Jabalpur Engineering College, Jabalpur

(Declared Autonomous by MP Govt., Affiliated to RGPV, Bhopal)

(AICTE Model Curriculum Based Scheme)

Bachelor of Technology (B.Tech.) III Semester (Computer Science & Engineering)

w.e.f. July 2023

S.No.	Subject Code	Category Code	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours Per Week			Total Credits
				Theory			Practical						
				End. Sem.	Mid Sem. Exam.	Quiz/ Assignment	End Sem.	Lab Work		L	T	P	
1	MA33	BSC	Mathematics-III	70	20	10	-	-	100	3	1	-	4
2	CH32	HSMC	Energy & Environmental Engineering	70	20	10	-	-	100	3	1	-	4
3	CS33	PCC	Data Structures & Algorithms	70	20	10	30	20	150	3	-	2	4
4	CS34	PCC	Object Oriented Programming	70	20	10	30	20	150	3	-	2	4
5	CS35	PCC	Digital Electronics	70	20	10	30	20	150	3	-	2	4
6	CS36	ESC	Software Lab-I (Python)	-	-	-	30	20	50	-	-	4	2
Total				**350**	**100**	**50**	**120**	**80**	**700**	**15**	2	**10**	**22**
7	CS37	DLC	Self-Learning Presentation (SWAYAM/NPTEL/MOOC)	-	-	-	-	-	-	-	-	-	8
8	CS38	MC	NSS/NCC/Swatchhata Abhiyan/Rural Outreach	Qualifier									
Additional Course for Honours or Minor Specialization				Permitted to opt for maximum two additional MOOC courses in subject code CS37 for the award of Honours (Minor Specialization).									

Note: MOOC/NPTEL subjects shall be taken with permission of HOD/Coordinator

1 hour lecture (L) = 1 credit	1 hour Tutorial (T) = 1 credit	2 hour Practical (P) = 1 credit

BSC: Basic Science Course, HSMC: Humanities & Social Sciences including Management Course, PCC: Professional Core Course, ESC: Engineering Science Course, MC: Mandatory Course, DLC: Distance Learning Course

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(AICTE Model Curriculum Based Scheme and Syllabus)

Bachelor of Technology (B.Tech.) III Semester, Branch (CS/IT/AI&DS)

COURSE CONTENT **w.e.f. July 2023**

Subject Code	Subject Name	Maximum marks Allotted			Total marks	Hours/Week			Total Credit
MA33	MATHEMATICS-III	Theory			100	L	T	P	4
		End Sem	Mid-Sem Exam	Quiz/ Assignment		3	1	0	
		70	20	10					

Module 1: Numerical Methods-I (08 hours)

Solution of polynomial and transcendental equations – Bisection method, Newton –Raphson method and Regula – Falsi method. Finite differences, Relation between operators, interpolation using Newton's forward and backward difference formulae. Interpolation with unequal intervals: Newton's divided difference and Lagrange's formulae.

Module 2: Numerical Methods-II (10 hours)

Numerical differentiation, Numerical integration: Trapezoidal rule and Simpson's $1/3^{rd}$ and 3/8 rules. Solution of simultaneous Linear Algebraic equations by Gauss's Elimination, Gauss's Jordan, Crout's methods, Jacobi's Method, Gauss-Seidal, and Relaxation method. Solution of Ordinary differential equations: Taylor's series, Euler and modified Euler's method, Runge-Kutta method of fourth order Milne's and Adam's predicator – corrector methods.

Module 3: Basic Probability (08 hours)

Probability spaces, Counting techniques, Probability measure, Conditional probability and Baye's theorem, Random variable and distribution function, Moment, Expected value and Variance of Random variables, Chebychev Inequality, Moment generating function. Bivariate discrete and continuous random variables, Independence of random variables.

Module 4: Probability Distribution (08 hours)

Measures of Central tendency: Moments, Skewness and Kurtosis. Discrete Distributions (Binomial, Poisson's distribution), Continuous Distributions (Normal, Exponential Distribution.

Module 5: Applied Statistics (06 hours)

Curve fitting by the method of least squares- Fitting of straight lines, Second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, Difference of proportions, Single mean, Difference of means and difference of standard deviations.

Books References:

1. B. S. Grewal, Numerical Method in Engineering and Sciences, Khanna Publishers
2. B. V. Ramanna, Higher Engineering Mathematics, TMH Publishers.
3. Prasanna Sahoo, Probability and Mathematical Statistics, Louisville KY40292 USA.
4. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3^{rd} Edition, Wiley 1968. Statistics.
5. Introductory Statistics, Vol.1 of 2, ISBN: 978-1-304-89164-8, Open Stax College Rice University Houston, texax77005.
6. B.S.Grewal,Higher Engineering Mathematics,Khanna Publishers,35^{th}Edition, 2010.

Course Outcomes:

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

1. Understand mathematical tools for numerical solution of algebraic & transcendental equations.
2. Estimate the numerical values of function by interpolation techniques.
3. Determine derivative and integrals by various numerical methods.
4. Understand the concept of basic probability.
5. Apply probability distribution and statistics in various techniques dealing with engineering problems.

Dr. O.P. Chauhan
H.O.D.
Deptt. of App. Mathematics

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(AICTE Model Curriculum Based Scheme)
Bachelor of Technology (B.Tech.) III Semester
Branch- Common to (CE/EE/EC/CSE/IT/IP/AI&DS /MT)
COURSE CONTENTS

w.e.f. July 2023

Subject Code	Subject Name	Maximum Marks Allotted			Total Marks	Hours/Week			Total Credits
CH32	Energy & Environmental Engineering	Theory							
		End Sem	Mid-sem Exam	Quiz/ Assignment		L	T	P	4
		70	20	10	100	3	1	-	

Module 1:

A. **Introduction to Energy Science:**
World & Indian Energy Scenario, Overview to Energy Systems, Energy sustainability and Environment. Fossil Fuels. Alternatives for fossil fuels: biomass, wind, solar, nuclear, wave, tidal, hydrogen & geothermal energy.

B. **Batteries:**
Classification of Batteries, Important Applications, Lead-Acid battery, Ni-Cd battery & Li battery. Fuel Cell: Hydrogen-Oxygen Fuel cell.

Module2: Environmental Pollution A:

I. Air Pollution
Causes, Effects & Control Measures of Air Pollution: Primary and Secondary air pollutants and photo-chemical smog. Climate changes, Global warming, Ozone layer depletion. Pollution case studies: Bhopal gas Disaster and London smog Disaster.

II. Water Pollution
Definition, Causes, Effects and Control Measures (Primary & Secondary waste water treatment), Acid Rain and Marine pollution. Pollution case studies: Minamata Tragedy, Ganga Action Plan, Major oil spills of the 20^{th} & 21^{st} century. Water conservation, Rain water harvesting and Water Shed Management.

III. Noise Pollution
Causes, Effects & Control Measures.

Module3: Environmental Pollution B:

I. Sources, Adverse effects and Control measures of Soil Pollution, Thermal Pollution, Nuclear Pollution & Nuclear hazards. Major case studies.

II. Solid waste management: Municipal Solid Waste (MSW), Collection and disposal methods. Disaster Management.

III. Introduction to carbon footprint, ways to reduce carbon footprint, Carbon trading.

Module 4: Ecosystem & Biodiversity:

Concept of an ecosystem; Structure and function of an ecosystem; Producers, consumers and decomposers; Energy flow in the ecosystem; Ecological succession; Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of the following ecosystem (a.)Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Introduction ,Definition: genetic, species and ecosystem diversity; Bio-geographical classification of India; Value of biodiversity: Biodiversity at global & National levels; India as a mega-diversity nation; Hot-spots of biodiversity; Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; Endangered and Endemic species of India; Conservation of Biodiversity: In-situ and Ex-situ conservation of biodiversity. Environment Protection Act.

Module 5: Corrosion & its prevention:

Theories of Corrosion and Mechanism – Dry (Direct Chemical attack), Wet (Electro Chemical Theory) Atmospheric corrosion, Galvanic Series, Galvanic and Concentration Cell Corrosion, Corrosion by sea water. Factors Influencing and Control of Corrosion – Proper Design, Use of pure metal and metal alloys, passivity, cathodic protection – Sacrificial anode and Impressed Current. Modifying the environment, Use of inhibitors.

Protective coatings:

Hot dipping, Electroplating, Metal spraying metal cladding & cementation.

TEXT BOOKS

1. A text book of Engineering Chemistry by Jain & Jain, Dhanpat Rai Publishing Company, New Delhi
2. Chemistry of Engineering Materials by C.P. Murthy, C.V. Agarwal and A. Naidu BS Publication Hyd.
3. A text book of Environmental Chemistry and Pollution control by S.S. Dara & Dr. D. D. Mishra, S. Chand & Co, New Delhi
4. Energy,Environment Ecology and Society by Dr.Pushpendra,Vayu Education of India New Delhi
5. Energy, Environment Ethics and Society, by Dr.S.Deswal & Dr.A.Deswal Dhanpat Rai Publishing Company, New Delhi

REFERENCE BOOKS

1. J.C. Kuriakose and J. Rajaram, "Chemistry in Engineering and Technology", Vol.1 & 2, Tata Mcgraw Hill Publishing Company (P) Ltd., New Delhi
2. Mars G. Fontana, "Corrosion Engineering", Tata Mcgraw Hill Publishing Company (P) Ltd., New Delhi.
3. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
4. J.P.Gupta, A Text book of Energy, Environment Ethics & Society" Dhanpat Rai Publishing Company.

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

CO1	Apply the concept of sustainability of renewable energy to overcome the shortcoming of energy from non-renewable sources. Understanding of Energy devices.
CO2	Develop an understanding related to Water, Air and Noise pollution.
CO3	Understand the importance of Soil, Thermal and Nuclear pollution. Illustrate municipal practices in solid waste management. Define carbon footprints.
CO4	Understand the interrelationship of different species in variety of ecosystems. Conservation of Biodiversity & awareness of Environmental protection Act.
CO5	Recognize the origin as well as types of corrosion and apply appropriate protection mechanism to control corrosion.

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Subject code	Subject Name	Maximum Marks Allotted						Hours/Week			Total Credits
		Theory			Practical			L	T	P	
		End Sem	Mid Sem Exam	Quiz, Assignment	End Sem	Lab work	Total Marks				
CS33	**Data Structure & Algorithms**	70	20	10	30	20	150	3	0	2	4

Course Contents:

Module I: Introduction

Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off.
Searching: Linear Search and Binary Search Techniques and their complexity analysis.

Module II: Linked Lists

Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linkedlist; doubly linked list and Circular Linked Lists. Linked representation of Stack and Queue.

Module III: Stacks and Queues

Stack and its operations. Applications of Stacks: Expression Conversion and evaluation–corresponding algorithms. Queue and its operations. Types of Queue: Simple Queue, Circular Queue, Priority Queue.

Module IV: Trees

Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis. Applications of Binary Trees. B Tree, B+ Tree: definitions and operations.

Module V: Sorting and Hashing

Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort, Radix Sort; Performance and Comparison among all the methods. Hashing and Collision handling techniques. **Graph:** Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis.

Suggested books:

1. "Fundamentals of data structures in C " 2nd edition, by S Sahni, Universities Press.
2. "How to Solve it by Computer", 2nd Impression by R. G. Dromey, Pearson Edu.
3. "Data Structures using C and C++" 2nd edition, Tenenbaum, PHI publication.
4. "Introduction to algorithms" 3rd edition by Cormen, MIT press.

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Data Structures and Algorithms (CS33)
Course Outcomes:

CO1: Describe various data structures such as Arrays. linked lists. stacks. queues, trees and graphs and the operations performed on them.

CO2: Apply the concepts of various data structures such as linked lists, stacks, queues. trees and graphs to write algorithms and programs to implement them.

CO3: Analyze various searching and sorting algorithms such as Linear search, Binary search, Selection sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort and Heap sort to estimate their time and space complexity

CO4: Develop solutions of the given problem using appropriate data structures.

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		Theory			Practical			L	T	P	
		End Sem	Mid Sem Exam	Quiz, Assignment	End Sem	Lab Work	Total Marks				
CS34	**Object Oriented Programming**	70	20	10	30	20	150	3	0	2	4

Course Contents:

Module I:

Programming Paradigms. Introduction to Object Oriented Programming: Comparison with Procedural Programming, features of Object oriented paradigm– Merits and demerits. Object Oriented Programming Concepts, Implementation of OOP concepts in C++.

Module II:

Classes and Objects, identifying candidates for classes and objects. Member functions, inline function, friend function, Access specifiers, Concept of Objects: State, Behavior & Identity of an object; Static members of a Class, Constructors and their types, destructors.

Module III:

Class Relationships: has-a relationship (association, composition, aggregation), is-a relationship (Inheritance, specialization and generalization) Multiplicity of relationships: one to one, one to many etc. Inheritance in C++ : mode of inheritance, types of Inheritance: single, multiple, multilevel, hierarchical, hybrid. Ambiguity problem in multiple inheritance and its resolution. Inheritance of constructors and destructors.

Module IV:
Polymorphism in C++: Introduction, types of polymorphism, compile time vs run time polymorphism, Static and Dynamic binding; Function overloading, function overriding: virtual function, operator overloading of unary and binary operators. Operator overloading using member function and friend function. Abstract Class.

Module V: Case studies: Implementation of Stack, Queue and Linked Lists in C++.

Suggested Books :

1. Object Oriented Programming with C++ by E Balagurusamy, TMH.
2. Timothy Budd, "An Introduction to Object-Oriented Programming", AddisonWesley.
3. Object Oriented Programming with C++, A. K. Sharma Pearson.
4. James Martin, "Principles of Object Oriented Analysis and Design", Prentice Hall/PTR.

Object Oriented Programming (CS34)
Course Outcome: After completion of the course, Students will be able to:

CO1: Understand the basics of Object-Oriented Programming (OOP) and compare it with procedural programming.

CO2: Implement the concept of OOP such as classes, objects, and related concepts like constructors, destructors, and access specifiers.

CO3: Apply class relationships, inheritance, and polymorphism, addressing issues like ambiguity in multiple inheritance.

CO4: Apply OOP concepts to implement data structure such as Stack, Queue and linked lists.

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		Theory			Practical			L	T	P	
		End Sem	Mid Sem Exam	Quiz, Assignment	End Sem	Lab Work	Total Marks				
CS35	**Digital Electronics**	70	20	10	30	20	150	3	0	2	4

Course Contents:

Module I: Review of number systems and number base conversions. Binary codes, Boolean algebra, Boolean functions, Logic gates. Simplification of Boolean functions, Karnaugh map methods, SOP-POS simplification, NAND-NOR implementation.

Module II: Combinational Logic: Half adder, Half subtractor, Full adder, Full subtractor, look- ahead carry generator,BCD adder, Series and parallel addition, Multiplexer – demultiplexer, encoder- decoder, arithmetic circuits, ALU

Module III : Sequential logic: flip flops, D,T, S-R, J-K Master- Slave, racing condition, Edge & Level triggered circuits, Shift registers, Asynchronous and synchronous counters, their types and state diagrams. Semiconductor memories, Introduction to digital ICs 2716, 2732 etc. & their address decoding. Modern trends in semiconductor memories such as DRAM, FLASH RAM etc. Designing with ROM and PLA.

Module IV : Introduction to A/D & D/A convertors & their types, sample and hold circuits, Voltage to Frequency & Frequency to Voltage conversion. Multivibrators :Bistable, Monostable, Astable, Schmitt trigger, IC 555 & Its applications. TTL, PMOS, CMOS and NMOS logic. Interfacing between TTL to MOS.

Module V : Introduction to Digital Communication: Nyquist sampling theorem, time division multiplexing, PCM, quantization error, introduction to BPSK & BFSK modulation schemes. Shannon's theorem for channel capacity.

Suggested Books:

1. Morris Mano, Digital Circuits & Logic Design, PHI
2. Gothman, Digital Electronics, PHI
3. Tocci, Digital Electronics, PHI
4. R.P. Jain,"Modern Digital Electronics", McGraw Hill Education,2009.
5. Mavino& Leach, Digital Principles & Applications, PHI
6. Taub and schilling, Digital Integrated electronics.
7. Simon Haykin, Introduction to Analog & Digital Communication, Wiley.
8. Lathi B.P., Modern analog & digital communication , Oxford University

Digital Electronics (CS35)

Course Outcomes: After completion of the course, Students will be able to:

CO1. Understand the working of logic families and logic gates.
CO2. Design and implement combinational and sequential logic circuits.
CO3. Understand the process of Analog to Digital conversion and Digital to Analog conversion.
CO4. Be able to use number systems and number base conversions.

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Subject code	Subject Name	Maximum Marks Allotted						Hours/Week			Total Credits
		Theory			Practical			L	T	P	
		End Sem	Mid Sem Exam	Quiz, Assignment	End Sem	Lab Work	Total Marks				
CS36	**Software Lab-I** (Python)	-	-	-	30	20	50	-	-	4	2

1) **Introduction To Python** Installation and Working with Python Understanding Python variables Python basic Operators Understanding python blocks.
2) **Python Data Types** Declaring and using Numeric data types: int, float, complex Using string data type and string operations Defining list and list slicing Use of Tuple data type
3) **Python Program Flow Control** Conditional blocks using if, else and elif Simple for loops in python For loop using ranges, string, list and dictionaries Use of while loops in python Loop manipulation using pass, continue, break and else Programming using Python conditional and loops block.
4) **Python Functions, Modules And Packages** Organizing python codes using functions Organizing python projects into modules Importing own module as well as external modules Understanding Packages Powerful Lamda function in python Programming using functions, modules and external packages
5) **Python String, List And Dictionary Manipulations** Building blocks of python programs Understanding string in build methods List manipulation using in build methods Dictionary manipulation Programming using string, list and dictionary in build functions.
6) **Python File Operation** 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.

Suggested Books:

1. Python Crash Course: A Hands-On, Project-Based Introduction to Programming
2. Head-First Python: A Brain-Friendly Guide (2nd Edition)
3. Python Programming: An Introduction to Computer Science (3rd Edition)
4. Learn Python the Hard Way: 3rd Edition

Software Lab-I (Python) (CS36)

Course outcome: After completion of the course, Students will be able to:

CO 1. Understanding the installation and working process of Python.
CO 2. Write simple programs using built-in data types and basic operators of Python.
CO 3. Define and implement conditional, function(lambda,range) and loop for Python program.
CO 4. Use function and represent compound data using list, dictionaries, tuple, and set .

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