

Jharkhand University of Technology
Jharkhand, Ranchi

Proposed Syllabus for B.Tech 3rd Semester

Computer Science & Engineering
&
Information Technology

Computer Science & Engineering3rd semester course structure

Sl. No.	Course Code	Subject	L	T	P	Credit
01	CS301	Data Structures And Algorithms	3	1	0	3
02	IT301	Object Oriented Programming	3	1	0	3
03	EC301	Basic Electronics	3	1	0	3
04	EC302	Digital Electronics And Logic Design	3	1	0	3
05	BSC301	Mathematics-III	3	1	0	4
06	BSC302	Environmental Science	2	0	0	0
01	CS301P	Data Structures And Algorithms Lab	0	0	3	1
02	IT301P	Object Oriented Programming Lab	0	0	3	1
03	EC302P	Digital Electronics & Logic Design Lab	0	0	3	1
04	EX301	Extra Activities (NSO/NSS/NCC/Yoga / Creative Arts/Mini Project)	0	0	2	1
05	HS301	Communication Skill Lab	0	0	2	1
Total credit						21

Information Technology3rd semester course structure

Sl. No.	Course Code	Subject	L	T	P	Credit
01	IT301	Object Oriented Programming	3	1	0	3
02	CS301	Data Structures And Algorithms	3	1	0	3
03	EC301	Basic Electronics	3	1	0	3
04	EC302	Digital Electronics And Logic Design	3	1	0	3
05	BSC301	Mathematics-III	3	1	0	4
06	BSC302	Environmental Science	2	0	0	0
01	IT301P	Object Oriented Programming Lab	0	0	3	1
02	CS301P	Data Structures And Algorithms Lab	0	0	3	1
03	EC302P	Digital Electronics & Logic Design Lab	0	0	3	1
04	EX301	Extra Activities (NSO/NSS/NCC/Yoga / Creative Arts/Mini Project)	0	0	2	1
05	HS301	Communication Skill Lab	0	0	2	1
Total credit						21

MATHEMATICS III
(COMMON FOR ALL BRANCH)

Course code –BSC- 301

L T P CR.

3 1 0 4

Module I

Laplace Transformation: Laplace Transformation and its applications, Inverse Laplace Transformation, Convolution Theorem, Solution of ODE by Laplace Transformation.

Module II

Fourier Transform: Complex form of Fourier series, Fourier Transformation and inverse Fourier Transformation, sine, cosine Transformation, Inverse Transformations - simple illustration.

Module III

Z-Transform: Inverse Z-Transform- Properties – Initial and final value theorems-convolution theorem- Difference equations, Solution of Difference equations using Z-Transformation.

Module IV

Partial Differential Equations: Solution of Wave equation, Heat equation, Laplace's equation by the method of separation of variables and its applications. Solution of PDE by Laplace Transformation.

Module V

Numerical Method: Finite difference, Symbolic relations, Interpolation and Extrapolation, Newton – Gregory forward and backward formula, Gauss forward and backward formula, Lagrange's formula, Inverse Interpolation by Lagrange's formula, Numerical Differentiation and Numerical Integration : Trapezoidal rule, Simpson's 1/3rd rule, Simpson's 3/8th rule, Weddle quadrature formula.

Text Books

- Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons.
- Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 2010.
- B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition.

Reference Books

- R. J. Beerends, H. G. Ter Morsche, J. C. Van Den Berg, E. M. Van De Vrie, Fourier and Laplace Transforms, Cambridge University Press.
- Sastry S.S, Introductory Methods of Numerical Analysis, PHI.

BASIC ELECTRONICS

(ECE, EEE, EE, CSE, IT)

Course code -EC 301

L T P CR.

3 1 0 3

Module I**Basic Electronic Components**

Active and Passive Components, Types of resistors and Colour coding, Capacitors, Inductors applications of Resistor, Capacitor and Inductor, Relay, LDR, Basic Integrated Circuits (IC 7805, 7809, 7812, 555 etc.). Measuring Instruments like CRO, Power supply, Multi-meters etc.

Module II**Semiconductors**

Difference between Insulators, Semiconductors and Conductors, Mobility and Conductivity, Intrinsic and Extrinsic Semiconductors, Fermi Level, Energy band, Charge Densities in Semiconductors, Mass Action Law, Current Components in Semiconductors, Drift and Diffusion Current, The Continuity Equation, Injected Minority Charge Carrier, Hall Effect, P-N Junction Diode, construction, working, characteristics and diode equation Application of Diode, Rectifier: Half Wave, Full Wave and Bridge Rectifier, Zener Diode and its Applications, Varactor Diode, Schottky Diode, Regulated Power Supply using Zener Diode and Regulated ICs, LED, Photodetector.

Module III:**Transistors**

Construction, Working, Modes and Configuration of BJT, Input and Output Characteristics of all Configurations, Comparison of all Configuration & Modes, BJT as a Switch and as an Amplifier. JFET Construction, working and characteristics. MOSFET Construction, working and Characteristics, Types of MOSFET.

Module IV: Power electronic devices & Communication engineering

Construction, characteristics and working of SCR, DIAC, TRIAC and UJT. Introduction, Characteristics and applications of Operational Amplifier (Ic741). Modulation and its types.

Module V: Digital Logic and basic circuit Design

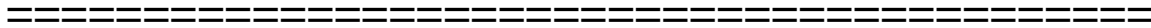
Number systems and conversion (DECIMAL, OCTAL, HEXADECIMAL, BINARY, BCD etc.), binary addition and subtraction, Logic Gates and their truth-table, Boolean algebra. Design of Single Stage Amplifier, LED Driver Circuit, Infrared Transmitter Receiver Circuit, LDR Driver Circuit, Relay Driver Circuit, Square Wave and Fix Frequency Generator using 555 IC.

Text Books

1. Basic Electronics and Linear Circuits by N. N. Bhargava, D. C. Kulshreshtha and S. C. Gupta, TMH Publications.
2. Op-Amps and Linear Integrated Circuits by Ramakant A. Gayakwad, PHI Publications.
3. Electronic Devices and Circuits by Godse and Bakshi Technical, Vol-1 Technical Publication Pune.

Reference Books

1. Integrated Devices & Circuits by Millman & Halkias, TMH Publications.
2. Electronics Devices and Circuit Theory by R. Boylestad & L. Nashelsky, Pearson Publication
3. Electronic Communication System by G. Kennedy, TMH Publications.
4. Basic Electronics by Sanjeev Kumar & Vandana Sachdeva, Paragaon International Publication

**DATA STRUCTURES AND ALGORITHMS**

(CSE, IT)

Course code -CS 301

(3-CREDIT) (L-T-P/3-0-0)

Module I

Basic concepts and notations: Data structures and data structure operations, Complexity Analysis: Mathematical notation and functions, algorithmic complexity and time space trade off, Big O Notation, The best, average & worst cases analysis of various algorithms. Arrays: Linear & Multidimensional Arrays, Representation & traversal. Sorting algorithms: Bubble sort, Selection sort, Insertion sort, Merge sort and Quick sort, Counting Sort. Linear search and Binary search on sorted arrays.

Module II

Abstract Data Types (ADTs) Stack: Push; Pop, stack representation using array and linked list, Applications of Stack, Recursion. Queue: Representation using array and linked list, Insertion and deletion operations, circular queue, Dequeue, priority queue. Linked Lists & their types (Single, Double, Circular linked lists), Operations on Varieties of Linked Lists (Search and Update) with applications

Module III

Introduction to Trees, Binary tree - definitions and properties; binary tree traversal algorithms with and without recursion., Binary Search Tree - creation, insertion and deletion operations, Threaded tree (One way and Two way). AVL tree balancing; B-tree

Module IV

Graph Algorithms: Graphs and their Representations, Graph Traversal Techniques: Breadth First Search (BFS) and Depth First Search (DFS), Applications of BFS and DFS, Minimum Spanning Trees (MST), Prim's and Kruskal's algorithms for MST, Connected Components, Dijkstra's Algorithm for Single Source Shortest Paths,, Floyd's Algorithm for All-Pairs Shortest Paths Problem

Module V

Hashing techniques, Hash function, Address calculation techniques- common hashing functions Collision resolution, Linear probing, quadratic probing, double hashing, Bucket addressing. Rehashing

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

- Understand the concept of ADT
- Identify data structures suitable to solve problems
- Develop and analyze algorithms for stacks, queues
- Develop algorithms for binary trees and graphs
- Implement sorting and searching algorithms
- Implement symbol table using hashing techniques

Text Books:

1. Data Structures Using C – A.M. Tenenbaum (PHI)
2. Introduction to Data Structures with Applications by J. Tremblay and P. G. Sorenson (TMH)
3. Data Structures, Algorithms and Application in C, 2nd Edition, Sartaj Sahni
4. Data Structures and Algorithms in C, M.T. Goodrich, R. Tamassia and D. Mount, Wiley India.

REFERENCE BOOKS:

1. Data Structure and Program Design in C by C.L. Tondo.
 2. Data Structures with C++, J. Hubbard, Schaum's Outlines, TMH.
 3. Data Structures and Algorithms in C, M.T. Goodrich, R. Tamassia and D. Mount, Wiley India.
 4. Data Structures and Algorithm Analysis in C, 3rd Edition, M.A. Weiss, Pearson.
 5. Classic Data Structures, D. Samanta, 2nd Edition, PHI.
 6. Data Structure Using C by Pankaj Kumar Pandey.
 7. Data Structure with C, Tata McGraw Hill Education Private Limited by Seymour Lipschutz.
 8. Data Structure through C in Depth, BPB Publication, by S.K. Srivastava.
 9. Data Structure and algorithm Analysis in C 2nd Edition, PEARSON Publishing House, Mark Allen Weiss
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OBJECT ORIENTED PROGRAMMING

(CSE, IT)

Course code -IT 301

(3-CREDIT) (L-T-P/3-0-0)

Course Outcome:

1. To be able to apply an object-oriented approach to programming and identify potential benefits of object-oriented programming over the approaches.
2. To be able to reuse the code and write the classes which work like built in types.
3. To be able to design applications which are easier to debug, maintain and extend.
4. To be able to apply object-oriented concepts in real world applications.
5. To be able to develop applications using multi-threading.
6. To be able to handle exceptions in any applications.

Module-I 12 Hrs

Introduction to Java and Java Programming Environment, Object Oriented Programming, Fundamental Programming Structure: Data Types, Variable, Typecasting Arrays, Operators and their Precedence. Control Flow: Java's Selection Statements (if, Switch, Iteration, Statement, While, Do While, for, Nested Loop). Concept of Objects and Classes, Using Existing Classes Building your own Classes, Constructor Overloading, Static, Final this Keyword, Inheritance: Using Super to Call Super Class Constructor, Method Overriding, Dynamic Method Dispatch, Using Abstract Classes, Using Final with Inheritance. The Object Class Packages & Interfaces: Packages, Access Protection, Importing Package, Interface, Implementing Interfaces, Variables in Interfaces, Interfaces can be Extended. Exception Handling: Fundamentals, Types Checked, Unchecked Exceptions, Using Try & Catch, Multiple Catch, Throw, Throws, Finally Java's Built in Exceptions, User Defined Exception.

Module-II 12 Hrs

Multi-Threading: Java Thread Model, Thread Priorities, Synchronization, creating a Thread, Creating Multiple Threads, Using is Alive () and Join () Wait () & Notify (). String Handling: String Constructors, String Length, Character Extraction, String Comparison, Modifying a String. Java I/O: Classes & Interfaces, Stream Classes, Byte Streams, Character Streams, Serialization, JDBC: Fundamentals, Type I, Type II, Type III, Type IV Drivers. Networking: Basics, Socket Overview, Networking Classes, & Interfaces, TCP/IP Client Sockets, Whois, URL Format, URL Connection, TCP/IP Server Sockets.

Module-III 12 Hrs

Applets: Basics, Architecture, Skeleton, The HTML APPLET Tag, Passing Parameters to Applets, Applet Context and Show Documents (). Event Handling: Delegation Event Model, Event Classes, Event Listener Interfaces, Adapter Classes. AWT: AWT Classes Window Fundamentals, Component, Container, Panel Window, Frame, Canvas, Creating a Frame Window in an Applet, Working with Graphics, Control Fundamentals, Layout Managers, Handling Events by Extending AWT Components. Core Java API package, reflection, remote method invocation (RMI) swing applet, icons & labels, text fields, Buttons, combo boxes, tabbed panes, scroll panes, trees, tables exploring Java-language: Simple type wrappers, runtime memory management, object fusing clone () and the cloneable interface, thread, thread group, runnable.

TEXT BOOK:

1. Introduction to Java Programming: Liang, Pearson Education, 7th Edition.
2. Java the Complete Reference: Herbert Schildt, TMH, 5th Edition.

REFERENCE BOOKS:

1. Balguruswamy, Programming with Java, TMH.
2. Programming with Java: Bhave&Patekar, Person Education.
3. Big Java: Horstman, Willey India, 2nd Edition.
4. Java Programming Advanced Topics: Wigglesworth, Cengage Learning.

DIGITAL ELECTRONICS AND LOGIC DESIGN

(ECE, CSE, IT)

Course code -EC 302

L T P CR.

3 1 0 3

Module I: Binary Codes and Boolean algebra

Analog and Digital, Binary Number System. Addition, Subtraction, Multiplication, Division of binary numbers, Subtraction using 2's complement method. Binary codes: weighted and non weighted codes, self complementary codes, BCD, Excess-3, Gray codes, Alphanumeric codes, ASCII Codes. *Boolean algebra*: Boolean Laws and Expression using Logic Gates, Realization of different gates using Universal gates, DeMorgan's Theorem, Duality Theorems.

Module II: Boolean function minimization Techniques

Standard forms: SOP, POS, Simplification of Switching function & representation (Maxterm & Minterm), Boolean expression & representation using logic gates, Propagation delay in logic gate. *Karnaugh map*: K-map(up to 5 variables), mapping and minimization of SOP and POS expression, Don't care condition, conversion from SOP to POS and POS to SOP form using K-map, Minimization of multiple output circuits, Quine Mc-cluskey method minimization technique, prime implicant table, Don't care condition.

Module III: Combinational Circuits Design

Adder & Subtractor (Half and Full), Parallel Binary adder, BCD Adder, Binary multipliers, Code Converters, parity bit generator, Comparators, Decoder, BCD to 7-segment Decoder, Encoders, Priority Encoders, Multiplexers, De Multiplexers.

Module IV: Sequential Circuits Elements

Introduction to sequential circuit, Flip-flop & Timing Circuits: SR latch, Gated latch, Tri state logic, Edge triggered flip-flop: - D, JK, T Flip-flop, flip-flop asynchronous inputs, characteristic table of Flip-flop, excitation table of Flip-flop, master slave JK flip flop, inter conversion of Flip-flop. Study of timing parameters of flip-flop. Shift registers: buffer register, controlled buffer register. Data transmission in shift resistor SISO, SIPO, PISO, PIPO, Bidirectional shift register, universal shift registers. *Counter*: Classification, Ripple or asynchronous counter, Effect of propagation delay in ripple counters, up-down counter, Design of Mod-n counter, synchronous counter, Ring counter, Johnson counter. Introduction to FSM. Design of synchronous FSM, Algorithmic State Machines charts. Designing synchronous circuits like Pulse train generator.

Module V: Logic Families and VLSI Design flow

Logic Families and Semiconductor Memories: TTL NAND gate, Specifications, Noise margin, Propagation delay, fan-in, fan-out, TTL, ECL, CMOS families and their interfacing, Memory elements, Concept of Programmable logic devices like FPGA, Logic implementation using Programmable Devices VLSI Design flow: Design entry, Schematic, FSM & HDL, different modeling styles in VHDL, Data types and objects, Dataflow, Behavioral and Structural Modeling, Synthesis and Simulation VHDL constructs and codes for combinational and sequential circuits

Text Books :

1. Kharate "Digital Electronics" OXFORD Publication
2. A. Anand Kumar 'Fundamentals of Digital Circuits'. PHI Publications

2nd year UG courses Engg & Tech, Jharkhand university of Technology.

3. R.P. Jain-'Modern Digital Electronics' IIIrd Edition- Tata Mc Graw Hill, Publication
4. Douglas Perry, "VHDL", Tata McGraw Hill, 4th edition, 2002.
5. Charles Roth, "Digital System Design using VHDL", Tata McGraw Hill 2nd edition
6. Bhaskar VHDL BASED DESIGN ,PEARSON EDUCATION

Reference Books:

1. Rajkamal 'Digital Systems Principals and Design' Pearson Education
2. A.P. Malvino, D.P. Leach 'Digital Principles & Applicatioos' -VIth Edition-TMH publication.
3. M. Morris Mano 'Digital Design' (Third Edition). PHI Publications

ENVIRONMENTAL SCIENCE

Course code – BSC 302

L T P CR.

2 0 0 0

(COMMON FOR ALL BRANCH)

Module-1

Concept and scope of Environment science, components of environment, environmental segment and their importance. (2 Hrs)

Module-II

Ecology: Ecosystem and its characteristics features, structure and function of forest ecosystem, grassland ecosystem, desert ecosystem and aquatic ecosystem, ecological balance and consequences of imbalance. (4 Hrs)

Module-III

Atmosphere: Atmospheric composition, energy balance, climate, weather, depletion of ozone layer, green house effect, acid rain, particles, ions and radicals in the atmosphere, chemical and photochemical reactions in the atmosphere. (4 Hrs)

Module-IV

Air pollution and control: Air pollutants, sources and effect of air pollutants, primary and secondary pollutants, photochemical smog, fly ash, inorganic and organic particulate matter. Air quality standards, sampling, monitoring and control measures for pollutants. (4 Hrs)

Module-V

Water pollution and control: Aquatic environment, water pollution, sources and their effect, lake and ground water pollution, eutrophication, water quality standard and water pollution control measures, waste water treatment. (4 Hrs)

Module-VI

Land pollution; Lithosphere, composition of soil, acid base and ion exchange reactions in soil, soil erosion, landslides, desertification, pollutants (municipal, industrial, commercial, agricultural , (4 Hrs)

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hazardous solid wastes), origin and effects, collection and disposal of solid wastes, recovery and
conversion methods. (5 Hrs)

Module-VII

Noise pollution; Noise classification and its sources, effects and measurement, noise pollution
hazards, standards and noise pollution control. (2 Hrs)

Books and References:

1. Master, G.M Introduction to environment engineering and science, Pearson Education.
 2. Nebel, B.J., Environment science, Prentice Hall Inc.
 3. Odum, E.P. Ecology: The link between the natural and social sciences. IBH Publishing Company Delhi
 4. De, A.K. Environmental Chemistry, Merrut.
 5. Sharma B.K Environmental Chemistry, Krishna Prakashan Media Merrut.
 6. Kaushik, A and Kaushik, C.P. Perspectives in Environmental studies, New Age International Publication.
 7. Menon, S.E. Environmental Chemistry.
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DATA STRUCTURE LAB

(CSE, IT)

Course code -CS 301P

Course Objective: The objective is to develop linear and non-linear data structure, express different operation on AVL tree, evaluate infix to postfix expression, and apply searching and sorting algorithms in real life applications.

1. C Programs on :
 - Bubble sort
 - Selection sort
 - Insertion sort,
 - Quick sort
 - Heap sort, Merge Sort
2. C Programs on :
 - Sequential Search
 - Binary Search
3. Write a C Program to create a stack using an array and perform
 - Push operation , Pop operation
4. Write a C Program that uses Stack Operations to perform the following:-
 - Converting an infix expression into postfix expression
 - Evaluating the postfix expression

5. Write a C Program to create a queue and perform
 - Push, Pop, Traversal
6. Write a C Program that uses functions to perform the following operations on a single linked list : i)Creation, ii) Insertion, iii) Deletion, iv) Traversal
7. Write a C Program that uses functions to perform the following operations on a double linked list: i)Creation, ii) Insertion, iii) Deletion
8. Write a C Program that uses functions to perform the following operations on a Binary Tree :i) Creation, ii) Insertion, iii) Deletion
9. Write a C Program for Single Source Shortest Paths using Dijkstra's Algorithm
10. Write a C Program for All-Pairs Shortest Paths using Floyd's Algorithm

NOTE : At least ten experiments are to be performed, minimum seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus.

OBJECT ORIENTED PROGRAMMING LAB

(CSE, IT)

Course code -IT 301P

Course Outcome:

1. Able to do program in object-oriented concept.
2. Able to create user defined exception.
3. Able to create GUI.
4. Able to understand JDBC and ODBC concept.

To do various Java Programs on:

1. Introduction, compiling & executing a Java program.
2. Data types & variables, decision control structures: if, nested if etc.
3. Loop control structures: do while, for etc.
4. Classes and objects.
5. Data abstraction & data biding, inheritance, polymorphism.
6. Using concept of package.
7. Threads, exception handlings and applet programs.
8. Interfaces and inner classes, wrapper classes, generics.
9. Programs on JDBC.
10. Creating GUI.

NOTE : At least ten experiments are to be performed, minimum seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus

DIGITAL ELECTRONICS AND LOGIC DESIGN LAB

(ECE, EEE,EE,CSE, IT)

Course code EC 302P

List of Experiments (Minimum 10)

1. Study of TTL gates – AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR.
2. Design & realize a given function using K-maps and verify its performance.
3. To verify the operation of multiplexer & Demultiplexer.
4. To verify the operation of comparator.
5. To verify the truth tables of S-R, J-K, T & D type flip flops.
6. To verify the operation of bi-directional shift register.
7. To design & verify the operation of 3-bit synchronous counter.
8. Design all gates using VHDL.
9. Design a multiplexer using VHDL
10. Design a decoder using VHDL
11. Write VHDL programs for the following circuits, check the wave forms and the hardware generated a. half adder b. full adder
12. Write VHDL programs for the following circuits, check the wave forms and the hardware generated a. multiplexer b. demultiplexer

NOTE : At least ten experiments are to be performed, minimum seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus. For VHDL Xilinx software may be used.

COMMUNICATION SKILL LAB

Course code HS301

This lab paper involves interactive practice sessions in Language Lab along with some class lectures to enable the students to be confident enough in language and professional sphere of life.

Module I: Listening Comprehension

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To comprehend spoken material in standard Indian English/ British English & American English

- Current situation in India regarding English
- American English Vs. British English

Module II: Phonetics & Phonology

- Introduction to Phonetics & Phonology
- Organs of Speech/ Speech Mechanism
- Pronunciation, Intonation, Stress and Rhythm, Syllable division
- Consonants/Vowels/Diphthongs Classification

Module III: Common Everyday Situations: Conversations and Dialogues

Module IV: Communication at Workplace

Module V: Telephonic Conversation

- Introduction
- Listening/Speaking
- Telephonic Skills Required
- Problems of Telephonic Conversation
- Intensive Listening

Module VI: Interviews

- The Interview Process
- Purpose/Planning/Two-way Interaction/Informality
- Pre-interview Preparation Techniques
- Projecting a Positive Image
- Answering strategies

Module VII: Formal Presentations

- Introduction
- Nature/Importance of Presentation
- Planning
- Objective with central idea, main ideas, role of supporting materials
- Handling Stage Fright

Module VIII: Forms of Technical Communication: Technical Report: Definition & importance; Thesis/Project writing: structure & importance; synopsis writing: Methods; Technical research Paper writing: Methods & style; Seminar & Conference paper writing; Expert Technical Lecture: Theme clarity; Analysis & Findings; C.V./Resume writing; Technical Proposal: Types, Structure & Draft.

Module IX: Technical Presentation: Strategies & Techniques Presentation: Forms; interpersonal Communication; Class room presentation; style; method; Individual conferencing: essentials: Public Speaking: method; Techniques: Clarity of substance; emotion; Humour; Modes of Presentation; Overcoming Stage Fear; Audience Analysis & retention of audience interest; Methods of Presentation: Interpersonal; Impersonal; Audience Participation: Quizzes & Interjections.

Module X: Technical Communication Skills: Interview skills; Group Discussion: Objective & Method; Seminar/Conferences Presentation skills: Focus; Content; Style; Argumentation skills: Devices: Analysis; Cohesion & Emphasis; Critical thinking; Nuances: Exposition narration & Description; effective business communication competence: Grammatical; Discourse competence: combination of expression & conclusion; Socio-linguistic competence: Strategic competence: Solution of communication problems with verbal and non verbal means.

Jharkhand University of Technology
Jharkhand, Ranchi

Proposed Syllabus for B.Tech 4th Semester

Computer Science & Engineering
&
Information Technology

Computer Science & Engineering4th semester course structure

Sl. No.	Course code	Subject	L	T	P	Credit
01	CS401	Operating System	3	1	0	3
02	CS402	Design And Analysis Of Algorithms	3	1	0	3
03	CS403	Formal Language And Automata Theory	3	1	0	3
04	BSC401	Discrete Mathematics	3	1	0	3
05	IT401	Database Management Systems	3	1	0	3
06	EN401/ IT402	Engineering Economics / Cyber Security	2	0	0	0
01	CS401P	Operating System Lab	0	0	3	1
02	CS402P	Design And Analysis Of Algorithms Lab	0	0	3	1
03	CS403P	Formal Language And Automata Theory Lab	0	0	3	1
04	EX401	Extra Activities (NSO/NSS/NCC/Yoga / Creative Arts/Mini Project)	0	0	2	1
05	IN401	Internship/ Tour & Training/Industrial Training	0	0	0	2
Total credit						21

Information Technology4th semester course structure

Sl. No.	Course code	Subject	L	T	P	Credit
01	IT401	Database Management Systems	3	1	0	3
02	CS401	Operating System	3	1	0	3
03	CS402	Design And Analysis Of Algorithms	3	1	0	3
04	CS403	Formal Language And Automata Theory	3	1	0	3
05	BSC401	Discrete Mathematics	3	1	0	3
06	EN401/ IT402	Engineering Economics / Cyber Security	2	0	0	0
01	CS401P	Operating System Lab	0	0	3	1
02	CS402P	Design And Analysis Of Algorithms Lab	0	0	3	1
03	CS403P	Formal Language And Automata Theory Lab	0	0	3	1
04	EX401	Extra Activities (NSO/NSS/NCC/Yoga/ Creative Arts/Mini Project)	0	0	2	1
05	IN401	Internship/ Tour & Training/Industrial Training	0	0	0	2
Total credit						21

OPERATING SYSTEM

Course Code- CS401

(3-CREDIT) (L-T-P/3-1-0)

Module - I

OPERATING SYSTEMS OVERVIEW: Introduction, Evolution of operating system, operating system operations, operating system structure, System Calls, Types of System Calls

Modul – II

PROCESS MANAGEMENT: Process concepts, process state, process control block, scheduling queues, process scheduling, Interposes Communication, Threads and implementation of threads.

CPU SCHEDULING: Objective and Criteria, CPU scheduling algorithms: FCFS, SJF, Priority Scheduling, Round robin, multilevel queue scheduling and multilevel feedback queue scheduling.

Modul- III

CONCURRENCY AND SYNCHRONIZATION: Process synchronization, critical section problem, and its solutions. Semaphores, classical problems of synchronization: readers and writers problem, dining philosophers problem, sleeping barber problem.

Modul- IV

DEADLOCKS: Introduction, deadlock characterization, Resource allocation graph, Methods for Handling Deadlocks: deadlock prevention, avoidance and deadlock detection, recovery from deadlock.

Modul V

MEMORY MANAGEMENT: Introduction, memory allocation techniques, paging, implementation of paging, segmentation and its implementation, segmentation with paging, virtual memory, demand paging, page-replacement algorithms, thrashing and its solution.

Modul VI

FILE SYSTEM: Concept of a file, access methods, directory structure, file system mounting, file sharing, protection. File system implementation: file system structure, directory implementation, allocation methods, free-space management, efficiency and performance.

Mass-Storage Structure: Overview of mass storage structure, disk structure, disk scheduling algorithms,

TEXT BOOKS:

1. **ABRAHAM SILBERSCHATZ, PETER BAER GALVIN, GREG GAGNE (2012)**, Operating System Principles, 9th edition, Wiley India Private Limited, New Delhi.

REFERENCE BOOKS:

1. **William Stallings**, Operating Systems, Internals and Design Principles, 7th edition, Pearson Education, India. 2.
2. **Andrew S. Tanenbaum (2007)**, Modern Operating Systems, 2nd edition, Prentice Hall of India, India. 3. **Deitel & Deitel (2008)**, Operating systems, 3rd edition, Pearson Education, India.

COURSE OVERVIEW:

Operating systems course is intended as a general introduction to the techniques used to implement operating systems and related kinds of systems software. The topics covered will be functions and structure of operating systems, process management (creation, synchronization, and communication); processor scheduling; deadlock prevention, avoidance, and recovery; main-memory management; virtual memory management (swapping, paging, segmentation and page-replacement algorithms); control of disks and other input/output devices; file-system structure and implementation; and protection and security

COURSE OBJECTIVES:

- To explain main components of OS and their working.
- To familiarize the operations performed by OS as a resource Manager.
- To impart various scheduling policies of OS.
- To teach the different memory management techniques.

COURSE OUTCOMES: At the end of the course students will be able to the following

- Outline various concepts and features of Operating systems.
- Compare various operating systems with respect to characteristics and features.
- Implement algorithm of CPU Scheduling, Memory Management and disk scheduling.
- Make changes in the OS configurations as per need.

DESIGN AND ANALYSIS OF ALGORITHM

Course Code- CS402

(3-CREDIT) (L-T-P/3-1-0)

Course Outcome:

1. Ability to analyze the performance of algorithms.
2. Ability to choose appropriate algorithm design techniques for solving problems.
3. Ability to understand how the choice of data structures and the algorithm design methods impact the performance of programs.

MODULE-I

INTRODUCTION & ANALYSIS:

Analyzing Algorithms, Recurrence Equations, Growth Function: Asymptotic Notation, Standard Notation & Common Functions, Recurrence Relation, Different Methods of Solution of Recurrence Equations with Examples.

MODULE-II

DIVIDE AND CONQUER & BACKTRACKING PARADIGM:

Introduction to Divide and Conquer Paradigm, Quick and Merge Sorting Techniques, Linear Time Selection Algorithm, The Basic Divide and Conquer Algorithm for Matrix Multiplication, Backtracking & Recursive Backtracking, Applications of Backtracking Paradigm, Heaps.

MODULE-III

GREEDY PARADIGM & DYNAMIC PROGRAMMING:

Greedy Paradigm: The Basic Greedy Strategy & Computing Minimum Spanning Trees, Algorithms of Kruskal and Prim, Union to Find Algorithm & Their Applications, Disjoint Set, The Relationship in Dijkstra's and Prim's Algorithms, Use of Greedy Strategy in Algorithms for the Knapsack Problem and Huffman Trees. The Basic Dynamic Programming Paradigm, Dynamic Programming

MODULE-IV**GRAPHS ALGORITHMS & STARING MATCHING ALGORITHMS:**

Representational Issues in Graphs, Depth First Search & Breath First Search on Graphs, Computation of Bi-connected Components and Strongly Connected Components Using DFS, Topological Sorting & Applications, Shortest Path Algorithms on Graphs: Bellman-Ford Algorithm, Dijkstra's Algorithm & Analysis of Dijkstra's Algorithm Using Heaps, Floyd-Warshall's all Pairs Shortest Path Algorithm and its Refinement for Computing the Transitive Closure of a Graph. The General String Problem as a Finite Automata, Kunth Morris and Pratt Algorithms.

MODULE-V**NP-COMPLETE PROBLEMS:**

Solvable Problems, Types of Problems, The Notion of a Non-Deterministic Algorithm and its Basic Relationship to Backtracking, Polynomial Time Non-Deterministic Algorithms for Problems Like Satisfiability, Clique Problem, Hamiltonian Path Problems etc. The Definition of NP-Hardness and NP-Completeness, The Statement of Cook's Theorem and a Discussion of its Implication, The Notion of Polynomial Transformation, Vertex Cover, Subset Sum and Hamiltonian Cycle Problems are NP-Complete, Other Models for Computations.

Text Books:

1. Introduction to Algorithms (Second Edition); Cormen, Leserson, Rivert; PHI.
2. Fundamentals of Algorithms, Sahni& Horowitz; Galgotia.

Reference Books:

1. The Design & Analysis of Computer Algorithms, Hopcroft-Aho-Ullman, AWL.
2. Handbook of Algorithms & Data Structures, G.H. Gonnet, AWL.
3. Introduction to Design & Analysis of Algorithms, Levitin, PE-LPE.

FORMAL LANGUAGES AND AUTOMATA THEORY**Course Code- CS403****(3-CREDIT) (L-T-P/3-1-0)****Module I: Fundamentals & Finite Automata:**

Alphabet, Strings, Language, Operations, Mathematical proving techniques, Finite state machine, definitions, finite automaton model, acceptance of strings, and languages, Deterministic Finite Automaton (DFA) and Non deterministic Finite Automaton (NFA), transition diagrams and Language recognizers. Equivalence of DFA and NFA, NFA to DFA conversion, NFA with ϵ - transitions - Significance, acceptance of languages. Equivalence between NFA with and without ϵ -

2nd year UG courses Engg & Tech, Jharkhand university of Technology.
transitions, minimization of FSM, Finite Automata with output- Moore and Mealy machines and conversion of Mealy to Moore and vice-versa.

Module II: Regular Expression and Languages:

Regular sets, regular expressions, identity rules, Constructing finite Automata for a given regular expressions, Conversion of Finite Automata to Regular expressions. Regular grammars-right linear and left linear grammars, conversion of right linear grammar to left linear and vice-versa, equivalence between regular grammar, regular expression and FA, Pumping lemma of regular sets, closure properties of regular sets.

Module III: Context Free Grammars and Push Down Automata:

Context free grammar, derivation trees, sentential forms. Right most and leftmost derivation of strings. Ambiguity in context free grammars. Reduction of Context Free Grammars. Chomsky normal form(CNF), Greiback normal form(GNF), Pumping Lemma for Context Free Languages. Simplification of CFL.

Push down automata(PDA) definition, model, acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence. Equivalence of CFG and PDA, interconversion. Introduction to DCFL and DPDA. DPDA Vs NPDA.

Module IV: Turing Machine:

Turing Machine definition, representation of Turing Machines model, Variants of TM, design of TM, linear bounded automata,

Module V: Computational Complexity & Decidability, Recursively Enumerable Languages:

Complexity : Growth rate of a function, class P and NP, polynomial time reduction and NP-Completeness, NP-Complete problems(SAT, CSAT,Hamiltonian circuit, travelling salesman, vertex cover). **Decidability**: decidability, decidable language, undecidable language, halting problem of Turing Machine.**Computability**: primitive recursive function and recursive function.

TEXT BOOKS:

1. Theory of Computer Science (Automata Language and Computation) K.L.P. Mishra and N. Chandrasekran, PHI.
2. Introduction to Automata Theory, Language and Computation, John E, Hopcroft and Jeffery D. Ullman, Narosa Publishing House.

REFERENCE BOOKS:

1. Theory of Automata and Formal Language, R.B. Patel & P. Nath, Umesh Publication.
 2. An Introduction and Finite Automata Theory, Adesh K. Pandey, TMH.
 3. Theory of Computation AM Natrajan, Tamilarasi, Bilasubramani, New Age International Publishers, Chhattisgarh Swami Vivekan.
 4. An introduction to Formal Languages and Automata by Peter Linz, Narosa Publ
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DATABASE MANAGEMENT SYSTEMS

Course Code- IT401

Module I

Introduction: Overview, Database System vs File System, Database System Concept and Architecture, Data Model Schema and Instances, Data Independence and Database Language and Interfaces, Data Definitions Language, DML, Overall Database Structure. Data Modeling Using the Entity Relationship Model: ER Model Concepts, Notation for ER Diagram, Mapping Constraints, Keys, Concepts of Super Key, Candidate Key, Primary Key, Generalization, Aggregation, Reduction of an ER Diagrams to Tables, Extended ER Model, Relationship of Higher Degree.

Module II

Relational data Model and Language: Relational Data Model Concepts, Integrity Constraints, Entity Integrity, Referential Integrity, Keys Constraints, Domain Constraints, Relational Algebra, Relational Calculus, Tuple and Domain Calculus. Introduction on SQL: Characteristics of SQL, Advantage of SQL. SQL Data Type and Literals. Types of SQL Commands. SQL Operators and Their Procedure. Tables, Views and Indexes. Queries and Sub Queries. Aggregate Functions. Insert, Update and Delete Operations, Joins, Unions, Intersection, Minus, Cursors, Triggers, Procedures in SQL/PL SQL

Module III

Data Base Design & Normalization: Functional dependencies, normal forms, first, second, 8 third normal forms, BCNF, inclusion dependence, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design

Module IV

Transaction Processing Concept: Transaction System, Testing of Serializability, Serializability of Schedules, Conflict & View Serializable Schedule, Recoverability, Recovery from Transaction Failures, Log Based Recovery, Checkpoints, Deadlock Handling. Distributed Database: Distributed Data Storage, Concurrency Control, Directory System.

Module V

Concurrency Control Techniques: Concurrency Control, Locking Techniques for Concurrency Control, Time Stamping Protocols for Concurrency Control, Validation Based Protocol, Multiple Granularity, Multi Version Schemes, Recovery with Concurrent Transaction, Case Study of Oracle.

References:

1. Korth, Silbertz, Sudarshan," Database Concepts", McGraw Hill
2. Date C J, "An Introduction to Database Systems", Addison Wesley
3. Elmasri, Navathe, " Fundamentals of Database Systems", Addison Wesley
4. O'Neil, Databases, Elsevier Pub.
5. RAMAKRISHNAN"Database Management Systems",McGraw Hill
6. Leon & Leon,"Database Management Systems", Vikas Publishing House
7. Bipin C. Desai, " An Introduction to Database Systems", Gagotia Publications
8. Majumdar & Bhattacharya, "Database Management System", TMH
9. R.P. Mahapatra, Database Management System, Khanna Publishing House

DISCRETE MATHEMATICS

Course Code- BSC401

(3-CREDIT) (L-T-P/3-1-0)

MODULE-I

Mathematical Logic:

Introduction, Statements and Notation, Connectives, Normal Forms, Theory of Inference for the Statement Calculus, The Predicate Calculus, Inference Theory of the Predicate Calculus.

MODULE-II

Set Theory:

Introduction, Basic Concepts of Set Theory, Representation of Discrete Structures, Relations and Ordering, Functions.

Algebraic Structures:

Introduction, Algebraic Systems, Semi Groups and Monoids, Groups, Lattices as Partially Ordered Sets, Boolean Algebra.

MODULE-III

Elementary Combinations:

Basic of Counting, Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with Repetitions, Enumerating Permutations with Constrained Repetitions, Binomial Coefficients, The Binomial and Multi-Nominal Theorems, The Principle of Inclusion-Exclusion.

MODULE-IV

Recurrence Relations:

Generating Functions of Sequences, Calculating Coefficients of Generating Functions, Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions, The Method of Characteristic Roots, Solutions of Inhomogeneous Recurrence Relations.

MODULE-V

Graphs and Trees:

Basic Concepts, Isomorphisms and Subgraphs, Trees and Their Properties, Spanning Trees, Directed Trees, Binary Trees, Planar Graphs, Euler's Formula, Multigraphs and Euler Circuits, Hamiltonian Graphs, Chromatic Numbers, The Four-Color Problem.

TEXT BOOKS:

1. Discrete Mathematical Structures with Applications to Computer Science, J.P. Tremblay, R. Manohar, McGraw Hill Education (India) Private Limited (Units-I, II).
2. Discrete Mathematics for Computer Scientists & Mathematicians, Joe L. Mott, Abraham Kandel, Theodore P. Baker, Pearson, 2nd Edition (Units- III, IV, V).

REFERENCE BOOKS:

1. Discrete Mathematics and its Applications, Kenneth H. Rosen, 7th Edition, McGraw Hill Education (India) Private Limited.
2. Discrete Mathematics D.S. Malik & K. K. Sen, Revised Edition Cengage Learning.
3. Elements of Discrete Mathematics, C.L. Liu and D.P. Mohapatra, 4th Edition, McGraw Hill Education (India) Private Limited.
4. Discrete Mathematics with Applications, Thomas Koshy, Elsevier.
5. Discrete and Combinatorial Mathematics, R. P. Grimaldi, Pearson.
6. Discrete Mathematical Structures by Bernard Kolman, Robert C. Busby and Sharon Cutler Ross, Pearson Education.

CYBER SECURITY

Course code –IT 402

Module I: Introduction to Cybercrime : Introduction, Cybercrime, and Information Security, Who are Cybercriminals, Classifications of Cybercrimes, and Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes.

Module II: Cyber Offenses: How Criminals Plan Them: Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing.

Module III: Cybercrime : Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices:

2nd year UG courses Engg & Tech, Jharkhand university of Technology.
Security Implications for Organizations, Organizational Measures for Handling
Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

Module – IV: Tools and Methods Used in Cybercrime : Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow.

Module V: Cyber Security : Organizational Implications Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.

TEXT BOOK:

- Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and Sunil Belapure, Wiley INDIA.

REFERENCE BOOK:

- Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
- Introduction to Cyber Security , Chwan-Hwa(john) Wu,J.David Irwin.CRC Press T&F Group

ENGINEERING ECONOMICS

Course code –EN 401

COURSE OUTLINE:

The basic purpose of this course is to provide a sound understanding of concepts and principles of engineering economy and to develop proficiency with methods for making rational decisions regarding problems likely to be encountered in professional practice.

Module -1

Introduction of Engineering Economics and Demand Analysis: Meaning and nature of Economics, Relation between science, engineering, technology and economics; Nature of Economic problem, Production possibility curve, Concepts and measurement of utility, Law of Diminishing Marginal Utility, Law of equi-marginal utility – its practical application and importance.

Meaning of Demand, Individual and Market demand schedule, Law of demand, shape of demand curve, Elasticity of demand, measurement of elasticity of demand, practical importance & applications of the concept of elasticity of demand.

Module -II

Meaning of production and factors of production; Law of variable proportions, Returns to scale, Internal and External economics and diseconomies of scale.

Various concepts of cost – Fixed cost, variable cost, average cost, marginal cost, money cost, real cost, opportunity cost. Shape of average cost, marginal cost, total cost, Cost curves.

Module III

Meaning of Market, Types of Market – Perfect Competition, Monopoly, Oligopoly, Monopolistic Competition (Main features of these markets)

Pricing Policies- Entry Deterring policies, Predatory Pricing, Peak load Pricing. Product Life cycle

Firm as an organisation- Objective of the Firm, Type of the Firm, Vertical and Horizontal Integration, Diversification, Mergers and Takeovers.

Module -IV

Nature and characteristics of Indian economy (brief and elementary introduction), Privatization – meaning, merits and demerits. Globalisation of Indian economy – merits and demerits. Elementary Concepts of VAT, WTO, GATT & TRIPS agreement, Business cycle, Inflation

RECOMMENDED BOOKS:-

1. R.Paneer Seelvan: Engineering Economics, PHI
 2. Managerial Economics, D.N.Dwivedi, Vikash Publication
 3. Managerial Economics, H.L. Ahuja, S. Chand and Co. Ltd.
 4. Managerial Economics, Suma Damodaran, Oxford.
 5. R.molrishnd Ro T.V S 'Theory of firms : Economics and Managerial Aspects'. Affiliated East West Press Pvt Ltd New Delhi
 6. Managerial Economics, H. Craig Petersen &W. Cris Lewis, Pearson Education.
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DESIGN AND ANALYSIS OF ALGORITHM LAB**Course Code- CS402P****Course Outcome:**

1. Able to Analyze the Real World Problem and Solv it.
2. Able to analyze Any Algorithm in Terms of Complexity.
3. Able to Compare Different Sorting Algorithm.

4. Able to Design Algorithm by Following Different Approach.

list of experiments:

1. Using a Stack of Characters, Convert an Infix String of Postfix String (I Class)
2. Implement Insertion, Deletion, Searching of a BST, (I Class)
3. (a) Implement Binary Search and Linear Search in a Program.
(b) Implement a Heap Sort Using a Max Heap.
4. (a) Implement DFS/BFS for a Connected Graph.
(b) Implement Dijkstra's Shortest Path Algorithm Using BFS.
5. (a) Write a Program to Implement Huffman's Algorithm.
(b) Implement MST Using Kruskal/Prim Algorithm
6. (a) Write a Program on Quick Sort Algorithm.
(b) Write a Program on Merge Sort Algorithm.
Take Different Input Instance for Both the Algorithm and Show the Running Time.
7. Implement Matrix Chain Order Algorithm.
8. Write Down a Program to Find Out a Solution for 0/1 Knapsack Problem.
9. Using Dynamic Programming Implement LCS.
10. (a) Find Out the Solution on the N-Queen Problem.
(b) Implement Back Tracking Using Game Trees.

NOTE : At least ten experiments are to be performed, minimum seven experiments should be performed from above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus

OPERATING SYSTEM LAB

Course Code- CS401P

1. Study of hardware and software requirements of different operating systems (UNIX,LINUX,WINDOWS XP, WINDOWS7/8)
2. Execute various UNIX system calls for i. Process management ii. File management iii. Input/output Systems calls
3. Implement CPU Scheduling Policies: i. SJF ii. Priority iii. FCFS iv. Multi-level Queue
4. Implement file storage allocation technique: i. Contiguous(using array) ii. Linked –list(using linked-list) iii. Indirect allocation (indexing)
5. Implementation of contiguous allocation techniques: i. Worst-Fit ii. Best- Fit iii. First- Fit
6. Calculation of external and internal fragmentation i. Free space list of blocks from system ii. List process file from the system
7. Implementation of compaction for the continually changing memory layout and calculate total movement of data
8. Implementation of resource allocation graph (RAG)
9. Implementation of Banker's algorithm
10. Conversion of resource allocation graph (RAG) to wait for graph (WFG) for each type of method used for storing graph.
11. Implement the solution for Bounded Buffer (producer-consumer)problem using inter process communication techniques-Semaphores
12. Implement the solutions for Readers-Writers problem using inter process communication technique -

FORMAL LANGUAGES AND AUTOMATA THEORY
Course Code- CS403P

1. Write a program for Pattern searching ?
2. Write a program to simulate Nondeterministic Finite Automata (NFA)
3. Write a program to simulate deterministic Finite Automata (DFA)
4. Write a Program to remove Useless Production in a C.F.G
5. Write a Program to remove Unit Production in a C.F.G
6. Create a pushdown automata for string translation