Module 3:- Ordinary Differential Equations (ODE) :- **(5 lectures)**

Introduction to ODEs; Implicit and explicit Euler's methods, Second-Order Runge-Kutta Methods, MATLAB ode45 algorithm in single variable, Higher order Runge-Kutta methods, Error analysis of Runge-Kutta method, **Ordinary Differential Equations (ODE) – Practical aspects**-MATLAB ode45 algorithm in multiple variables, Stiff ODEs and MATLAB ode15s algorithm, Practical example for ODE-IVP, Solving transient PDE using Method of Lines.

List of Practical's-Any 12

1. Introduction to Matlab.
2. Programming in Matlab: Introduction, Branching statements, loops, functions, additional data types, plots, arrays, inputs/outputs etc.
3. Program to display a Matrix.
4. Program to Addition of matrix.
5. Program to transpose of a Matrix.
6. Introduction regarding usage of any Network Simulator.
7. Practical Implementation of Queuing Models using C/C++.
8. Applications of matlab.
9. To solve linear equation
10. Write a program to implement trapezoidal rule.
11. Write a program of Eigen values and Eigen vectors of a Square matrix.
12. Write a program to implement LU decomposition.
13. Write a program to implement Euler Method.
14. Write a program to implement Runge- Kutta method.
15. Write a program to implement least square method.
    a. Linear Regression.
    b. Polynomial Regression.
    c. Multiple Regressions.

.**Course Outcomes:**

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

1. Understand the main features of the MATLAB development environment.
2. Use the MATLAB GUI effectively.
3. Design simple algorithms to solve problems.
4. Write simple programs in MATLAB to solve scientific and mathematical problems.
5. Know where to find help

Text Books:

1. Bansal R.K, Goel A.K., Sharma M.K., “MATLAB and its Applications in Engineering”, Pearson Education, 2012.

Reference Books:

1. Amos Gilat, “MATLAB-An Introduction with Applications”, Wiley India, 2009.
2. Stephen.J.Chapman, “Programming in MATLAB for Engineers”, Cengage Learning, 2011.

Swami Ramanand Teerth Marathwada University, Nanded

B.E. Second Year U.G. Program in Computer Engineering

Effective From 2019-2020

SEMESTER III

Teaching Scheme:

Category	Code	Course Title	Hours per Week				Marking Scheme				
			L	T	P	CR	PR	OR	TW	MSE	ESE
Professional Core Courses	PCC-CS 305	Discrete Mathematics	4	1	0	4	0	0	0	30	70

Course Objectives:

Throughout the course, students will be expected to demonstrate their understanding of Discrete Mathematics by being able to do each of the following:

1. Use mathematically correct terminology and notation.
2. Construct correct direct and indirect proofs.
3. Use division into cases in a proof.
4. Use counterexamples.
5. Apply logical reasoning to solve a variety of problems.

Course contents:

Module 1: Sets, Relation and Function: **(6 Lectures)**

Operations and Laws of Sets, Cartesian Products, Binary Relation, Partial Ordering Relation, Equivalence Relation, Image of a Set, Sum and Product of Functions, Objective functions, Inverse and Composite Function, Size of a Set, Finite and infinite Sets, Countable and uncountable Sets, Cantor's diagonal argument and The Power Set theorem, Schroeder-Bernstein theorem.

Module 2: Principles of Mathematical Induction: **(6 Lectures)**

The Well-Ordering Principle, Recursive definition, The Division algorithm: Prime Numbers, The Greatest Common Divisor: Euclidean Algorithm, The Fundamental Theorem of Arithmetic.

Module 3: Basic counting techniques: **(7 Lectures)**

Inclusion and exclusion, pigeon-hole principle, permutation and combination.

Module 4: Propositional Logic: **(6 Lectures)**

Syntax, Semantics, Validity and Satisfiability, Basic Connectives and Truth Tables, Logical Equivalence: The Laws of Logic, Logical Implication, Rules of Inference, The use of Quantifiers. Proof Techniques:

Some Terminology, Proof Methods and Strategies, Forward Proof, Proof by Contradiction, Proof by Contraposition, Proof of Necessity and Sufficiency.

Module 5: Algebraic Structures and Morphism: (7 Lectures)

Algebraic Structures with one Binary Operation, Semi Groups, Monoids, Groups, Congruence Relation and Quotient Structures, Free and Cyclic Monoids and Groups, Permutation Groups, Substructures, Normal Subgroups, Algebraic Structures with two Binary Operation, Rings, Integral Domain and Fields. Boolean Algebra and Boolean Ring, Identities of Boolean Algebra, Duality, Representation of Boolean Function, Disjunctive and Conjunctive Normal Form , Coding Theory ,Codes and group codes

Module 6: Graphs and Trees: (8 Lectures)

Graphs and their properties, Degree, Connectivity, Path, Cycle, Sub Graph, Isomorphism, Eulerian and Hamiltonian Walks, Graph Colouring, Colouring maps and Planar Graphs, Colouring Vertices, Colouring Edges, List Colouring, Perfect Graph, definition properties and Example, rooted trees, trees and sorting, weighted trees and prefix codes, Bi-connected component and Articulation Points, Shortest distances.

Course Outcomes:

At the end of the course student will be able to

1. Understand the notion of mathematical thinking, mathematical proofs and to apply them in problem solving.
2. Ability to reason logically.
3. Ability to understand relations, Diagraph and lattice..
4. Ability to understand use of functions, graphs and their use in programming applications. 5. Understand use of groups and codes in Encoding-Decoding
5. Apply discrete structures into other computing problems such as formal specification, verification, artificial intelligence, cryptography, Data Analysis and Data Mining etc.

Text Books/Reference Books:

1. BernadKolman, Robert Busby, Sharon Cutler Ross, Nadeem-ur-Rehman, “Discrete Mathematical Structures”, Pearson Education.
2. C.L.Liu, Elements of Discrete Mathematics, second edition 1985, McGraw-Hill BookCompany. Reprinted 2000.
3. K.H.Rosen, Discrete Mathematics and applications, fifth edition 2003, TataMcGraw Hill publishing Company.
4. D.E. Rydeheard University of Manchester , R.M. Burstall, University of Edinburgh “Computational Category Theory”.
5. Y N Singh, “Discrete Mathematical Structures”, Wiley-India.
6. J .L.Mott, A.Kandel, T.P .Baker, Discrete Mathematics for Computer Scientists and Mathematicians, second edition 1986, Prentice Hall of India.

7. J. P. Trembley, R. Manohar “Discrete Mathematical Structures with Applications to Computer Science”, TataMcgraw-Hill.
8. Seymour Lipschutz , Marc Lars Lipson,“ Discrete Mathematics” Schaum‟sOutline, McGraw Hill Education.
9. .Dr. M. Mazhar-ul-haque, A Text book of Discrete Mathematics,2019

Swami Ramanand Teerth Marathwada University, Nanded

B.E. Second Year U.G. Program in Computer Engineering

Effective From 2019-2020

SEMESTER III

Teaching Scheme:

Category	Code	Course Title	Hours per Week				Marking Scheme				
			L	T	P	CR	PR	OR	TW	MSE	ESE
Humanities and Social Sciences including Management Courses	HSMC 306	Humanities-I (Effective Technical Communication)	2	0	2	3	--	25@	50	0	0

Course Objective (s):

1. To improve technical drafting skills, comprehension abilities and make students communicate effectively in global context.
2. To facilitate the knowledge of technical proposals, drafts, reports, business correspondence, agendas, minutes, etc. amongst the learners.
3. To inculcate effective speaking skills and enrich presentation skills by enhancing comprehension abilities of students.
4. To encourage innovative thinking, artistic drafting and elegant expressions both verbally and non-verbally amongst students.

Detailed Contents:

Module 1: Self Development and Assessment **(04 Hours)**

1. Self-Assessment and Awareness
2. Perception, Attitude, and Belief System
3. Self-esteem and Values
4. Personal Goal Setting
5. Career Planning and Assessment

Module 2: Technical Writing, and Business Correspondence **(06 Hours)**

A] Technical Writing

1. Technical Writing: Meaning & Scope

2. Technical Writing: purpose and objectives
3. Drafting for print and online media.
4. Basic Grammatical Errors

B] Office Correspondence

1. E-mailing Etiquettes,
2. Blog Writing
3. Business Correspondence: Notices, Memos & Circulars, etc.
4. Letter Writing: Formal and Personal
5. Report Writing: Factual, Progress, Feasibility, Survey, etc.

Module 3: Drafting, Revising and Editing Skills **(08 Hours)**

A] Drafting and Revising Skills:

1. Manuals, Brochures & Leaflets
2. Articles & Business Proposals
3. Newsletters and Magazines.
4. Indexing Techniques

B] Editing, and Proof Reading

1. Editing Techniques
2. Translation Techniques.
3. Note-Making Techniques.
4. The Art of Condensation.
5. Summarizing and Conclusion.

Module 4: Professional Work Culture & Ethics **(04 Hours)**

1. Business Ethics & Morals
2. Professional Work Culture
3. Managing Time and Punctuality
4. Conflict-management
5. Problem-Solving Techniques

Module 5: Public Speaking and Presentation Skills **(06 Hours)**

A] Public Speaking Skills

1. The Art of Public Speaking
2. Group Discussion Skills
3. Interview Techniques,
4. Telephone Etiquettes
5. Extempore, Elocution Techniques

B] Presentation Skills

1. Presentation Skills
2. Non-verbal Communication

3. Power Point Presentation
4. Using Audio-Visual Aids

List of Practical / Assignments:

1. Assessment of self-perception, attitude, belief system and values by using worksheets, modals and charts.
2. Setting personal, professional goals and plan career by experimental activities in the classroom / labs.
3. Drafting activities based on con-current events, happenings for print as well as online media.
4. Identification and elimination of basic grammatical errors in sentences, paragraphs and content.
5. Drafting activity based on business correspondence, letter writing and report writing.
6. Drafting blog and emails for distinguished situations, in professional work culture.
7. Drafting, Editing and Proof Reading activities based on appropriate content in English.
8. Condensation, summarizing activities based on appropriated content in English.
9. Giving Presentations, seminars on suitable topic using PPTs to improve presentation skills.
10. Arrange elocution, extempore in the classroom on current topics in the social scenario.
11. Arrange group discussion, expert interview sessions, and mocks in the classroom.
12. Brain storming and problem-solving activities should be arranged in the classroom.

Note: <u>This is the suggestive list of assignments / practical to be conducted in the classroom / language lab. However, the subject teacher is free to set, design new assignment / practicals in relevance with the subject content</u>.

(Any eight assignments to be conducted and submitted to the subject teacher to form the record of the subject).

Course Outcome (s): <u>Learner(s) will be able to…</u>

1. Accumulate, review, mediate accurate information and transmit technical ideas, policies with greater clarity & precision.
2. Draft, revise and edit technical drafts, letters, proposals, applications, with effective linguistic skills and abilities by eliminating grammatical errors in the same.
3. Absorb, inculcate and practice an industrial ethics, professional work culture and collaborate effectively in organizational communication system.
4. Lead, present and communicate business strategies persuasively and convincingly through result oriented endeavors both verbally and non-verbally within and outside organizations.

Text Books:

1. Meenakshi Raman and Sangeeta Sharma Technical Communication Principles and Practice, Third Edition. OXFORD University Press, New Delhi, 2015.
2. Dale Jung, k., Applied Writing for Technicians, McGraw Hill, New York, 2004. (ISBN: 07828357-4)
3. Sharma, R. and Mohan, K. Business Correspondence and Report Writing, TMH New Delhi 2002.
4. Dr. Alandkar, N. V. Effective Communication Skills, GRACE, Nanded, 2019.

Reference Books:

1. David F. Beer and David McMurrey, Guide to writing as an Engineer, John Willey. New York, 2004
2. Diane Hacker, Pocket Style Manual, Bedford Publication, New York, 2003. (ISBN 0312406843)
3. Shiv Khera, You Can Win, Macmillan Books, New York, 2003.

Swami Ramanand Teerth Marathwada University, Nanded

B.E. Second Year U.G. Program in Computer Engineering

Effective From 2019-2020

SEMESTER III

Teaching Scheme:

Category	Code	Course Title	Hours per Week				Marking Scheme				
			L	T	P	CR	PR	OR	TW	MSE	ESE
Humanities and Social Sciences including Management Courses	HSMC 307	Seminar-I	0	0	2	1	0	0	50	0	0

Course Objective:

1. The seminar learning objectives is to increase competency of the students.
2. Understand more vital issues of basic science.
3. To improve communication skills and stage courage of the students.
4. To understand the ethics of presentation and to get a scope of self-improvement..

Course Content:

This seminar is based on the recent advances in Basic Science. Student has to write a paper in a standard format on any recent topic pertaining to Basic science, mentioned below by referring different journals, books and other source of information's. Student has to prepare PPT of the same and present in front of a group of students and faculties who will be the observer of the presentation.

Seminar Topics:

1. **Polymers**

   Introduction, Classification of polymers, addition polymerization, condensation polymerisation, mechanism of addition polymerisation, diiference between thermoplastic and thermosetting resins, plastic,rubber, natural rubber, processing of latex, valcanization of rubber. Biodegradable polymers.

   Basic methods of degradation.

2. **Composites**

   Introduction, characteristics of composites, Specific strength, Application of composites, design principles and concepts, constituents of composite, Types of composites, fiber reinforced

composites, carbon fiber, reinforced polymer composites, layered composites, Aramid reinforced polymer composites.

3. **Explosives and propellants**

   Explosives, classification of explosive, primary explosives, 1000 explosives, High explosives, precautions during storage of explosives, blasting fuses. Manufacturer of Important Explosives, Rocket propellants, Classification of Propellants.

4. **Inorganic Engineering materials**

   Abrasives, Natural abrasives, Artificial Abrasives, Refractories, properties of Refractories, manufacture of refractories, Common Refractory Brics,cements, Insulating Refractories, Gypsum plaster, manufacturer of Portland cements, Chemical constituents of Portland cements, Glasses and Ceramics, manufacture of Glass. Types of Glasses.

5. **Semi-Conductor**

   Classification of metals, conductors and semiconductors. Different types of semiconductors, semiconductor diode, p-n junction, application of junction diode as a rectifier, photo diode, light emitting diode, solar cell.

6. **Radiation**

   Introduction, Electron emission, photoelectric effect, effect of intensity of light on photocurrent, Einstein's photo electric equation, Energy Quantum of Radiation.

7. **Fiber Optics**

   a. Principles of work, definition, fiber class, Launching of light into an optical fiber, Numerical aperture of optical fiber, application of optical fiber in industry and in medicine. Optical fiber as sensor.

8. **Laser**

   Principles of Laser, Einstein relation for spontaneous and stimulated emission. Microwave application by stimulated emission. Different types of Laser & their applications.

9. **Nuclear Energy:**

   Mass energy equivalence, Nuclear binding energy, nature of Nuclear forces, energy released in nuclear reactor, nuclear fusion.

10. **Plant physiology**: Transpiration, Mineral nutrition.

11. **Ecology:**

    Ecosystem components, types, flow of matter and energy in an ecosystem; Community ecology-characteristics, frequency, life forms and biological pyramids.

12. **Molecular Genetics:** Structure of DNA and RNA, CONCEPT OF Gene, Gene regulation, e.g., Operon concept.

13. **Biotechnology:** Basic concepts. Totipotency and Cell manipulations, Plant and Animal tissue culture, methods and uses in agriculture, medicine and health, Recombinant DNA Technology-Techniques and applications.

Course Outcomes:

1. Use multiple thinking strategies to examine real-world issues through self-learning.
2. Explore creative avenues of expression, solve problems, and make consequential decisions.
3. Developing stage courage and confidence
4. Apply innovative thinking for best presentation.

Swami Ramanand Teerth Marathwada University, Nanded

B.E. Second Year U.G. Program in Computer Engineering

Effective From 2019-2020

SEMESTER IV

Teaching Scheme:

Category	Code	Course Title	Hours per Week				Marking Scheme				
			L	T	P	CR	PR	OR	TW	MSE	ESE
Professional Core Courses	PCC-CS 401	Computer Organization	3	1	2	5	25#	0	25	30	70

Course Objectives:

1. To understand work of Computer Systems & the basic principles.
2. To study the Instruction Level Architecture and Instruction execution.
3. To study and understand the current state of art in memory system design.
4. To study and understand How I/O devices are accessed and its principles.
5. To provide the knowledge on Instruction Level Parallelism.
6. How impart the knowledge on micro programming.

Course Contnts:-

Module 1: Functional blocks of a computer: **(6 lectures)**

CPU, memory, input-output subsystems, and control unit. Instruction set architecture of a CPU – registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Case study – instruction sets of some common CPUs.

Module 2: Data representation: **(4 lectures)**

Signed number representation, fixed and floating point representations, character representation. Computer arithmetic – integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication – shift-and add, Booth multiplier, carry save multiplier, etc. Division restoring and non-restoring techniques, floating point arithmetic.

Module 3: Introduction to x86 architecture: **(5 lectures)**

CPU control unit design: hardwired and micro-programmed design approaches, Case study – design of a simple hypothetical CPU.

Module 4: Memory system design: **(5 lectures)**

memory system and design semiconductor memory technologies, memory organization.

Module 5: Peripheral devices and their characteristics: I **(4 lectures)**

Input-output subsystems, I/O device interface, I/O transfers – program controlled, interrupt driven and DMA, privileged and non-privileged instructions, software interrupts and exceptions. Programs and processes – role of interrupts in process state transitions, I/O device interfaces – SCII, USB.

Module 6: Pipelining: **(4 lectures)**

Basic concepts of pipelining, throughput and speedup, pipeline hazards.

Module 7: Parallel Processors: **(4 lectures)**

Introduction to parallel processors, Concurrent access to memory and cache coherency.

Module 8: Memory organization: **(5 lectures)**

Memory interleaving, concept of hierarchical memor organization, cache memory, cache size vs. block size.

Module 9: Replacement Algorithm **(3 lectures)**

Mapping functions, replacement algorithms, and write policies.

List of practical's:- (Any 12)

1. Study of Multiplexer and Demultiplexer.
2. Study of Half Adder and Subtractor.
3. Study of Full Adder and Subtractor.
4. WAP to add two 8 bit numbers and store the result at memory location 2000.
5. WAP to multiply two 8 bit numbers stored at memory location 2000 and 2001 and stores the result at memory location 2000 and 2001.
6. WAP to add two 16-bit numbers. Store the result at memory address starting from 2000.
7. WAP which tests if any bit is '0' in a data byte specified at an address 2000. If it is so, 00 would be stored at address 2001 and if not so then FF should be stored at the same address.
8. Assume that 3 bytes of data are stored at consecutive memory addresses of the data memory starting at 2000. Write a program which loads register C with (2000), i.e. with data contained at memory address 2000, D with (2001), E with (2002) and A with (2001).
9. Sixteen bytes of data are specified at consecutive data-memory locations starting at 2000. Write a program which increments the value of all sixteen bytes by 01.
10. WAP to add t 10 bytes stored at memory location starting from 3000. Store the result at memory location 300A.
11. Draw the functional block diagram of a single bus architecture of a computer and describe the function of the instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set.
12. Write assembly language program for specified microprocessor for computing 16 bit multiplication, division and I/O device interface (ADC, Control circuit, serial port communication).

13. Write a flowchart for Concurrent access to memory and cache coherency in Parallel Processors and describe the process.
14. Given a CPU organization and instruction, design a memory module and analyze its operation by interfacing with the CPU.
15. Given a CPU organization, assess its performance, and apply design techniques to enhance performance using pipelining, parallelism and RISC methodology.

Course Outcome:

How Computer Systems work & the basic principles.

1. Instruction Level Architecture and Instruction execution. (BT1)
2. The current state of art in memory system design. (BT2)
3. How I/O devices are accessed and its principles. (BT1 and BT2)
4. To provide the knowledge on Instruction Level Parallelism.(BT 2)
5. To impart the knowledge on micro programming.(BT4 and BT5)

Text Books:

1. "Computer Architecture and Organization", 3rd Edition by John P. Hayes, WCB/McGraw-Hill

2. "Computer Organization and Architecture: Designing for Performance", 10th Edition by William Stallings, Pearson Education.

Reference Books:

1. "Computer System Design and Architecture", 2nd Edition by Vincent P. Heuring and Harry F. Jordan, Pearson Education.

2. "Computer Organization and Design: The Hardware/Software Interface", 5th Edition by David A. Patterson and John L. Hennessy, Elsevier.

3. "Computer Organization and Embedded Systems", 6th Edition by Carl Hamacher, McGraw Hill Higher Education.