

Dr. Babasaheb Ambedkar Marathwada University
Aurangabad- 431004(MS) India.



Undergraduate Bachelor Degree Program
In Science and Technology

B.Sc. Honours(Information Technology)

Curriculum Structure and Scheme of
Examination

Choice Based Credit System

(Effective from Academic Year 2022-23)

Dr. Babasaheb Ambedkar Marathwada University
Aurangabad– 431004 (MS), India.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

Choice Based Credit System (CBCS) Curriculum

For

Faculty of Science and Technology

Course Structure (First Year)

BSc. Honours (Information Technology)

Course Type	Semester			
	Semester -I		Semester -II	
	Name of Paper	Credit (Theory +Practical)	Name of Paper	Credit (Theory +Practical)
Core Course (CC), 02 Course (06 Credit Each)	Computer Fundamentals and Information Technology	04+02=06	Computer System Architecture	04+02=06
	Operating System	04+02=06	Programming in C	04+02=06
Ability Enhancement Compulsory Courses (AECC), 01 Course (4 credit each)	English Communication Skills (linguistic Approach)	02	English Communication Skills (Soft Skill Development)	02
	Marathi/Hindi	02	Marathi/Hindi	02
Skill Enhancement Courses (SEC) any 04 Course (04 Credit Each)	----	----	----	----
Discipline Specific Elective (DSE)any 04 Course (06 Credit Each)	----	---	----	---
Generic Elective (GE) any 04 Course (06 Credit Each)	Programming Methodology OR Mathematical Concepts for Computer Science(M-1)	04+02=06	Linux Operating System OR Computational Statistics(M-2)	04+02=06
Non-Credit Course	-----	-----	Constitution of India	--
Total Credit	22		22	

Curriculum Structure and Scheme of Examination

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

Choice Based Credit System (CBCS) Curriculum

For

Faculty of Science and Technology

Course Structure and Scheme of Examination

B. Sc. Honours (Information Technology)

Semester-I

Course Type	Course Code	Course Title	Teaching Time/Week	Credits	Scheme of Examination			
					UA	IA	Max Marks	Min Marks
Core Course (CC)	BIT-101T	Computer Fundamentals and Information Technology	45 (6/per week)	4	80	20	100	40
	BIT-102T	Operating System	45 (6/per week)	4	80	20	100	40
Ability Enhancement Compulsory Courses (AECC)	BIT-103T	English Communication Skills (linguistic Approach)	45 (3/per week)	2	80	20	100	40
	BIT-104T	Marathi/Hindi	45 (3/per week)	2	80	20	100	40
Generic Elective (GE) Select anyone	* BIT-105.1T	Programming Methodology	45 (6/per week)	4	80	20	100	40
	* BIT-105.2T	Mathematical Concepts for Computer Science(M-1)						
Laboratory Course	BIT-106P	Based on BIT-101T	45 (3/per week)	2	50	-	50	20
	BIT-107P	Based on BIT-102T	45 (3/per week)	2	50	-	50	20
	BIT-108P	Based on BIT-105T	45 (3/per week)	2	50	-	50	20
Non Credit Course	-	-	-	-	-	-
			33 Period Per week	22	550	100	650	260

Total Credits for Semester I: 22 (Theory: 16, Laboratory: 06)

*** Select anyone from BIT-105.1T/BIT105.2T (College should teach both paper and student can select any one)**

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Choice Based Credit System (CBCS) Curriculum

For

Faculty of Science and Technology

Course Structure and Scheme of Examination

B. Sc. Honours (Information Technology)

Semester-II

Course Type	Course Code	Course Title	Teaching Time/Week	Credits	Scheme of Examination			
					UA	IA	Max Marks	Min Marks
Core Course (CC)	BIT-201T	Computer System Architecture	45(6/per week)	4	80	20	100	40
	BIT-202T	Programming in C	45(6/per week)	4	80	20	100	40
Ability Enhancement Compulsory Courses (AECC)	BIT-203T	English Communication Skills (Soft Skill Development)	45(3/per week)	2	80	20	100	40
	BIT-204T	Marathi/Hindi	45(3/per week)	2	80	20	100	40
Generic Elective (GE) Select anyone	*BIT-205.1T	Linux Operating System Or	45(6/per week)	4	80	20	100	40
	*BIT-205.2T	Computational Statistics(M-2)						
Laboratory Course	BIT-206P	Based on BIT-201T	45(3/per week)	2	50	-	50	20
	BIT-207P	Based on BIT-202T	45(3/per week)	2	50	-	50	20
	BIT-208P	Based on BIT-204T	45(3/per week)	2	50	-	50	20
Non Credit	BIT-213	Constitution of India	45(3/week)	-	-	-	-	-
			36 Period Per week	22	550	100	650	260

Total Credits for Semester II: 22 (Theory: 16, Laboratory: 06)

* Select anyone from BIT-204.1T/BIT 204.2T (College should teach both paper and student can select any one)

2. Program Educational Objectives

PE01

Develop proficiency as information technology experts with an ability to create a wide range of IT based applications for industries, government, or other work environments.

PE02

Attain the ability to adapt quickly to new environments and technologies, assimilate new information, and work in multi-disciplinary areas with a strong focus on innovation and entrepreneurship.

PE03

Possess the ability to think logically and the capacity to understand technical problems with information systems.

PE04

Possess the ability to collaborate as team members and team leaders to facilitate cutting-edge technical solutions for information systems and thereby providing improved functionality.

3. Program Specific Outcomes

PS01

Ability to design, develop, implement computer programs and use knowledge in various domains to identify research gaps and hence to provide solution to new ideas and innovations.

PS02

Work with and communicate effectively with professionals in various fields and pursue lifelong professional development in information technology.

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B.Sc. Honours(Information Technology)
Semester-I

Curriculum for Semester I

Course Code: BIT-101T	Course Title: Computer Fundamentals and Information Technology
Total Credits: 04	Marks: 100 (UA: 80 + IA: 20)
Periods: 6 per week (45 minutes each)	

Prerequisites:

There are no prerequisites required for attending this course.

Learning Objectives

- This course will introduce the student to the operation and use of computers. Specific applications taught include operating systems, word processing, spreadsheets, and presentation software. In addition, students will learn basic terminology and concepts related to the use of computers in today's society.

Learning Outcomes

Students who complete this course successfully will acquire:

- Demonstrate basic competency in operating systems, word processing, spreadsheets, email, and presentation software.
- Determine the nature and extent of information needed.
- Collect or retrieve and evaluate the information that is appropriate to the academic level or discipline.
- Access and use information on Internet.
- Use, individually or as a member of a group, information effectively to accomplish a specific purpose.

Course Outline

Unit I: Introduction of Computers

Generations of computer, Types of Computers (Based on Purpose, Based on Technology Used, Based on Size and Storage Capacity), Computers of the Future (Mobile Computers, Nanotech Computers). Applications of Computers, Role of Computers in Business, Role of Computers in Science, Role of Computers in Education, Role of Computers in Entertainment, Role of Computers in Data Communications, Emerging Information Technologies.

Unit II: Hardware Concepts

Motherboard (CPU & Memory Chip), Input Devices (Keyboard, mouse, joystick, trackball, touchscreen, light pen, digitizer, scanner, bar code reader, MICR device, optical character reader (OCR), optical mark reader (OMR), microphone, web camera), Output devices (Monitor, printer, plotter), Storage Devices (Types of Storage devices, Hard disk HDD, Floppy Disk, CD-ROM, DVD-ROM, RAM Disk, Pen Drive.)

Unit III: Software Concepts

System Software, Operating Systems, Booting, Types of Operating Systems, Functions of Operating Systems, Utility Software, File Management Utilities, Text Editing Utilities, Virus Detection and Removal Utilities, Diagnostic Utilities and Performance Monitoring Utilities, Spooling Utilities, Data Compression Utilities, MIDI Software, Speech Synthesis Software, Web Authoring Software

Unit IV: Information Technology

Information, Technology, Information Technology, Present Scenario, Role of Information Technology, Information Technology and the Internet, Careers in the IT Industry.

Unit V: Internet

What is internet, Internet v/s Online Services, Authorities Governing Internet, Applications of Internet, World Wide Web, Web Server and Websites, Hypertext, Hypermedia and Hyperlinks, Webserver, Website, Web Page and Portal, Web Browsers.

Text Book:

1. Computer Fundamentals and Applications, Ashok Arora, 1st Edition, Vikas Publication, 2015, ISBN 9789325971608
2. Introduction to Information Technology, 2nd Edition, IITL Limited IITL Education Solutions Limited, Published by Pearson Education India.

Reference Books:

1. **Fundamentals of Computers**, Rajaraman 6th edition PHI Learning Private Limited 2014
2. **Fundamentals of Information Technology** By Chetan Srivastava, Kalyani Publishers
3. **Fundamentals of Computers** By V.Rajaraman, PHI Publication ,IVth Edition.
4. **Fundamentals of Programming** By Raj K.Jain, S.Chand Publication

Additional Reference:

1. **Computer Today** By Suresh K. Basandra, GalgotiaPublication, Updated Edition
2. **Computer Fundamental** ByB.Ram, BPB Publication.

Course Code: BIT-106P	Course Title: Lab Based on BIT-101T
Total Credits: 02	Marks: 50 (UA: 50+ IA: 00)
Periods: 3 per week (45 minutes each)	

Sample List of experiments to be carried out based on the course **BIT-101T**. Three experiments can be carried out based on each unit. Faculty can add experiments of their choice as well.

1. Prepare a report based on computer component such as monitor, printer, CPU, Pen drive, CD -ROM , Hard Disk.
2. Create a partition of computer drive creation, formatting the drive and deleting the partition.
3. Create a user and password of computer user and Reset a computer password using CMOS battery.
4. Practical on office word tool as a creation, edit, insertion of table in the new word file.
5. Practical based on Ms-Excel for creation of student data with name, marks, roll no for sorting and mark sheet creation.
6. Perform practical of DOS internal commands. DIR,TYPE,DEL, MD,CD,COPY,RMDIR,VER,DATE,TIME, CLS EXIT.
7. Write a comparative report of different web browser such as opera, Microsoft edge, chrome and Mozilla Firefox.
8. Create an IP setting and home network setting for the computer.
9. Connect internet using wifi for a computer.
10. Create an email account based on Gmail and send the email using the parameter as CC, BCC and schedule send option.
11. Practical based on online meeting using zoom, Google meet and Skype
12. Practical based on remote desktop using any desk software.

Course Code: BIT-102T	Course Title: Operating System
Total Credits: 04	Marks: 100 (UA: 80 + IA: 20)
Periods: 6 per week (45 minutes each)	

Prerequisites:

There are no prerequisites for attending this course.

Learning Objectives

- To introduce students the basic functioning of operating systems as resource manager and its salient features.
- To acquaint students about Process States, CPU Scheduling, Inter Process Communication, Synchronization, Deadlocks.

Learning Outcomes

Upon successful completion of the course, the students will:

- Gain knowledge of System Software, Program and Process.
- Understand Types of Operating System, Basic functions of O.S. and Evolution of O.S.
- Understand the concept of Process, Process Control Block and Threads.
- Understand the CPU scheduling Non-Pre-emptive and Pre-emptive Scheduling algorithms
- Understand the concept of Synchronization and Deadlock.

Course Outline

Unit I: Introduction to Operating System:

Introduction to Software: Definition, Classification of software, Operating system as the main component of system software, Program and Process.**Operating System Fundamental :** O.S. as a resource manager, Structure of O.S., Types of O.S.- Single user and multiuser O.S., Basic functions of O.S., Characteristics of modern O.S.**Evolution of O.S. :** Early systems, Simple batch systems, Multiprogramming batch systems, Time sharing system, Operating system for Personal Computers, workstations and Hand held devices, Parallel systems, Distributed systems, Real time systems, Advantages and Disadvantages of each system.

Unit II: Process Management:

Concept of Process: Process States, Process Control Block, Operations on Processes, Threads.

CPU Scheduling: Types of schedulers, Criteria for scheduling, Non-Pre-emptive Scheduling Algorithms – First-come First-served Scheduling and Shortest Job First Scheduling, Pre-emptive Scheduling Algorithms- Priority Scheduling, Round Robin.

Unit III: Inter Process Communication and Synchronization:

Need for synchronization, introduction of Critical Section and Semaphores.

Deadlocks :Concept of Deadlock, Deadlock Modeling, Methods for Handling Deadlock.

Unit IV: Memory Management:

Address Binding, Logical Vs. Physical address space, Memory Allocation Strategies- Fixed and Variable Partitions, Paging, Segmentation, Virtual Memory.

Unit V: Device Management:

Introduction: Dedicated devices, Shared devices and Virtual devices, Pipes, Buffer, I/O System Components : I/O Devices, I/O Hardware, Interrupts, Application I/O Interface.

Reference Books:

1. “**Operating System**”, By S.R. Sathe & Anil S. Mokhade, MacMillan Publication.
2. A Silberschatz, P.B. Galvin, G. Gagne, **Operating Systems Concepts**, 8th Edition, John Wiley Publications 2008.
3. A.S. Tanenbaum, **Modern Operating System**, 3rd Edition, Pearson Education 2007.
4. G. Nutt, **Operating System: A Modern Perspective**, 2nd Edition Pearson Edition 1997.
5. W. Stallings, **Operating Systems, Internals & Design Principles** 2008 5th Edition, Prentice Hall of India.
6. M. Milenkovic, **Operating Systems- Concepts and design**, Tata McGraw Hill 1992.

Course Code: BIT-107P	Course Title: Lab Based on BIT-102T
Total Credits: 02	Marks: 50 (UA: 50 + IA: 00)
Periods: 3 per week (45 minutes each)	

Sample List of experiments to be carried out based on the course **BIT-102T**. Three experiments can be carried out based on each unit. Teacher can also add experiments of their choice.

1. Practical based on installation of operating system using bootable device.
2. Practical based on formatting and creation and modification of partition.
3. Practical based on video, audio, network, printer and other peripheral devices and it's sharing.
4. Write an algorithm and draw a flowchart for scheduling algorithm FCFS.
5. Write an algorithm and draw a flowchart for scheduling algorithm SJF.
6. Write an algorithm and draw a flowchart for scheduling algorithm priority scheduling.
7. Write an algorithm and draw a flowchart for scheduling algorithm round robin scheduling.
8. Write an algorithm and draw a flowchart for accepting list of processes, arrival time, display Giant Chart for FCFS.
9. Write an algorithm and draw a flowchart for accepting list of processes, arrival time, display Giant Chart for priority scheduling.
10. Write an algorithm and draw a flowchart for accepting list of processes, arrival time, display Giant Chart for round robin scheduling.
11. Execution of DOS internal commands.
12. Write an algorithm and draw a flowchart for Bankers algorithm for Deadlock Avoidance
13. Write an algorithm and draw a flowchart for Bankers Algorithm for deadlock Prevention
14. Write an algorithm and draw a flowchart for implementation of first fit, best fit algorithm for memory management. .(any one)
15. Write an algorithm and draw a flowchart of following Page Replacement Algorithm.(any one)
 - a. FIFO
 - b. LRU
 - c. OPTIMAL

Note: If teacher want they can give demo in any programing language or simulation software.

Course Code:BIT-103T	Course Title: English Communication Skills
Total Credits: 02	Marks: 100 (UA: 80 + IA: 20)
Periods: 3 per week (45 minutes each)	

Prerequisites:

There are no prerequisites for attending this course.

Learning Objectives

- Learn fundamentals of Parts of Speech.
- Detailed study of Spellings, Silent letters and Articles.
- Learn Auxiliary verbs, Subject and Object and how to make Questions and Question tags.
- Addressing the Greetings and giving directions.
- To enhance the vocabulary-building, word formation, Synonyms & Antonyms, One-word substitutes and Phrasal verbs.
- To improve listening, oral and reading skills

Learning Outcomes

Upon successful completion of the course, the students will be able to:

- Understand the different styles of communication.
- Understand the effective speaking skills and develops effective reading comprehensions.
- Understand how to write a good personal profile and improve one's presentation skills.
- Develop good writing skills.

Course Outline

Unit I: Basics of Communication Skill:

Communication Skills: Introduction, Definition, Nature and Scope of Communication, an Importance and Purpose of Communication, 'C's of good communication, Process of Communication. **Barriers to communication:** Physiological Barriers, Physical Barriers, Cultural Barriers, Language Barriers, Gender Barriers, Interpersonal Barriers, Psychological Barriers, Emotional barriers **Communication Network in Organization:** Personal Communication, Internal Operational Communication, External Operational Communication, Horizontal (Lateral) Communication, Vertical (Downward) Communication, Vertical (Upward) Communication.

Unit II: English Grammar:

Parts of Speech: Nouns, Pronouns, Verbs, Adverbs, Adjectives, Conjunctives, Prepositions, Interjections. Using the **Dictionary:** Primary Auxiliaries, Modal Auxiliaries, Subject and Object (Direct/Indirect), Yes or No Questions, Wh-word Questions, Question Tags. **Grammar:** Type of Verbs, Subject- Verb Agreement, Tense

(present and past) and Aspect, several possibilities for denoting future Time, vocabulary building, constructing paragraphs

Unit III: Elements of Communication & Listening Skills:

Elements of Communication: Introduction, Face to Face Communication – Tone of voice, Body Language (Non-Verbal Communication), Verbal Communication, Physical Communication. **Listening Skills-I:** Introduction, Listening to Conversation (Formal and Informal), Active Listening, Benefits of Listening Skill, Barriers to Listening, Listening to Announcements (Railway stations/Bus stations/ Airports/ Sports Announcements/ Commentaries etc.) **Listening Skills-II:** Academic Listening (Listening to Lectures), Listening to Talks and Presentations, Note Taking Tips.

Unit IV: Oral Communication Skills:

Importance of Spoken English, Status of Spoken English in India, International Phonetic Alphabet (IPA) Symbols, Spelling and Pronunciation, Requesting and responding to requests, Congratulating people on their success, Expressing condolences, Apologizing and forgiving, Giving instructions, Seeking and giving permission, Expressing Opinions (likes and dislikes), Demanding Explanations, Asking for and giving advice and suggestions. **Reading Skills:** Purpose, Process, Methodologies, Skimming and Scanning, Levels of Reading, Reading Comprehension.

Unit V: Effective Writing Skills:

Elements of Effective Writing, Sentences, Phrases and Clauses, Types of Sentences. Main Forms of Written Communication, Paragraph Writing (Linkage and Cohesion), Letter Writing (Formal and Informal), Essay Writing, Notices, Summarizing, Precise Writing, Note-Making, Amount of Discussion Required Understanding and Applying Vocabulary: Words Often Confused-Pairs of words, One Word Substitutes, Synonyms and Antonyms, Word Formation: Prefixes, Bases and Suffixes (Derivational & Inflectional).

Reference Books:

1. **Basic communication skills for Technology**, Andreja. J. Ruther Ford, 2nd Edition, Pearson Education, 2011
2. **Communication skills**, Sanjay Kumar, Pushpalata, 1st Edition, Oxford Press, 2011
3. **Organizational Behaviour**, Stephen.P. Robbins, 1st Edition, Pearson, 2013
4. **Brilliant- Communication skills**, Gill Hasson, 1st Edition, Pearson Life, 2011
5. **Business Communication**, By Urmila Rai & S.M. Rai. Himalaya Pub
6. **Business Communication** Anjali Ghanekar
7. **Anderson, Kenneth.** Joan Maclean and Tony Lynch. Study Speaking: A Course in Spoken English for Academic Purposes. Cambridge: CUP, 2004.

Course Code:BIT-105.1T	Course Title: Programming Methodology
Total Credits: 04	Marks: 100 (UA: 80 + IA: 20)
Periods: 6 per week (45 minutes each)	

Prerequisites:

There are no prerequisites for attending this course.

Learning Objectives

- Learn to develop simple algorithms and flow charts to solve a problem.
- Develop problem solving skills coupled with top down design principles.
- Learn about the strategies of writing efficient and well-structured computer algorithms/programs.
- Develop the skills for formulating iterative solutions to a problem.

Learning Outcomes

- Learn the History and types of Programming.
- Learn various approach of writing program.
- Learn to develop simple algorithms and flow charts to solve a problem.

Unit I Introduction to Programming Environment

Introduction to Programming, Definition of program and programmer, features of good programming language, Bugs and Debugging

Unit II Programming Techniques

Programming approaches: Structural Programming, Modular Designing, Top Down Designing, Bottom Up Designing, Object Oriented Programming

Unit III Programming Languages

History of languages, Classification of computer language: Generation wise, high-level, Low level, Assembly languages etc., Compilers, Interpreters, Assemblers, Linkers, Loaders.

Unit IV Algorithm

Pseudocode or Structured English, Algorithm, Definition and basic features and properties of algorithm.

Unit V Flow-Chart

Principles of flowcharting, Flowcharting symbols, converting algorithms to flowcharts, problem solving through algorithm and flowchart.

Text Books :

1. **Fundamentals of Computer** ,V. Rajaraman
2. **Programming Logic and Design**, Comprehensive By Joyce Farrell
3. **Problem Solving and Program Design in C**, J. R. Hanly and E. B. Koffman, Pearson, 2015.

Course Code: BIT-108P	Course Title: Lab Based on BIT-105.1T
Total Credits: 02	Marks: 50 (UA: 50 + IA: 00)
Periods: 3 per week (45 minutes each)	

Sample List of experiments to be carried out based on the course **BIT-105.1T**. Faculty can add experiments of their choice as well.

Write 10 algorithms on any general problems and draw flowchart of the same.

Course Code: BIT-105.2T	Course Title: Mathematical Concepts for Computer Science(M-1)
Total Credits: 04	Marks: 100 (UA: 80 + IA: 20)
Periods: 6 per week (45 minutes each)	

Prerequisites:

Basic understanding of mathematical concepts (School or Junior College).

Learning Objectives

To expose the students to the following:

- Propositional function, statements, well-formed formulas.
- Set theory concepts like Finite Set, Subset, Empty Set and operations on set.
- Matrices and its various types.
- Binary relations, posets, Functions, and pigeonhole principle.
- Algebraic structures like groups and elementary combinatorics.
- Various concepts in graphs and trees like its representation and its types.

Learning Outcomes

After successful completion of course the student should be able to

- Know how to represent various statements using set, relations, functions, permutations and combinations, groups, graphs and trees
- Use logical notations to formulate and reason about fundamental mathematical concepts such as sets, relations, functions and algebraic structures.
- Analyse the growth of functions and real-world problems using various concepts like recurrence relations, graph implementation etc.
- Apply mathematical logic to solve problems, pigeonhole principle to solve real time problems,
- Model and solve real world problems using graphs and trees.

Course Outline

Unit I: Mathematical Logic:

Propositional Calculus: Statements and Notations, Connectives, Well Formed Formulas, Truth Tables, Tautologies, Equivalence of Formulas, Duality Law, Normal Forms.

Unit II: Set Theory:

Types of Set: Finite, Infinite, Singleton, Empty, Subset, Proper Subset, Universal Set, Power Set, Venn Diagram, Operations on Set: Union of Sets, Intersection of Sets, Complement of Set, Cartesian Product, Difference and Symmetric Difference of Set.

Introduction to Matrices: Types of Matrices, Matrix, Operations, Adjoint and Inverse of a Matrix, Rank of a Matrix and Special Matrices.

Unit III: Combinatorics:

Review of Permutation and Combination, Mathematical Induction - Pigeon hole principle, Principle of Inclusion and Exclusion, generating function, Recurrence relations.

Unit IV: Basics of Graph Theory and Tree:

Introduction to Graph, Application of Graph, Finite and Infinite Graph, Incidence and Degree, Null Graph, Isolated and Pendent Vertex, Isomorphism, Subgraph, Walks, Path and Circuit, Union and Intersection Operation. Graph, Planner Graph, Trees, Pendant Vertices on Tree, Binary Tree, Spanning Tree.

Unit V: Relation:

Basic definitions of Relation and types of Relations, Graph of Relations, Properties of Binary Relations, Matrix Representation of Relations, Operations on Relations, Partition and Covering, Transitive Closure, Equivalence, Compatibility and Partial Ordering Relations.

Text Books:

1. **Elements of Discrete Mathematics-A Computer Oriented Approach** C. L Liu, D.P. Mohapatra, 3rd edition Tata McGraw Hill.
2. **Discrete Mathematical Structures with Applications to Computer Science**, J. P. Tremblay and P. Manohar, Tata McGraw Hill
3. **Foundations of Computer Science**, A. Aho and J. Ullman- W. H. Freeman, 1992.
4. **Discrete Mathematics**-Dr. Bembalkar

Reference Books:

1. **Discrete Mathematics for Computer Scientists and Mathematicians**, J. L. Mott, A. Kandel, T.P. Baker, 2nd Edition, Prentice Hall of India.
2. **Discrete Mathematical Structures**, BernandKolman, Roberty C. Busby, Sharn Cutter Ross, Pearson Education/PHI.
3. **Discrete Mathematics and its Applications with Combinatorics and Graph Theory**, K. H. Rosen, 7th Edition, Tata McGraw Hill.

Course Code: BIT-108P	Course Title: Lab Based on BIT-105.2T
Total Credits: 02	Marks: 50 (UA: 50 + IA: 00)
Periods: 3 per week (45 minutes each)	

Students are required to solve the problems by making use of any spreadsheet software like Microsoft Excel or any open office tool. Student should implement the programs by using any Programming Language such as C-Programming.

Practical No.	Details
1.	Practical based on Mathematical Logic.
2.	Practical based on Set Theory: Algebra of Set Operations
3.	Representation of set using Venn Diagram
4.	Practical based on various Operations on Set. (Union, Intersection, Difference, Complement)
5.	Write an algorithm and draw a flowchart to find determinant of Square Matrix.
6.	Write an algorithm and draw a flowchart to find Adjoint of Matrix, Inverse of Matrix.
7.	Write an algorithm and draw a flowchart to find Rank of Matrix.
8.	Representation of Principle of inclusion and exclusion.
9.	Practical based on Permutation.
	(a) Write an algorithm and draw a flowchart to find permutation of distinguishable objects.
	(b) Write an algorithm and draw a flowchart to find nPr with repetitions.
10.	Practical based on Combination.
	(a) Write an algorithm and draw a flowchart to generate all combinations of 1,2 and 3.
	(b) Write an algorithm and draw a flowchart to find nCr with repetitions.
11.	Representation of Graph and tree.
12.	Practical based on binary relations and operations on relations.

Note: If teacher want they can give demo in any programing language or simulation software.

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B.Sc. Honours(Information Technology)
Semester-II

Curriculum for Semester II

Course Code: BIT-201T		Course Title: Computer System Architecture	
Total Credits: 04		Marks: 100 (UA: 80 + IA: 20)	
Periods: 6 per week (45 minutes each)			

Prerequisites:

There are no prerequisites for attending this course.

Learning Objectives

- To impart basic knowledge of digital logic and circuit towards understanding of basic concept of digital communication. Student will be able to understand functionalities of numerous digital logics and its circuit towards the implementation of this knowledge for real time application design. The understanding of logic designing is useful for student to design and develop computer based electronic circuit development.

Learning Outcomes

Students who complete this course successfully will acquire:

- To make students understand the basic structure, operation and characteristics of digital computer.
- To familiarize the students with arithmetic and logic unit as well as the concept of the concept of pipelining.
- To familiarize the students with hierarchical memory system including cache memories and virtual memory.
- To make students know the different ways of communicating with I/O devices and standard I/O interfaces.

Course Outline

Unit I: Boolean algebra and Logic Gate:

Postulates of Boolean algebra, theorem of Boolean algebra, commutative, associative, distributive, absorption laws. De-morgan's theorem. Logic gates: AND, OR, NOT, Ex-OR, Ex-NOR, NAND, NOR gates as universal building blocks. Logic diagram, Boolean expression and truth tables of each gate.

Unit II: Minimization Techniques:

Introduction, Minterm and Maxterm , K-Map, K-Map for 2 variables. K-Map for 3 variables, K-Map for 4 variables.

Combinational and Sequential Circuit Half adder and Full adder, Binary parallel adder, Half subtractor and Full subtractor, Adder/ Subtractor for 2's complement system, BCD to decimal decoder, 2: 4 De-multiplexer, 4 line to 1-line multiplexer

Unit III: Flip Flops:

Introduction of Flip Flops, RS Flip Flop, Clocked RS FF, D Flip Flops, triggering, preset and clear, JK Flip flops, T Flip Flops, race around condition, Master slave Flip Flops.

Unit IV: Counters:

Introduction, Asynchronous /ripple counter, Modulus counter, MOD-12 counter Synchronous counter: synchronous serial and synch parallel counter BCD counter, ring counter and Johnson counter.

Unit V: Shift Register:

Introduction, buffer register, Serial-in Serial-out, serial- in parallel-out, Parallel – in serial –out, parallel –in parallel –out. **Memory and I/O Systems:** Peripheral Devices, I/O Interface, Data Transfer Schemes, Program Control, Interrupt, DMA Transfer, Cache Memory, Associative Memory, Interleave, Virtual Memory.

TEXT BOOKS

1. **Computer System Architecture**, M. Morris Mano, 3rd Edition, Prentice Hall.
2. **Computer Organization and Design**, David A. Patterson and John L. Hennessey, Fifth edition, Morgan Kaufman / Elsevier, 2014.
3. **Digital Electronics and Micro-Computers** – R.K.Gaur ,DhanpatRai Publication
4. **Digital fundamentals** –Floyd & Jain –Pearson Education

Reference Book

1. **Computer Organization and Architecture**, William Stallings, Prentice Hall.
2. **Introduction to computers** –Norton –McGraw Hill
3. **Digital fundamentals** –Floyd & Jain –Pearson Education

Course Code: BIT-206P	Course Title: Lab Based on BIT-201T
Total Credits: 02	Marks: 50 (UA: 50 + IA: 00)
Periods: 3 per week (45 minutes each)	

Practical based on Digital Electronic

The practical should be done on kit for AND, OR , NOT, NAND, NOR , X-OR and X-Nor gate **(If kit not available use the software simulation for practical)**

1. Testing of AND, OR and NOT Gate.
2. Testing of NAND and NOR gate
3. Testing of XOR and X-NOR gate
4. Implementation of Boolean Functions using MUX
5. Construction of half and full adder using XOR and NAND gates and verification of its operation.
6. The practical for Half adder. Full adder, encoder and Multiplexer.
7. Practical for SR Flip flop
8. Practical for JK Flip Flop
9. Practical based on D-Flip flops
10. Design and verify the 4- Bit Synchronous or Asynchronous Counter using JK Flip Flop
11. Verify Binary to Gray and Gray to Binary conversion using NAND gates only
12. Design and Verify the counter functionalities using simulator.
13. Design and Verify the 4-Bit Serial In - Parallel Out Shift Registers
14. Design and Verify the 4-Bit parallel In - serial Out Shift Registers
15. Experiment for DMA based on simulator.

The link of virtual lab as is below.

The Digital Electronic Circuits Virtual Laboratory is an initiative of Ministry of Human Resource Development (MHRD), Govt. of India, under the National Mission on Education through Information and Communication Technology (NME-ICT).

1. <https://www.vlab.co.in> : Virtual Lab for IIT Delhi
2. <http://vlabs.iitkgp.ernet.in/dec/>
3. <https://www.iitg.ac.in/cseweb/vlab/Digital-System-Lab/experiments.php>

Course Code:BIT-202T	Course Title: Programming in C
Total Credits: 04	Marks: 100 (UA: 80 + IA: 20)
Periods: 6 per week (45 minutes each)	

Prerequisites:

There are no prerequisites for attending this course.

Learning Objectives

- To understand the constructs of C Language.
- To develop C Programs using basic programming constructs.
- To develop C programs using decision making and looping constructs
- To develop C programs using arrays and strings.
- To develop modular applications in C using functions
- To develop applications in C using pointers and structures

Learning Outcomes

Upon successful completion of the course, the students will be able to:

- Write, compile and debug programs in C language
- Develop simple programs in C using basic constructs
- Design programs involving decision structures, loops
- Design and implement applications using arrays.
- Develop and implement modular applications in C using functions
- Develop applications in C using structures and pointers
- Identify the difference between call by value and call by reference

Course Outline

Unit I: Basics of C Programming:

Introduction to C Language, Character set, C Tokens, Data Types, Type modifiers, Operators, Precedence & Associativity of Operators, Expressions and its Evaluation, Structure of C Program, Input / Output statements

Unit II: Decision Making ,Looping and branching Statements:

Conditional and unconditional jumps. goto statement, Simple if statement, if-else statement, else if ladder, Nested if, Switch-case statement.while loop, do-while loop, for loop, break statement, continue statement.

Unit III: Arrays and Structure:

Array: Introduction, Declaration, initialization and accessing of one dimensional (1D) , Two-Dimensional (2D) array, Multidimensional array, Character array.

Structure: Introduction, Declaration and initializing structure, Accessing structure members, Nested structures, Arrays of structure, typedef statement and Enumerated data types. Unions: Declaration, Difference between structure and union

Unit IV: Functions:

Introduction, Types of functions, defining functions, Arguments, Function prototype, actual parameters and formal parameters, calling function, Returning function results. Parameter Passing Mechanism: Call by Value & Call by Reference, Recursion.

Unit V: Pointers:

Introduction, The Address(&) and Indirection(*) Operators, Declaration and initialization of pointers. Pointer expression and pointer arithmetic, Pointer to pointer.

Reference Books:

1. **Let us C:** Y. P. Kanetkar [bpb publication]
2. **Programming in C** : E. Balagurusamy [Tata McGraw hill]
3. **Programming in C:** Gottfried [Shaums Series]

Course Code: BIT-207P	Course Title: Lab Based on BIT-202T
Total Credits: 02	Marks: 50 (UA: 50 + IA: 00)
Periods: 3 per week (45 minutes each)	

Sample List of experiments to be carried out based on the course **BIT-202T**. Three experiments can be carried out based on each unit. Teacher can also add experiments of their choice.

Practical no	Details
1	Implement the following programs
	a) Write a program to find area of circle
	b) Write a program to find average of three numbers
2	Implement the following using if-else
	a) Write a program to find maximum amongst 2 numbers
	b) Write a program to check entered number is even or odd
3	Implement the following using else-if ladder
	a) Write a program to find entered number is positive, negative or zero
	b) Write a program to print grade of students based on percentage
4	Implement the following using switch-case
	a) Write a program to print weekday based on given number
	b) Write a program to check entered character is vowel or not
5	Implement the following using while loop
	a) Write a program to find factorial of given number
	b) Write a program to find sum of first 10 natural numbers
6	Implement the following using do while loop
	a) Write a program to print odd numbers from 1 to N
	b) Write a program to print Fibonacci series
7	Implement the following using for loop
	a) Write a program to print following series 1 2 3 4 5 6
	b) Write a program to print prime numbers from 1 to 100
8	Implement the following using 1-D array
	a) Write a program to find largest element in an array
	b) Write a program to sort an array elements in ascending order
9	Implement the following using 2-D array
	a) Write a program to find sum of two matrices
	b) Write a program to perform transpose of matrix

10	Implement the following using functions
	a) Write a program to exchange two numbers b) Write a program to find factorial of a given number
11	Implement the following using structure
	a) Write a program to create structure student b) Write a program to demonstrate array of structure
12	Implement the following using union
	a) Write a program to create union employee b) Write a program to find sizeof() structure and sizeof() union
13	Implement the following using pointer
	a) Write a program to demonstrate double pointer b) Write a program to exchange two numbers

Course Code: BIT-203T		Course Title: English Communication Skills (Soft Skill Development)	
Total Credits: 02		Marks: 100 (UA: 80 + IA: 20)	
Periods: 3 per week (45 minutes each)			

Prerequisites:

There are no prerequisites for attending this course.

Learning Objectives

- To understand the fundamental soft skills and their practical social and workplace usage.
- It helps participants to communicate effectively and to carry themselves confidently and in harmony with the surroundings.
- To identify and overcome the barriers in interpersonal relationships.
- To employ oral and written communication, teamwork, leadership, problem-solving and decision-making skills, to gain best results.

Learning Outcomes

Upon successful completion of the course, the students will be able to:

- Understand the significance and essence of a wide range of soft skills.
- Learn how to apply soft skills in a wide range of routine social and professional settings.
- Learn how to employ soft skills to improve interpersonal relationships
- Learn how to employ soft skills to enhance employ ability and ensure workplace and career success.

Course Outline

Unit I:

Soft Skills: An Introduction – Definition and Significance of Soft Skills; Process, Importance and Measurement of Soft Skill Development. **Self-Discovery:** Discovering the Self; Setting Goals; Beliefs, Values, Attitude, Virtue. **Positivity and Motivation:** Developing Positive Thinking and Attitude; Driving out Negativity; Meaning and Theories of Motivation; Enhancing Motivation Levels.

Unit II:

Public Speaking: Skills, Methods, Strategies and Essential tips for effective public speaking. **Group Discussion: Importance,** Planning, Elements, Skills assessed; Effectively disagreeing, Initiating, Summarizing and Attaining the Objective, Do's and Don'ts of Group Discussion. **Non-Verbal Communication:** Importance and Elements; Body Language.

Unit III:

Role Play: Introduction, Basics of Role Playing, Role Play Script (Teacher-Student Script, Short Drama Script, Any Short Plays and etc.), **Interview Skills:** Interviewer and Interviewee – in-depth perspectives. Before, During and After the Interview. Tips for Success, Do's and Don'ts of Interview. **Presentation Skills:** Types, Content, Audience Analysis, Essential Tips – Before, During and After, Overcoming Nervousness, Planning and Structuring your Presentation, Techniques of Delivery.

Unit IV:

Etiquette and Manners: Social and Business. **Stress Management:** Stress, Sources of Stress, Ways to Cope with Stress, **Time Management:** Concept, Essentials, Tips.

Unit V:

Leadership and Assertiveness Skills: A Good Leader; Leaders and Managers; Leadership Theories; Types of Leaders; Leadership Behaviour; Assertiveness Skills. Decision Making and Negotiation: Introduction to Decision Making, Steps for Decision Making, Decision Making Techniques, Negotiation Fundamentals, Negotiation Styles, Major Negotiation Concepts, Emotional Intelligence: Meaning, History, Features, Components, Intrapersonal and Management Excellence; Strategies to enhance Emotional Intelligence.

Reference Books:

1. Soft Skills: an Integrated Approach to Maximise Personality, Gajendra S. Chauhan, Sangeeta Sharma, Wiley India
2. Managing Soft Skills for Personality Development – edited by B.N.Ghosh, McGraw Hill India, 2012.
3. English and Soft Skills – S.P.Dhanavel, Orient Blackswan India, 2010.

Course Code: BIT-205.1T	Course Title: Linux Operating System
Total Credits: 04	Marks: 100 (UA: 80 + IA: 20)
Periods: 6 per week (45 minutes each)	

Prerequisites:

The prerequisite of this course is operating system.

Learning Objectives

- To introduce students the basic knowledge of open source operating system such as Linux.
- To acquaint students about implementation of execution of Linux commands.

Learning Outcomes

Upon successful completion of the course, the students will:

1. To acquaint students with various Linux commands and installation of open source operating system.
2. To cultivate implementation skill of open source operating system.
3. To develop skills in managing software and system administration tool.
4. To prepare students for future courses having technical operating system knowledge.

Course Outline

Unit-I : Introduction and basic concepts of Linux

Introduction to Red Hat Enterprise Linux: Linux, Open Source and Red Hat, Origins of Linux, Distributions, Duties of Linux System Administrator. **Command Line:** Working with the Bash Shell, Getting the Best of Bash, Useful Bash Key Sequences, Working with Bash History, Performing Basic File System Management Tasks, Working with Directories, Piping and Redirection, Finding Files

Unit-II: System Administration task

System Administration Tasks: Performing Job Management Tasks, System and Process Monitoring and Management, Managing Processes with ps, Sending Signals to Processes with the kill Command, Using top to Show Current System Activity, Managing Process Niceness, Scheduling Jobs, Mounting Devices, Working with Links, Creating Backups, Managing Printers, Setting Up System Logging, Setting Up Rsyslog, Common Log Files, Setting Up Log rotate

Managing Software: Understanding RPM, Understanding Meta Package Handlers, Creating Your Own Repositories, Managing Repositories, Installing Software with Yum, Querying Software, Extracting Files from RPM Packages

Unit-III: Configuring and Managing Storage

Understanding Partitions and Logical Volumes, Creating Partitions, Creating File Systems, File Systems Overview, Creating File Systems, Changing File System Properties, Checking the File System Integrity, Mounting File Systems Automatically Through fstab, Working with Logical Volumes, Creating Logical Volumes, Resizing Logical Volumes, Working with Snapshots, Replacing Failing Storage Devices, Creating Swap Space, Working with Encrypted Volumes

Unit-IV: Connecting to the Network

Understanding NetworkManager, Working with Services and Runlevels, Configuring the Network with NetworkManager, Working with system-config-network, NetworkManager Configuration Files, Network Service Scripts, Networking from the Command Line, Troubleshooting Networking, Setting Up IPv6, Configuring SSH, Enabling the SSH Server, Using the SSH Client, Using PuTTY on Windows Machines, Configuring Key- Based SSH Authentication, Using Graphical Applications with SSH, Using SSH Port Forwarding, Configuring VNC Server Access

Unit-V: Working with Users, Groups, and Permissions

Managing Users and Groups, Commands for User Management, Managing Passwords, Modifying and Deleting User Accounts, Configuration Files, Creating Groups, Using Graphical Tools for User, and Group Management, Using External Authentication Sources, the Authentication Process, sssd, nsswitch, Pluggable Authentication Modules, Managing Permissions, the Role of Ownership, Basic Permissions: Read, Write, and Execute, Advanced Permissions, Working with Access Control Lists, Setting Default Permissions with umask, Working with Attributes

References:

1. Sander van Vugt, "Red Hat Enterprise Linux 6 Administration" John Wiley and Sons, 2013
2. Terry Collings and Kurt Wall, "Red hat Linux Networking and System Administration", Wiley, 2015.
3. Wale Soyinka, "Linux Administration: A Beginner's Guide", TMH, 2015.

Course Code: BIT-208P	Course Title: Lab Based on BIT-205.1T
Total Credits: 02	Marks: 50 (UA: 50 + IA: 00)
Periods: 3 per week (45 minutes each)	

Sample List of experiments to be carried out based on the course **BIT-205.1T**. Three experiments can be carried out based on each unit. Teacher can also add experiments of their choice.

	Installation of Linux RHEL 6.X
1	Practical based on Graphical User Interface and Command Line Interface and Processes
2	Practical based on Exploring the Graphical Desktop
3	Practical based on The Command Line Interface
4	Practical based on Managing Processes
5	Storage Devices and Links, Backup and Repository
6	Practical based on Working with Storage Devices and Links
7	Practical based on Making a Backup
8	Practical based on Creating a Repository
9	Practical based on Working with RPMsm Storage and Networking
10	Practical based on Using Query Options
11	Practical based on Extracting Files From RPMs
12	Practical based on Configuring and Managing Storage
13	Practical based on Connecting to the Network
14	Practical based on Working with Users, Groups, and Permissions
15	Practical based on Firewall and Cryptographic services

Course Code:BIT-205.2T	Course Title: Computational Statistics(M-2)
Total Credits: 04	Marks: 100 (UA: 80 + IA: 20)
Periods: 6 per week (45 minutes each)	

Prerequisites:

The prerequisite of this course is Mathematical concepts of computer science.

Learning Objectives

- To introduce students the basic knowledge of statistics in real time problem solving methodology.
- To acquaint students about data collection methods, data representation and collected data analysis using statistical algorithm.

Learning Outcomes

Upon successful completion of the course, the students will:

5. To acquaint students with various statistical methods and their applications in different Fields.
6. To cultivate statistical thinking among students.
7. To develop skills in handling complex problems in data analysis and research
8. To prepare students for future courses having quantitative components.

Course Outline

Unit-I : Introduction and basic concepts of Statistics

Definition of Statistics, Scope and importance of Statistics. Primary and Secondary data, Types of data : qualitative, quantitative, discrete, continuous, cross-section, time series, failure, industrial, directional data.

Unit-II: Graphical Representation of Data

Graphical presentation: Histogram, Frequency, polygon, frequency Curves Diagrammatic, presentation: Bar diagrams, Pi diagram, scatter diagram.

Unit-III: Statistical Measure for Data

Computation of mode, Merits and demerits of mode. Median: Computation for frequency and non-frequency data, computation. Merits & demerits of median. Geometric mean (G.M.) computation for G M, Merits demerits and applications of G.M., Harmonic Mean (H M) computation for frequency, non-frequency data, merits, demerits

Unit-IV: Descriptive statistics

The histogram, the density scale, cross-tabulation, the average And the SD and their relationship to the histogram, the median, the normal approximation for data, percentiles, percentiles and the normal curve, measurement error.

Unit-V: Correlation and Probability

Correlation: the scatter diagram, the correlation coefficient, properties of the correlation coefficient, Basics of Regression. Probability: basics of probability, conditional probabilities, the multiplication rule, Independence.

References:

1. "Numerical Computational Methods" - Dr.P.B.Patil, Narosa Publication Hous.
2. **Statistical Methods** By S.C.Gupta and V.K. Kapoor.

Course Code: BIT-208P	Course Title: Lab Based on BIT-205.2T
Total Credits: 02	Marks: 50 (UA: 50 + IA: 00)
Periods: 3 per week (45 minutes each)	

Sample List of experiments to be carried out based on the course **BIT-205.2T**. Three experiments can be carried out based on each unit. Teacher can also add experiments of their choice.

1. Basics of Excel- data entry, editing and saving, establishing and copying a formula, built in functions in excel, copy and paste and exporting to MS word document.
2. Graphical presentation of data (Histogram, frequency polygon).
3. Graphical presentation of data (Histogram, frequency polygon) using MS Excel
4. Diagrammatic presentation of data (Bar and Pie).
5. Diagrammatic presentation of data (Bar and Pie) using MS Excel
6. Calculate Mean, median and mode of series using excel and manually.
7. Practical of calculation Corrections for grouped data.
8. Practical for calculation probability of data.
9. Practical for calculation of central tendency using excel.
10. Practical for calculation of grouped and ungrouped data.

Course Code: BIT-213		Course Title: Constitution of India	
Total Credits: Non-Credit		Marks: ---	
Periods: 3 per week (45 minutes each)			

Course Outline

Unit-I:

1. Meaning and concept of Indian Constitution.
2. Nature of constitution.
3. Brief idea of Indian Constitution.

Unit-II: Silent Feature of Indian Constitution

Written and Enacted Constitution; The longest and most detailed Constitution of the World; Rigidity and Flexibility Constitution; Parliamentary system of Government; Federal system with unitary basis; Adult Franchise; Single Citizenship; Sovereign, Democratic, Republic; Secularism; directive Principles of state policy; independent Judiciary; Fundamental Rights; Fundamental Duties.

Unit-III:

A. Fundamental Rights

Concept of State (Art-12); Right of Equality (Art-14 to 18); Right to Freedom (Art-19 to 22); Right against Exploitation (Art-23 & 24); Right to Religion (Art-25 to 28); Right to Minorities (Art-29 & 30) Constitutional Remedies (Art-32).

Fundamental Duties (Art-51 A)

Unit-IV: Directive Principles of State Policy (DPSP's) (15 periods)

1. Meaning and Significance of Directive Principles.
2. Classification / Principles of D. P. S. P.
3. Relationship between F. Rs. and D. P. S. P.

Unit V: Executives

A) Union Government: The President, Council of Ministers and Prime Minister
State Government: The Governor, Council of Ministers and Chief Minister

References

1. Constitution of India, Bare Act. Govt. of India.
2. Subhash C. Kashyap, Our Constitution (An Introduction of Indian Constitution and Constitutional) low, National Book Trust, India 2001.

3. Avasti & Maheshwari, Indian Constitution, Lakshmi Narain Agrwal Agra 2017.
4. Basu D. D. , Introduction to the Constitution of India, Laxis Nexis 2013.
5. Sharma L. N. Indian Prime Minister, The MacMillan company of India, 1976.
6. Jain H. M. Union Executive, Chaitanya Publication House 1969.
7. Dr. S. N. Busi, Dr. B. R. Ambedkar, Framing of Indian Constitution, 1st Edition 2015.
8. M. P. Jain, Indian Constitution Law 7th Edition Nexis 2014
9. M. P. Jain, Outline of Indian Legal and Constitutional History Laxis Nexis 2014
10. भारताचे संविधान , प्रदीप गायकवाड, (संपादक) भारताचे संविधान शिल्पकार डॉ. बाबासाहेब आंबेडकर दीक्षाभूमी संदेश, नागपूर २००६
11. डॉ. भा.ल. भोळे, भारताचे शासन आणि राजकारण, विद्या प्रकाशन नागपूर

NOTE: All latest volumes of above-mentioned books must be preferred. The above list of books is not an exhaustive one.

Two Internal Test (45 Minutes)

10 Marks

Two Home Assignment

10 Marks