

Graph Theory: Basic Concepts, Graph Theory and its Applications, Sub graphs, Graph Representations: Adjacency and Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multigraphs, Bipartite and Planar Graphs, Euler's Theorem, Graph Colouring and Covering, Chromatic Number, Spanning Trees, Prim's and Kruskal's Algorithms, BFS and DFS Spanning Trees.

Text Books:

- 1) Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and P. Manohar, Tata McGraw Hill.
- 2) Elements of Discrete Mathematics-A Computer Oriented Approach, C. L. Liu and D. P. Mohapatra, 3rd Edition, Tata McGraw Hill.

Reference Books:

- 1) Discrete Mathematics for Computer Scientists and Mathematicians, J. L. Mott, A. Kandel and T. P. Baker, 2nd Edition, Prentice Hall of India.
- 2) Discrete Mathematical Structures, Bernand Kolman, Robert C. Busby and Sharon Cutler Ross, PHI.
- 3) Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H. Rosen, 7th Edition, Tata McGraw Hill.

e-Resources:

- 1) <https://nptel.ac.in/courses/106/106/106106094/>



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II Year – I Semester		L	T	P	C
		0	0	3	1.5
OBJECT ORIENTED PROGRAMMING THROUGH C++ LAB					

Course Objectives:

The objective of this lab is to

- Demonstrate procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects.
- Understand dynamic memory management techniques using pointers, constructors, destructors, etc
- Demonstrate the concept of function overloading, operator overloading, virtual functions and polymorphism, inheritance.

Course Outcomes:

By the end of this lab the student is able to

- Apply the various OOPs concepts with the help of programs.

Exercise -1 (Classes Objects)

Create a Distance class with:

- feet and inches as data members
 - member function to input distance
 - member function to output distance
 - member function to add two distance objects
1. Write a main function to create objects of DISTANCE class. Input two distances and output the sum.
 2. Write a C++ Program to illustrate the use of Constructors and Destructors (use the above program.)
 3. Write a program for illustrating function overloading in adding the distance between objects (use the above problem)

Exercise – 2 (Access)

Write a program for illustrating Access Specifiers public, private, protected

1. Write a program implementing Friend Function
2. Write a program to illustrate this pointer
3. Write a Program to illustrate pointer to a class



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Exercise -3 (Operator Overloading)

1. Write a program to Overload Unary, and Binary Operators as Member Function, and Non Member Function.
 1. Unary operator as member function
 2. Binary operator as non member function
2. Write a c ++ program to implement the overloading assignment = operator

Exercise -4 (Inheritance)

1. Write C++ Programs and incorporating various forms of Inheritance
 - i) Single Inheritance
 - ii) Hierarchical Inheritance
 - iii) Multiple Inheritances
 - iv) Multi-level inheritance
 - v) Hybrid inheritance
2. Also illustrate the order of execution of constructors and destructors in inheritance

Exercise -5(Templates, Exception Handling)

1. a)Write a C++ Program to illustrate template class
2. b)Write a Program to illustrate member function templates
3. c) Write a Program for Exception Handling Divide by zero
4. d)Write a Program to rethrow an Exception

Exercise -6

1. Write a C++ program illustrating user defined string processing functions using pointers (string length, string copy, string concatenation)
2. Write a C++ program illustrating Virtual classes & virtual functions.
3. Write C++ program that implement Bubble sort, to sort a given list of integers in ascending order



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II Year – I Semester		L	T	P	C
		0	0	3	1.5
OPERATING SYSTEM LAB					

Course Objectives:

- To understand the design aspects of operating system
- To study the process management concepts & Techniques
- To study the storage management concepts
- To familiarize students with the Linux environment
- To learn the fundamentals of shell scripting/programming

Course Outcomes:

- To use Unix utilities and perform basic shell control of the utilities
 - To use the Unix file system and file access control
 - To use of an operating system to develop software
 - Students will be able to use Linux environment efficiently
 - Solve problems using bash for shell scripting
- 1) a) Study of Unix/Linux general purpose utility command list: man, who, cat, cd, cp, ps, ls, mv, rm, mkdir, rmdir, echo, more, date, time, kill, history, chmod, chown, finger, pwd, cal, logout, shutdown.
 b) Study of vi editor
 c) Study of Bash shell, Bourne shell and C shell in Unix/Linux operating system
 d) Study of Unix/Linux file system (tree structure)
 e) Study of .bashrc, /etc/bashrc and Environment variables.
 - 2) Write a C program that makes a copy of a file using standard I/O, and system calls
 - 3) Write a C program to emulate the UNIX ls -l command.
 - 4) Write a C program that illustrates how to execute two commands concurrently with a command pipe. Ex: - ls -l | sort
 - 5) Simulate the following CPU scheduling algorithms:
 (a) Round Robin (b) SJF (c) FCFS (d) Priority
 - 6) Multiprogramming-Memory management-Implementation of fork (), wait (), exec() and exit (), System calls
 - 7) Simulate the following:
 a) Multiprogramming with a fixed number of tasks (MFT)
 b) Multiprogramming with a variable number of tasks (MVT)
 - 8) Simulate Bankers Algorithm for Dead Lock Avoidance
 - 9) Simulate Bankers Algorithm for Dead Lock Prevention.



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- 10) Simulate the following page replacement algorithms:
a) FIFO b) LRU c) LFU
- 11) Simulate the following File allocation strategies
(a) Sequenced (b) Indexed (c) Linked
- 12) Write a C program that illustrates two processes communicating using shared memory
- 13) Write a C program to simulate producer and consumer problem using semaphores
- 14) Write C program to create a thread using pthreads library and let it run its function.
- 15) Write a C program to illustrate concurrent execution of threads using pthreads library.



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II Year – I Semester		L	T	P	C
		0	0	3	1.5
SOFTWARE ENGINEERING LAB					

Course Objectives:

The objective of this lab is to acquire the generic software development skill through various stages of software life cycle and also to ensure the quality of software through software development with various protocol based environment

Course Outcomes:

- By the end of this lab the student is able to elicit, analyze and specify software requirements through a productive working relationship with various stakeholders of the project
- prepare SRS document, design document, test cases and software configuration management and risk management related document.
- develop function oriented and object oriented software design using tools like rational rose.
- use modern engineering tools necessary for software project management, estimations, time management and software reuse
- generate test cases for software testing

1) Perform the following, for the following experiments:

- i. Do the Requirement Analysis and Prepare SRS
- ii. Draw E-R diagrams, DFD, CFD and structured charts for the project.

- 1) Course Registration System
- 2) Students Marks Analyzing System
- 3) Online Ticket Reservation System
- 4) Stock Maintenance

- 5) Consider any application, using COCOMO model, estimate the effort.
- 6) Consider any application, Calculate effort using FP oriented estimation model.
- 7) Draw the UML Diagrams for the problem 1,2, 3, 4.
- 8) Design the test cases for e-Commerce application (Flipcart, Amazon)
- 9) Design the test cases for a Mobile Application (Consider any example from Appstore)
- 10) Design and Implement ATM system through UML Diagrams.



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II Year - I Semester	Skill Oriented Course- I	L	T	P	C
		0	0	4	2
APPLICATIONS OF PYTHON-NumPy					

Course Objectives:

The objective of this lab is to acquire programming skills in Python package NumPy and perform mathematical and statistical operations.

Course Outcomes:

By the end of this lab the student is able to

- Explain how data is collected, managed and stored for processing
- Understand the workings of various numerical techniques, different descriptive measures of Statistics, correlation and regression to solve the engineering problems
- Understand how to apply some linear algebra operations to n-dimensional arrays
- Use NumPy perform common data wrangling and computational tasks in Python.

Perform the following:

- 1) NumPy Installation using different scientific python distributions(Anaconda, Python(x,y), WinPython, Pyzo)
- 2) NumPy Basics (np.array, np.arrange, np.linspace, np.zeros, np.ones, np.random.random, np.empty)
- 3) Arrays (array.shape, len(array), array.ndim, array.dtype, array.astype(type), type(array))
- 4) Array Manipulation (np.append, np.insert, np.resize, np.delete, np.concatenate, np.vstack, np.hstack)
- 5) Mathematical Operations(np.add, np.subtract, np.divide, np.multiply, np.sqrt, np.sin, np.cos, np.log, np.dot, np.roots) , Statistical Operations(np.mean, np.median, np.std, array.corrcoef())
- 6) NumPy data types
- 7) NumPy ndarray
- 8) NumPy String Operations
- 9) NumPy Financial functions
- 10) NumPy Functional Programming



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II Year - I Semester	Skill Oriented Course- I	L	T	P	C
		0	0	4	2
Web Application Development Using Full Stack					
Frontend Development – Module -I					

Course Objectives:

The objective of this lab is to provide understanding about the core concepts of frontend programming for web application

Course Outcomes:

By the end of this lab the student is able to

- Analyze a web page and identify its elements and attributes.
- Demonstrate the important HTML tags for designing static pages and separate design from content using Cascading Style sheet
- Implement MVC and responsive design to scale well across PC, tablet and Mobile Phone
- Create web pages using HTML and Cascading Style Sheets.

Perform experiments related to the following concepts:

A) HTML

- 1) Introduction to HTML
- 2) Browsers and HTML
- 3) Editor's Offline and Online
- 4) Tags, Attribute and Elements
- 5) Doctype Element
- 6) Comments
- 7) Headings, Paragraphs, and Formatting Text
- 8) Lists and Links
- 9) Images and Tables

B) CSS

- 1) Introduction CSS
- 2) Applying CSS to HTML
- 3) Selectors, Properties and Values
- 4) CSS Colors and Backgrounds
- 5) CSS Box Model
- 6) CSS Margins, Padding, and Borders
- 7) CSS Text and Font Properties
- 8) CSS General Topics



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II Year - I Semester		L	T	P	C
		2	0	0	0
CONSTITUTION OF INDIA					

Course Objectives:

- To Enable the student to understand the importance of constitution
- To understand the structure of executive, legislature and judiciary
- To understand philosophy of fundamental rights and duties
- To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.
- To understand the central and state relation financial and administrative

Course Outcomes:

At the end of the course, the student will be able to have a clear knowledge on the following:

- Understand historical background of the constitution making and its importance for building a democratic India.
- Understand the functioning of three wings of the government ie., executive, legislative and judiciary.
- Understand the value of the fundamental rights and duties for becoming good citizen of India.
- Analyze the decentralization of power between central, state and local self-government.
- Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.
 1. Know the sources, features and principles of Indian Constitution.
 2. Learn about Union Government, State government and its administration.
 3. Get acquainted with Local administration and Pachayati Raj.
 4. Be aware of basic concepts and developments of Human Rights.
 5. Gain knowledge on roles and functioning of Election Commission

UNIT I

Introduction to Indian Constitution: Constitution meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

Learning outcomes: After completion of this unit student will

- Understand the concept of Indian constitution
- Apply the knowledge on directive principle of state policy
- Analyze the History, features of Indian constitution
- Evaluate Preamble Fundamental Rights and Duties



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UNIT II

Union Government and its Administration Structure of the Indian Union: Federalism, Centre-State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions;

Learning outcomes: After completion of this unit student will

- Understand the structure of Indian government
- Differentiate between the state and central government
- Explain the role of President and Prime Minister
- Know the Structure of supreme court and High court

UNIT III

State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organisation, Structure and Functions

Learning outcomes: After completion of this unit student will

- Understand the structure of state government
- Analyze the role Governor and Chief Minister
- Explain the role of state Secretariat
- Differentiate between structure and functions of state secretariat

UNIT IV

A. Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation
 Pachayati Raj: Functions PRI: Zila Panchayat, Elected officials and their roles, CEO Zila Panchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root democracy

Learning outcomes:-After completion of this unit student will

- Understand the local Administration
- Compare and contrast district administration role and importance
- Analyze the role of Mayor and elected representatives of Municipalities
- Evaluate Zilla Panchayat block level organisation

UNIT V

Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate State Election Commission:, Functions of Commissions for the welfare of SC/ST/OBC and women



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Learning outcomes: After completion of this unit student will

- Know the role of Election Commission apply knowledge
- Contrast and compare the role of Chief Election commissioner and Commissiononerate
- Analyze role of state election commission
- Evaluate various commissions of viz SC/ST/OBC and women

References:

- 1) Durga Das Basu, Introduction to the Constitution of India, Prentice Hall of India Pvt. Ltd.
- 2) SubashKashyap, Indian Constitution, National Book Trust
- 3) J.A. Siwach, Dynamics of Indian Government & Politics
- 4) D.C. Gupta, Indian Government and Politics
- 5) H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
- 6) J.C. Johari, Indian Government andPolitics Hans
- 7) J. Raj IndianGovernment and Politics
- 8) M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi
- 9) Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

e-Resources:

- 1) nptel.ac.in/courses/109104074/8
- 2) nptel.ac.in/courses/109104045/
- 3) nptel.ac.in/courses/101104065/
- 4) www.hss.iitb.ac.in/en/lecture-details
- 5) www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution



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II Year – II Semester		L	T	P	C
		3	0	0	3
PROBABILITY AND STATISTICS					

Course Objectives:

- To familiarize the students with the foundations of probability and statistical methods
- To impart probability concepts and statistical methods in various applications Engineering

Course Outcomes:

Upon successful completion of this course, the student should be able to

- Classify the concepts of data science and its importance (L4) or (L2)
- Interpret the association of characteristics and through correlation and regression tools (L4)
- Make use of the concepts of probability and their applications (L3)
- Apply discrete and continuous probability distributions (L3)
- Design the components of a classical hypothesis test (L6)
- Infer the statistical inferential methods based on small and large sampling tests (L4)

UNIT I

Descriptive statistics and methods for data science: Data science – Statistics Introduction – Population vs Sample – Collection of data – primary and secondary data – Type of variable: dependent and independent Categorical and Continuous variables – Data visualization – Measures of Central tendency – Measures of Variability (spread or variance) – Skewness Kurtosis.

UNIT II

Correlation and Curve fitting: Correlation – correlation coefficient – rank correlation – regression coefficients and properties – regression lines – Method of least squares – Straight line – parabola – Exponential – Power curves.

UNIT III

Probability and Distributions: Probability – Conditional probability and Baye’s theorem – Random variables – Discrete and Continuous random variables – Distribution function – Mathematical Expectation and Variance – Binomial, Poisson, Uniform and Normal distributions.



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UNIT IV

Sampling Theory: Introduction – Population and samples – Sampling distribution of Means and Variance (definition only) – Central limit theorem (without proof) – Introduction to t , χ^2 and F-distributions – Point and Interval estimations – Maximum error of estimate.

UNIT V

Tests of Hypothesis: Introduction – Hypothesis – Null and Alternative Hypothesis – Type I and Type II errors – Level of significance – One tail and two-tail tests – Tests concerning one mean and two means (Large and Small samples) – Tests on proportions.

Text Books:

- 1) Miller and Freund's, 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.

Reference Books:

- 1) Shron L. Myers, Keying Ye, Ronald E Walpole, Probability and Statistics Engineers and the Scientists, 8th Edition, Pearson 2007.
- 2) Jay I. Devore, Probability and Statistics for Engineering and the Sciences, 8th Edition, Cengage.
- 3) Sheldon M. Ross, Introduction to probability and statistics Engineers and the Scientists, 4th Edition, Academic Foundation, 2011.
- 4) Johannes Ledolter and Robert V. Hogg, Applied statistics for Engineers and Physical Scientists, 3rd Edition, Pearson, 2010.



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II Year – II Semester		L	T	P	C
		3	0	0	3
DATABASE MANAGEMENT SYSTEMS					

Course Objectives:

- To introduce about database management systems
- To give a good formal foundation on the relational model of data and usage of Relational Algebra
- To introduce the concepts of basic SQL as a universal Database language
- To demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization
- To provide an overview of physical design of a database system, by discussing Database indexing techniques and storage techniques

Course Outcomes:

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

- Describe a relational database and object-oriented database
- Create, maintain and manipulate a relational database using SQL
- Describe ER model and normalization for database design
- Examine issues in data storage and query processing and can formulate appropriate solutions
- Outline the role and issues in management of data such as efficiency, privacy, security, ethical responsibility, and strategic advantage

UNIT I

Introduction: Database system, Characteristics (Database Vs File System), Database Users (Actors on Scene, Workers behind the scene), 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.

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 BASIC SQL: Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update), basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions (Date and Time, Numeric, String conversion).

UNIT III

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



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UNIT IV

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

UNIT V

Transaction Concept: Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm.

Indexing Techniques: B+ Trees: Search, Insert, Delete algorithms, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes , Index data Structures, Hash Based Indexing: Tree base Indexing ,Comparison of File Organizations, Indexes and Performance Tuning

Text Books:

- 1) Database Management Systems, 3/e, Raghurama Krishnan, Johannes Gehrke, TMH
- 2) Database System Concepts,5/e, Silberschatz, Korth, TMH

Reference Books:

- 1) Introduction to Database Systems, 8/e C J Date, PEA.
- 2) Database Management System, 6/e Ramez Elmasri, Shamkant B. Navathe, PEA
- 3) Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.

e-Resources:

- 1) <https://nptel.ac.in/courses/106/105/106105175/>
- 2) <https://www.geeksforgeeks.org/introduction-to-nosql/>



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II Year – II Semester		L	T	P	C
		3	0	0	3
FORMAL LANGUAGES AND AUTOMATA THEORY					

Course Objectives:

- To learn fundamentals of Regular and Context Free Grammars and Languages
- To understand the relation between Regular Language and Finite Automata and machines
- To learn how to design Automata's and machines as Acceptors, Verifiers and Translators
- To understand the relation between Contexts free Languages, PDA and TM
- To learn how to design PDA as acceptor and TM as Calculators

Course Outcomes:

By the end of the course students can

- Classify machines by their power to recognize languages.
- Summarize language classes & grammars relationship among them with the help of Chomsky hierarchy
- Employ finite state machines to solve problems in computing
- Illustrate deterministic and non-deterministic machines
- Quote the hierarchy of problems arising in the computer science

UNIT I

Finite Automata: Need of Automata theory, Central Concepts of Automata Theory, Automation, Finite Automata, Transition Systems, Acceptance of a String, DFA, Design of DFAs, NFA, Design of NFA, Equivalence of DFA and NFA, Conversion of NFA into DFA, Finite Automata with ϵ -Transitions, Minimization of Finite Automata, Finite Automata with output-Mealy and Moore Machines, Applications and Limitation of Finite Automata.

UNIT II

Regular Expressions, Regular Sets, Identity Rules, Equivalence of two RE, Manipulations of REs, Finite Automata and Regular Expressions, Inter Conversion, Equivalence between FA and RE, Pumping Lemma of Regular Sets, Closure Properties of Regular Sets, Grammars, Classification of Grammars, Chomsky Hierarchy Theorem, Right and Left Linear Regular Grammars, Equivalence between RG and FA, Inter Conversion.

UNIT III

Formal Languages, Context Free Grammar, Leftmost and Rightmost Derivations, Parse Trees, Ambiguous Grammars, Simplification of Context Free Grammars-Elimination of Useless Symbols, ϵ -Productions and Unit Productions, Normal Forms-Chomsky Normal



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Form and Greibach Normal Form, Pumping Lemma, Closure Properties, Applications of Context Free Grammars.

UNIT IV

Pushdown Automata, Definition, Model, Graphical Notation, Instantaneous Description, Language Acceptance of Pushdown Automata, Design of Pushdown Automata, Deterministic and Non – Deterministic Pushdown Automata, Equivalence of Pushdown Automata and Context Free Grammars, Conversion, Two Stack Pushdown Automata, Application of Pushdown Automata.

UNIT V

Turning Machine: Definition, Model, Representation of TMs-Instantaneous Descriptions, Transition Tables and Transition Diagrams, Language of a TM, Design of TMs, Types of TMs, Church's Thesis, Universal and Restricted TM, Decidable and Un-decidable Problems, Halting Problem of TMs, Post's Correspondence Problem, Modified PCP, Classes of P and NP, NP-Hard and NP-Complete Problems.

Text Books:

- 1) Introduction to Automata Theory, Languages and Computation, J. E. Hopcroft, R. Motwani and J. D. Ullman, 3rd Edition, Pearson, 2008
- 2) Theory of Computer Science-Automata, Languages and Computation, K. L. P. Mishra and N. Chandrasekharan, 3rd Edition, PHI, 2007

Reference Books:

- 1) Elements of Theory of Computation, Lewis H.P. & Papadimitriou C.H., Pearson /PHI
- 2) Theory of Computation, V. Kulkarni, Oxford University Press, 2013
- 3) Theory of Automata, Languages and Computation, Rajendra Kumar, McGraw Hill, 2014

e-Resources:

- 1) <https://nptel.ac.in/courses/106/104/106104028/>



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II Year – II Semester		L	T	P	C
		3	0	0	3
JAVA PROGRAMMING					

Course Objectives:

The learning objectives of this course are:

- To identify Java language components and how they work together in applications
- To learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
- To learn how to extend Java classes with inheritance and dynamic binding and how to use exception handling in Java applications
- To understand how to design applications with threads in Java
- To understand how to use Java APIs for program development

Course Outcomes:

By the end of the course, the student will be

- Able to realize the concept of Object Oriented Programming & Java Programming Constructs
- Able to describe the basic concepts of Java such as operators, classes, objects, inheritance, packages, Enumeration and various keywords
- Apply the concept of exception handling and Input/ Output operations
- Able to design the applications of Java & Java applet
- Able to Analyze & Design the concept of Event Handling and Abstract Window Toolkit

UNIT I

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.



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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, try-with-resources, Catching Subclass



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Exception, Custom Exceptions, Nested try and catch Blocks, Rethrowing Exception, Throws Clause.

UNIT V

String Handling in Java: Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings, Methods for Comparison of Strings, Methods for Modifying Strings, Methods for Searching Strings, Data Conversion and Miscellaneous Methods, Class String Buffer, Class String Builder.

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, Creating JDBC Application, JDBC Batch Processing, JDBC Transaction Management

Text Books:

- 1) JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.
- 2) The complete Reference Java, 8th edition, Herbert Schildt, TMH.

References Books:

- 1) Introduction to java programming, 7th edition by Y Daniel Liang, Pearson
- 2) Murach's Java Programming, Joel Murach

e-Resources:

- 1) <https://nptel.ac.in/courses/106/105/106105191/>
- 2) https://www.w3schools.com/java/java_data_types.asp



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II Year – II Semester		L	T	P	C
		3	0	0	3
MANAGERIAL ECONOMICS AND FINANCIAL ACCOUNTANCY					

Course Objectives:

- The Learning objectives of this paper are to understand the concept and nature of Managerial Economics and its relationship with other disciplines and also to understand the Concept of Demand and Demand forecasting
- To familiarize about the Production function, Input Output relationship, Cost-Output relationship and Cost-Volume-Profit Analysis
- To understand the nature of markets, Methods of Pricing in the different market structures and to know the different forms of Business organization and the concept of Business Cycles
- To learn different Accounting Systems, preparation of Financial Statement and uses of different tools for performance evaluation
- Finally, it is also to understand the concept of Capital, Capital Budgeting and the techniques used to evaluate Capital Budgeting proposals

Course Outcomes:

- The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product
- The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs
- The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units
- The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis
- The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making

UNIT I

Introduction to Managerial Economics and demand Analysis: Definition of Managerial Economics – Scope of Managerial Economics and its relationship with other subjects –Concept of Demand, Types of Demand, Determinants of Demand- Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement- Demand forecasting and Methods of forecasting, Concept of Supply and Law of Supply.

UNIT II

Theories of Production and Cost Analyses: Theories of Production function- Law of Variable proportions-Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs-Fixed costs, Variable Costs and Total costs –Cost –Volume-Profit analysis-Determination of Breakeven point(problems)-Managerial significance and limitations of Breakeven point.



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UNIT III

Introduction to Markets, Theories of the Firm & Pricing Policies: Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Price and Output Determination – Managerial Theories of firm: Marris and Williamson's models – other Methods of Pricing: Average cost pricing, Limit Pricing, Market Skimming Pricing, Internet Pricing: (Flat Rate Pricing, Usage sensitive pricing) and Priority Pricing, Business Cycles : Meaning and Features – Phases of a Business Cycle. Features and Evaluation of Sole Trader, Partnership, Joint Stock Company – State/Public Enterprises and their forms.

UNIT IV

Introduction to Accounting & Financing Analysis: Introduction to Double Entry System, Journal, Ledger, Trail Balance and Preparation of Final Accounts with adjustments – Preparation of Financial Statements-Analysis and Interpretation of Financial Statements-Ratio Analysis – Preparation of Funds flow and cash flow analysis (Problems)

UNIT V

Capital and Capital Budgeting: Capital Budgeting: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Time value of money- Methods of appraising Project profitability: Traditional Methods (pay back period, accounting rate of return) and modern methods(Discounted cash flow method, Net Present Value method, Internal Rate of Return Method and Profitability Index)

Text Books:

- 1) A R Aryasri, Managerial Economics and Financial Analysis, The McGraw – Hill companies.

Reference Books:

- 1) Varshney R.L, K.L Maheswari, Managerial Economics, S. Chand & Company Ltd.
- 2) JL Pappas and EF Brigham, Managerial Economics, Holt, R & W; New edition edition
- 3) N.P Srinivasn and M. SakthivelMurugan, Accounting for Management, S. Chand & Company Ltd.
- 4) Maheswari S.N, An Introduction to Accountancy, Vikas Publishing House Pvt Ltd
- 5) I.M Pandey, Financial Management , Vikas Publishing House Pvt Ltd
- 6) V. Maheswari, Managerial Economics, S. Chand & Company Ltd.



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II Year – II Semester		L	T	P	C
		0	0	2	1
DATABASE MANAGEMENT SYSTEMS LAB					

Course Objectives:

This Course will enable students to

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

Course Outcomes:

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

- Utilize SQL to execute queries for creating database and performing data manipulation operations
- Examine integrity constraints to build efficient databases
- Apply Queries using Advanced Concepts of SQL
- Build PL/SQL programs including stored procedures, functions, cursors and triggers

List of Exercises:

1. Creation, altering and dropping 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.
 - i. 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)
 - ii. Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.
6. Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.
7. Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE-APPLICATION ERROR.



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8. Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.
9. Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.
10. Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.
11. Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers
12. Create a table and perform the search operation on table using indexing and non-indexing techniques.

Text Books/Suggested Reading:

- 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



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II Year – II Semester		L	T	P	C
		0	1	2	2
R PROGRAMMING LAB					

COURSE OBJECTIVES:

- To learn statistical programming, computation, graphics, and modeling,
- To learn Writing functions and use R in an efficient way,
- To learn about basic types of statistical models

COURSE OUTCOMES:

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

- Access online resources for R and import new function packages into the R workspace
 - Import, review, manipulate and summarize data-sets in R
 - Explore data-sets to create testable hypotheses and identify appropriate statistical tests
 - Perform appropriate statistical tests using R
 - Create and edit visualizations with R
- 1) Write a R program to take input from the user (name and age) and display the values. Also print the version of R installation.
 - 2) Write a R program to get the details of the objects in memory.
 - 3) Write a R program to create a sequence of numbers from 20 to 50 and find the mean of numbers from 20 to 60 and sum of numbers from 51 to 91.
 - 4) Write a R program to create a simple bar plot of five subjects marks.
 - 5) Write a R program to get the unique elements of a given string and unique numbers of vector.
 - 6) Write a R program to create three vectors a,b,c with 3 integers. Combine the three vectors to become a 3×3 matrix where each column represents a vector. Print the content of the matrix.
 - 7) Write a R program to create a 5 x 4 matrix , 3 x 3 matrix with labels and fill the matrix by rows and 2 × 2 matrix with labels and fill the matrix by columns.
 - 8) Write a R program to combine three arrays so that the first row of the first array is followed by the first row of the second array and then first row of the third array.
 - 9) Write a R program to create a two-dimensional 5x3 array of sequence of even integers greater than 50.
 - 10) Write a R program to create an array using four given columns, three given rows, and two given tables and display the content of the array.
 - 11) Write a R program to create an empty data frame.
 - 12) Write a R program to create a data frame from four given vectors.
 - 13) Write a R program to create a data frame using two given vectors and display the duplicated elements and unique rows of the said data frame.
 - 14) Write a R program to save the information of a data frame in a file and display the information of the file.



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- 15) Write a R program to create a matrix from a list of given vectors.
- 16) Write a R program to concatenate two given matrices of same column but different rows.
- 17) Write a R program to find row and column index of maximum and minimum value in a given matrix.
- 18) Write a R program to append value to a given empty vector.
- 19) Write a R program to multiply two vectors of integers type and length 3.
- 20) Write a R program to find Sum, Mean and Product of a Vector, ignore element like NA or NaN.
- 21) Write a R program to list containing a vector, a matrix and a list and give names to the elements in the list.
- 22) Write a R program to create a list containing a vector, a matrix and a list and give names to the elements in the list. Access the first and second element of the list.
- 23) Write a R program to create a list containing a vector, a matrix and a list and remove the second element.
- 24) Write a R program to select second element of a given nested list.
- 25) Write a R program to merge two given lists into one list.
- 26) Write a R program to create a list named s containing sequence of 15 capital letters, starting from 'E'.
- 27) Write a R program to assign new names "a", "b" and "c" to the elements of a given list.
- 28) Write a R program to find the levels of factor of a given vector.
- 29) Write a R program to create an ordered factor from data consisting of the names of months.
- 30) Write a R program to concatenate two given factor in a single factor.



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II Year – II Semester		L	T	P	C
		0	0	3	1.5
JAVA PROGRAMMING LAB					

Course Objectives:

The aim of this lab is to

- Practice programming in the Java
- Gain knowledge of object-oriented paradigm in the Java programming language
- Learn use of Java in a variety of technologies and on different platforms

Course Outcomes:

By the end of the course student will be able to write java program for

- Evaluate default value of all primitive data type, Operations, Expressions, Control-flow, Strings
- Determine Class, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism
- Illustrating simple inheritance, multi-level inheritance, Exception handling mechanism
- Construct Threads, Event Handling, implement packages, developing applets

Exercise - 1 (Basics)

- 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 $ax^2+bx=0$. Calculate the discriminate D and basing on value of D, describe the nature of root.
- c) Five Bikers Compete in a race such that they drive at a constant speed which may or may not be the same as the other. To qualify the race, the speed of a racer must be more than the average speed of all 5 racers. Take as input the speed of each racer and print back the speed of qualifying racers.

Exercise - 2 (Operations, Expressions, Control-flow, Strings)

- 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 to sort for an element in a given list of elements using merge sort.
- d) Write a JAVA program using StringBuffer to delete, remove character.



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Exercise - 3 (Class, Objects)

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

Exercise - 4 (Methods)

- a) Write a JAVA program to implement constructor overloading.
- b) Write a JAVA program implement method overloading.

Exercise - 5 (Inheritance)

- 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 - 6 (Inheritance - Continued)

- 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?

Exercise - 7 (Exception)

- a) Write a JAVA program that describes exception handling mechanism
- b) Write a JAVA program Illustrating Multiple catch clauses

Exercise – 8 (Runtime Polymorphism)

- a) Write a JAVA program that implements Runtime polymorphism
- b) Write a Case study on run time polymorphism, inheritance that implements in above problem

Exercise – 9 (User defined Exception)

- a) Write a JAVA program for creation of Illustrating throw
- b) Write a JAVA program for creation of Illustrating finally
- c) Write a JAVA program for creation of Java Built-in Exceptions
- d) Write a JAVA program for creation of User Defined Exception

Exercise – 10 (Threads)

- 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)



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- b) Write a program illustrating **isAlive** and **join ()**
- c) Write a Program illustrating Daemon Threads.

Exercise - 11 (Threads continuity)

- a) Write a JAVA program Producer Consumer Problem
- b) Write a case study on thread Synchronization after solving the above producer consumer problem

Exercise – 12 (Packages)

- a) Write a JAVA program illustrate class path
- b) Write a case study on including in class path in your os environment of your package.
- c) Write a JAVA program that import and use the defined your package in the previous Problem

Exercise - 13 (Applet)

- a) Write a JAVA program to paint like paint brush in applet.
- b) Write a JAVA program to display analog clock using Applet.
- c) Write a JAVA program to create different shapes and fill colors using Applet.

Exercise - 14 (Event Handling)

- a) Write a JAVA program that display the x and y position of the cursor movement using Mouse.
- b) Write a JAVA program that identifies key-up key-down event user entering text in a Applet.



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II Year - II Semester	Skill Oriented Course- II	L	T	P	C
		0	0	4	2
APPLICATIONS OF PYTHON-Pandas					

Course Objectives:

The objective of this lab is to understand the fundamentals of the Pandas library in Python and how it is used to handle data and also develop basic skills in data analysis and visualization

Course Outcomes:

By the end of this lab the student is able to

- Use Pandas to create and manipulate data structures like Series and DataFrames.
- Work with arrays, queries, and dataframes
- Query DataFrame structures for cleaning and processing and manipulating files
- Understand best practices for creating basic charts

Perform the following:

- 1) Pandas Installation
- 2) Creating DataFrames

Exercises:

A) Pandas DataSeries:

- 1) Write a Pandas program to create and display a one-dimensional array-like object containing an array of data using Pandas module.
- 2) Write a Pandas program to convert a Panda module Series to Python list and it's type.
- 3) Write a Pandas program to add, subtract, multiple and divide two Pandas Series.
- 4) Write a Pandas program to convert a NumPy array to a Pandas series.

Sample Series:

NumPy array:

[10 20 30 40 50]

Converted Pandas series:

0 10

1 20

2 30

3 40

4 50

dtype: int64

B) Pandas DataFrames:



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Consider Sample Python dictionary data and list labels:

```
exam_data = {'name': ['Anastasia', 'Dima', 'Katherine', 'James', 'Emily', 'Michael',
                    'Matthew', 'Laura', 'Kevin', 'Jonas'],
            'score': [12.5, 9, 16.5, np.nan, 9, 20, 14.5, np.nan, 8, 19],
            'attempts': [1, 3, 2, 3, 2, 3, 1, 1, 2, 1],
            'qualify': ['yes', 'no', 'yes', 'no', 'no', 'yes', 'yes', 'no', 'no', 'yes']}
labels = ['a', 'b', 'c', 'd', 'e', 'f', 'g', 'h', 'i', 'j']
```

- 1) Write a Pandas program to create and display a DataFrame from a specified dictionary data which has the index labels.
- 2) Write a Pandas program to change the name 'James' to 'Suresh' in name column of the DataFrame.
- 3) Write a Pandas program to insert a new column in existing DataFrame.
- 4) Write a Pandas program to get list from DataFrame column headers.
- 5) Write a Pandas program to get list from DataFrame column headers.

C) Pandas Index:

- 1) Write a Pandas program to display the default index and set a column as an Index in a given dataframe.
- 2) Write a Pandas program to create an index labels by using 64-bit integers, using floating-point numbers in a given dataframe.

D) Pandas String and Regular Expressions:

- 1) Write a Pandas program to convert all the string values to upper, lower cases in a given pandas series. Also find the length of the string values.
- 2) Write a Pandas program to remove whitespaces, left sided whitespaces and right sided whitespaces of the string values of a given pandas series.
- 3) Write a Pandas program to count of occurrence of a specified substring in a DataFrame column.
- 4) Write a Pandas program to swap the cases of a specified character column in a given DataFrame.

E) Pandas Joining and merging DataFrame:

- 1) Write a Pandas program to join the two given dataframes along rows and assign all data.
- 2) Write a Pandas program to append a list of dictionaries or series to a existing DataFrame and display the combined data.
- 3) Write a Pandas program to join the two dataframes with matching records from both sides where available.

F) Pandas Time Series:

- 1) Write a Pandas program to create
 - a) Datetime object for Jan 15 2012.



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- b) Specific date and time of 9:20 pm.
 - c) Local date and time.
 - d) A date without time.
 - e) Current date.
 - f) Time from a datetime.
 - g) Current local time.
- 2) Write a Pandas program to create a date from a given year, month, day and another date from a given string formats.
 - 3) Write a Pandas program to create a time-series with two index labels and random values. Also print the type of the index.

G) Pandas Grouping Aggregate:

Consider dataset:

	school	class	name	date_Of_Birth	age	height	weight	address
S1	s001	V	Alberto Franco	15/05/2002	12	173	35	street1
S2	s002	V	Gino Mcneill	17/05/2002	12	192	32	street2
S3	s003	VI	Ryan Parkes	16/02/1999	13	186	33	street3
S4	s001	VI	Eesha Hinton	25/09/1998	13	167	30	street1
S5	s002	V	Gino Mcneill	11/05/2002	14	151	31	street2
S6	s004	VI	David Parkes	15/09/1997	12	159	32	street4

- 1) Write a Pandas program to split the following dataframe into groups based on school code. Also check the type of GroupBy object.
- 2) Write a Pandas program to split the following dataframe by school code and get mean, min, and max value of age for each school.

H) Pandas Styling:

- 1) Create a dataframe of ten rows, four columns with random values. Write a Pandas program to highlight the negative numbers red and positive numbers black.
- 2) Create a dataframe of ten rows, four columns with random values. Write a Pandas program to highlight the maximum value in each column.
- 3) Create a dataframe of ten rows, four columns with random values. Write a Pandas program to highlight dataframe's specific columns.



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I) Excel:

- 1) Write a Pandas program to import excel data into a Pandas dataframe.
- 2) Write a Pandas program to find the sum, mean, max, min value of a column of file.

J) Plotting:

- 1) Write a Pandas program to create a horizontal stacked bar plot of opening, closing stock prices of any stock dataset between two specific dates.
- 2) Write a Pandas program to create a histograms plot of opening, closing, high, low stock prices of stock dataset between two specific dates.
- 3) Write a Pandas program to create a stacked histograms plot of opening, closing, high, low stock prices of stock dataset between two specific dates with more bins.

K) Pandas SQL Query:

- 1) Write a Pandas program to display all the records of a student file.
- 2) Write a Pandas program to select distinct department id from employees file.



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II Year - II Semester	Skill Oriented Course- II	L	T	P	C
		0	0	4	2
Web Application Development Using Full Stack Frontend Development – Module -II					

Course Objectives:

The objective of this lab is to build strong foundation of JavaScript which will help developer to apply JavaScript concepts for responsive web frontend development

Course Outcomes:

By the end of this lab the student is able to

- develop of the major Web application tier- Client side development
- participate in the active development of cross-browser applications through JavaScript
- Develop JavaScript applications that transition between states

Perform experiments related to the following concepts:

- 1) Introduction to JavaScript
- 2) Applying JavaScript (internal and external)
- 3) Understanding JS Syntax
- 4) Introduction to Document and Window Object
- 5) Variables and Operators
- 6) Data Types and Num Type Conversion
- 7) Math and String Manipulation
- 8) Objects and Arrays
- 9) Date and Time
- 10) Conditional Statements
- 11) Switch Case
- 12) Looping in JS
- 13) Functions