Semester III (Second year)

Subject wise Detail Syllabus

(Third semester onwards)

Undergraduate Degree in Engineering & Technology

Branch/Course:

COMPUTER SCIENCE & ENGINEERING

ARYABHATTA KNOWLEDGE UNIVERSITY
Chanakya National Law University Campus
Mithapur, Patna-800001 www.akubihar.ac.in

Semester III (Second year)

SI. No.	Type of course	Code	Course Title	Hours per week			Credits
				Lecture	Tutorial	Practical	
1	Engineering Science Course	ESC 301	Analog Electronic Circuits	3	0	4	5
2	Professional Core Courses	PCC CS 301	Data structure & Algorithm	3	0	4	5
3	Professional Core Courses	PCC CS 302	Object Oriented Programming using C++	3	0	4	5
4	Basic Science Courses	BSC 301	Mathematics-III (Differential Calculus)	2	0	0	2
5	Humanities &Social Sciences including Management courses	HSMC 301	Technical Writing	3	0	0	3
6	Summer Industry Internship	SI 301	Summer Industry Internship - 1	-	-	-	4
						Total credits	**24**

ESC 301	Analog Electronic Circuits	3L:0T:4P	5 Credits

Objectives of the course:

1. To learn the fundamentals of analoge electronic circuits.
2. To design, construct and debug the analog electronic circuits.
3. Principles of operation, terminal characteristics, and equivalent circuit models for diodes, transistors, and op-amps.
4. Differential amplifiers, frequency response of cascaded amplifiers and gainbandwidth considerations.
5. Linear and nonlinear applications of op-amp.

Module 1 **Lectures: 4 hrs.**

Diode circuits: P-N junction diode, I-V characteristics of a diode; review of half-wave and full- wave rectifiers, Zener diodes, clamping and clipping circuits.

Module 2 **Lectures: 8 hrs.**

BJT circuits: Structure and I-V characteristics of a BJT; BJT as a switch. BJT as an amplifier: small-signal model, biasing circuits, current mirror; common-emitter, common-base and common- collector amplifiers; Small signal equivalent circuits, high-frequency equivalent circuits.

Module 3 **Lectures: 8 hrs.**

MOSFET circuits: MOSFET structure and I-V characteristics. MOSFET as a switch. MOSFET as an amplifier: small-signal model and biasing circuits, commonsource, common-gate and common-drain amplifiers; small signal equivalent circuits - gain, input and output impedances, trans- conductance, high frequency equivalent circuit.

Module 4 **Lectures: 8 hrs.**

Differential, multi-stage and operational amplifiers: Differential amplifier; power amplifier; direct coupled multi-stage amplifier; internal structure of an operational

amplifier, ideal op-amp, non-idealities in an op-amp (Output offset voltage, input bias current, input offset current, slew rate, gain bandwidth product)

Module 5 **Lectures: 8 hrs.**

Linear applications of op-amp: Idealized analysis of op-amp circuits. Inverting and non-inverting amplifier, differential amplifier, instrumentation amplifier, integrator, active filter, P, PI and PID controllers and lead/lag compensator using an op-amp, voltage regulator, oscillators (Wein bridge and phase shift). Analog to Digital Conversion.

Module 6 **Lectures: 6 hrs.**

Nonlinear applications of op-amp: Hysteretic Comparator, Zero Crossing Detector, Square-wave and triangular-wave generators. Precision rectifier, peak detector, Monoshot.

Suggested Books:

1. A S Sedra and K. C. Smith, "Microelectronic Circuits", New York, Oxford University Press, 1998.
2. J. V. Wait, L. P. Huelsman and G. A. Korn, "Introduction to Operational Amplifier theory and applications", McGraw Hill U. S., 1992.
3. J. Millman and A. Grabel, "Microelectronics", McGraw Hill Education, 1988.
4. P. Horowitz and W. Hill, "The Art of Electronics", Cambridge University Press, 1989.
5. P.R. Gray, R.G. Meyer and S. Lewis, "Analysis and Design of Analog Integrated Circuits", John Wiley & Sons, 2001.

Course Outcomes

After the completion of course, students can able to able to:

1. Understand the characteristics of transistors.
2. Design and analyze various rectifier and amplifier circuits.
3. Design sinusoidal and non-sinusoidal oscillators.
4. Understand the functioning of OP-AMP and design OP-AMP based circuit.

ESC 301P	**Analog Electronic Circuits Lab**

Hands-on experiments related to the course contents of ESC 301.

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PCC CS 301	Data Structure & Algorithms	3L:0T: 4P	5 credits
Pre-requisite	Programming for Problem Solving		

Objectives of the course:

1. To impart the basic concepts of data structures and algorithms.
2. To understand concepts about searching and sorting techniques
3. To understand basic concepts about stacks, queues, lists, trees and graphs.
4. To enable them to write algorithms for solving problems with the help of fundamental data structures

Detailed contents:

Module 1 **Lecture 4 hrs.**

Introduction: Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off.

Module 2 **Lecture 10 hrs.**

Stacks and Queues: ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation corresponding algorithms and complexity analysis. ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each Type of Queues: Algorithms and their analysis.

Module 3 **Lecture 6 hrs.**

Linked Lists: Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis.

Module 4 **Lecture 12 hrs.**

Searching, Sorting and Hashing: Linear Search and Binary Search Techniques and their complexity analysis. Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods, Hashing.

Module 5 **Lecture 8 hrs.**

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, algorithms and analysis.

Graph: Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis.

Suggested reference books:

1. Algorithms, Data Structures, and Problem Solving with C++", Illustrated Edition by Mark Allen Weiss, Addison-Wesley Publishing Company.
2. "How to Solve it by Computer", 2nd Impression by R.G. Dromey, Pearson Education.
3. "Fundamentals of Data Structures", Illustrated Edition by Ellis Horowitz, Sartaj Sahni, Computer Science Press.

Course outcomes

1. For a given algorithm student will able to analyze the algorithms to determine the time and computation complexity and justify the correctness.
2. For a given Search problem (Linear Search and Binary Search) student will able to implement it.
3. For a given problem of Stacks, Queues and linked list student will able to implement it and analyze the same to determine the time and computation complexity.
4. Student will able to write an algorithm Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort and compare their performance in term of Space and Time complexity.
5. Student will able to implement Graph search and traversal algorithms and determine the time and computation complexity.

PCC CS 301P	**Data Structure & Algorithms Lab**

Hands-on experiments related to the course contents of PCC CS 301.

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PCC CS 302	**Object Oriented Programming using C++**	**3L:0T: 4P**	**5 credits**
Pre-requisite	**Programming for Problem Solving**		

Objectives of the course:

1. To impart the basic concepts of Object Oriented Programming. 2. To understand concepts about Classes and Data Abstraction
3. To understand basic concepts about Inheritance.
4. To enable them to write algorithms for solving problems using object oriented approach.

Detailed contents:

Module 1 **Lecture: 3 hrs.**

Introduction to C++ : Object Oriented Technology, Advantages of OOP, Input-output in C++, Tokens, Keywords, Identifiers, Data Types C++, Derives data types. The void data type, Type Modifiers, Typecasting, Constant, Operator, Precedence of Operators, Strings.

Module 2 **Lecture: 6 hrs.**

Control Structures and Functions: Decision making statements like if-else, Nested if-else, goto, break, continue, switch case, Loop statement like for loop, nested for loop, while loop, do-while loop. Parts of Function, User- defined Functions, Value-Returning Functions, void Functions, Value Parameters, Function overloading, Virtual Functions.

Module 3 **Lecture: 12 hrs.**

Classes and Data Abstraction : Structure in C++, Class, Build- in Operations on Classes, Assignment Operator and Classes, Class Scope, Reference parameters and Class Objects (Variables), Member functions, Accessor and Mutator Functions, Constructors, default Constructor, Destructors.

Module 4 **Lecture: 8 hrs.**

Overloading, Templates and Inheritance: Operator Overloading, Function Overloading, Function Templates, Class Templates. Single and Multiple Inheritance, virtual Base class, Abstract Class, Pointer and Inheritance, Overloading Member Function.

Module 5 **Lecture: 11 hrs.**

Pointers, Arrays and Exception Handling: Void Pointers, Pointer to Class, Pointer to Object, Void Pointer, Arrays. The keywords try, throw and catch. Creating own Exception Classes, Exception Handling Techniques (Terminate the Program, Fix the Error and Continue, Log the Error and Continue), Stack Unwinding..

Suggested books:

1. Thinking in C++, Volume 1 & 2 by Bruce Eckel, Chuck Allison, Pearson Education
2. Mastering C++, 1/e by Venugopal, Tata McGraw Hill.
3. Object Oriented Programming with C++, 3/e by E. Balaguruswamy, Tata McGraw Hill.
4. Starting Out with Object Oriented Programming in C++, by Tony Gaddis, Wiley India.

Suggested Reference Books:

1. The C++ Programming language 3/e by Bjarne Stroustrup, Pearson Education.
2. C++, How to Programme, 4e, by Deitel, Pearson Education.
3. Big C++ by Cay Horstmann, Wiley India.
4. C++ Primer, 3e by Stanley B. Lippmann, JoseeLajoie, Pearson Education.
5. C++ and Object Oriented Programming Paradigm, 2e by Debasish Jana, PHI.
6. Programming with C++, 2/e by Ravichandran, Tata McGraw Hill.
7. C++ Programming Black Book by Steven Holzner, Dreamtech Press.

Course outcomes

After the completion of course, students can able to able to:

1. Understand the concepts of Class, Object, Inheritance and Polymorphism.
2. Apply overload operators in C++
3. Understand the difference between function overloading and function overriding 4. Incorporate exception handling in object-oriented programs
5. Able to use template classes.
6. Able to write object-oriented programs of moderate complexity in C++

PCC CS 302P	**Object Oriented Programming using C++ Lab**

Hands-on experiments related to the course contents of PCC CS 302.

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BSC 301	**Mathematics-III (Differential Calculus)**	**2L:0T: 0P**	**2 credits**

Detailed contents:

Module 1 **Lecture: 6 h**

Successive Differentiation, Leibnitz's Theorem. Limit, Continuity and Differentiability of function for one variable

Module 2 **Lecture: 8 hrs.**

Limit, Continuity and Differentiability of function for several variables. Partial Derivatives, Euler's Theorem for Homogeneous functions, Total derivatives, Change of Variables. Maxima and Minima of Several Variables. Methods of Lagrange Multipliers. Taylor's and Maclaurin's Theorem with remainders of several variables.

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Module 3 **Lecture: 8 hrs.**

Vector Calculus: Gradient, Divergence and Curl of a Vector and their Physical Interpretations, Vector Identities. Directional Derivatives. Line, Surface and Volume integrals, Application of Green's, Stokes and Gauss Divergence Theorem (Without Proof).

Module 4 **Lecture: 6 hrs.**

First Order Ordinary Differential Equations: Exact, Linear and Bernoulli's Equations, Euler's Equations, Equations not of First Degree: Equations Solvable for P, Equations Solvable for Y,
Equations Solvable for X and Clairaut's Type.

Module 5 **Lecture: 8 hrs.**

Ordinary Differential Equations of Higher Orders: Second Order Linear Differential Equations with Variable Coefficients, Method of Variation of Parameters, Cauchy-Euler Equation; Power Series Solutions; Legendre Polynomials, Bessel Functions of the First Kind and their properties.

Module 6 **Lecture: 6 hrs.**

Partial Differential Equations – First Order: First Order Partial Differential Equations, Solutions of First Order Linear and Non-Linear PDEs.

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HSMC 301	Technical Writing	3L:0T: 0P	3 credits
Pre-requisites	HSMC 201		

Objectives of the course:

1. To understand the variety of structure of technical documents
2. To convey clearly, cogently and correctly, through written media, the technical aspects of a practice to audiences.
3. To recognize and use of the verbal and technical elements necessary for the successful practice of scientific and technical communication
4. To work collaboratively and individually to research, to analyze, and to write about, public debates regarding the conduct of science and technology

Detail contents:

Module 1 **Lecture 10 hrs.**

Introduction: Fundamentals of Technical Writing: Need for Clear and Concise Technical Writing, Attributes of Technical Writing, Types of Technical Writing, Benefits of Technical Writing, Technical, Managerial and General Readers, Expressing versus Impressing, Correct use of Noun, Pronoun, Verb, Adjective, Adverbs, Tense and Punctuation.

Module 2 **Lecture 10 hrs.**

Performing Technical Studies: Types of Technical Studies, General Methodology- Proposing a Project, Gathering Background Information, Designing Test Plans, Performing Experiments, Reporting Results. **Writing Strategy:** Analysis of Readers, Scope of Writing, Purpose and Objective. **Document Options:** Document Hierarchy, Report Types and Selection. **Criteria for Good Technical Writing:** Technical Content, Presentation, Language Skills. **Writing Style:** Elements of Style, Examples of Writing Styles, Recommended Style, Learn to Prepare Effective Illustrations

Module 3 **Lecture 10 hrs.**

Formal Reports: The Outline and Introduction (Outline, Title, Front Matter, Writing the Introduction), Writing the Body (Writing a Procedure, Describing Machines/Processes, Writing Test Results, Writing the Discussion Section), Closure (Conclusions, Recommendations, References, Abstract, Back Matter,

Report Distribution, Saving Reports). **Informal Reports:** Elements of an Informal Report, Investigation Reports, Service Work, Action Letters and Proposals. Typical Memo Reports.

Module 4 **Lecture 10 hrs.**

Review and Editing: Types of Review and Edit, Review and Editing Methodology, Examples of Reviews. **Oral Presentations:** Types of Oral Presentations, Preparation, Visual Aids, Impediments to Technical Writing, Maintaining Writing Skills, Measuring Report Results.

Suggested books:

1. "Engineers' Guide to Technical Writing", Kenneth G. Budinski, ASM International.
2. "Handbook for Technical Writing", James H. Shelton, NTC Contemporary Press
3. "The Technical Writer's Handbook: Writing With Style and Clarity", Matt Young, University Science Books

Suggested reference books:

1. "A Guide to Technical Writing", T. A. Rickard, Franklin Classics.
2. "Technical Writing", S. Jayprakash, Himalaya Publishing House Pvt. Ltd.
3. "Technical Writing", O. N. Pandey.

Course outcomes

1. Student should able to demonstrate improved competence in Standard Written English, including grammar, sentence and paragraph structure, coherence, and document design (including the use of the visual), and use this knowledge to revise texts.

2. Student should identify and practice the stages required to produce competent, professional writing through planning, drafting, revising, and editing.
3. It determine and implement the appropriate methods for each technical writing task.
4. Students learn to practice the ethical use of sources and the conventions of citation appropriate to each genre.

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