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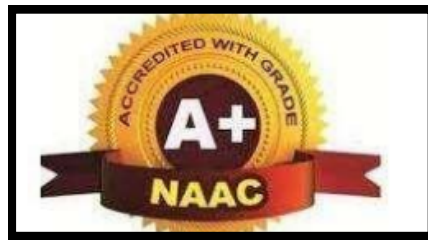
TULSIRAMJI GAIKWAD-PATIL

College of Engineering & Technology

— AN AUTONOMOUS INSTITUTE —



DEPARTMENT OF INFORMATION TECHNOLOGY



B.Tech Information Technology

As Per NEP-2020

III Year V Sem

Syllabus

Session:- 2025-26



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TULSIRAMJI GAIKWAD-PATIL

College of Engineering & Technology

— AN AUTONOMOUS INSTITUTE —



DEPARTMENT OF INFORMATION TECHNOLOGY

Vision of the Institute

To emerge as a learning Center of Excellence in the National Ethos in domains of Science, Technology and Management.

Mission of the Institute

- To strive for rearing standard and stature of the students by practicing high standards of professional ethics , transparency and accountability.
- To provide facilities and services to meet the challenges of Industry and Society.
- To facilitate socially responsive research, innovation and entrepreneurship.
- To ascertain holistic development of the students and staff members by inculcating knowledge and profession as work practices.



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College of Engineering & Technology

— AN AUTONOMOUS INSTITUTE —



DEPARTMENT OF INFORMATION TECHNOLOGY

Vision of the Department

“To emerge as a learning hub and center of excellence in the domain of Information Technology”

Mission of the Department

- To impart quality technical education through effective teaching learning process.
- To provide a platform to address societal issues as well as challenges faced by IT industries.
- To foster a culture of research and impart innovative and entrepreneurial skills in the field of IT.
- To ensure overall development of students and staff by inculcating knowledge and professional ethics as a part of lifelong learning.



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DEPARTMENT OF INFORMATION TECHNOLOGY

PEO's of the Department

PEO 1: Demonstrate essential technical skills to identify, analyze and solve problems and design issues in IT Sector.

PEO 2: Apply field knowledge, research and professional practices to meet the requirements of industries.

PEO3: Imbibe lifelong learning practices and entrepreneurship skills in tune with emerging technologies.

PEO 4: Inculcate professional ethics and managerial skills to satisfy real life problems for serving the needs of society and environment.

PSO's of the Department

PSO1: Develop and apply logical and programming skills to solve real-world challenges.

PSO2: Utilize knowledge of software engineering and network techniques to design and implement efficient solutions.

PSO3: Leverage computing knowledge to conduct research and adopt emerging technologies in the development of IT systems.



Tulsiramji Gaikwad-Patil College of Engineering & Technology, Nagpur

(An Autonomous Institution Affiliated to RTM Nagpur University, Nagpur)

SCHEME OF INSTRUCTION & SYLLABI

Programme: B. Tech. in Information Technology

Scheme of Instructions: B. Tech. Information Technology (As Per NEP 2020)

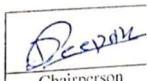


Semester- V

Sr	Sem	Type	BoS/ Dept	Sub Code	Subject	T/P	Contact Hours			Credits	% Weightage			ESE Duration	Total Marks
							L	P	Hrs		CT/IA	CA	ESE		
1	V	PCC	IT	BIT33501	Advanced Programming with Java	T	3	-	3	03	30	10	60	3 Hrs	100
2		PCC	IT	BIT33502	Theory of Computation	T	3	-	3	03	30	10	60	3 Hrs	100
3		PCC	IT	BIT33503	Design and Analysis of Algorithms	T	3	-	3	03	30	10	60	3 Hrs	100
4		PEC	IT	BIT33504-06	Program Elective-I	T	4	-	4	04	30	10	60	3 Hrs	100
5		MDM	ECE	BEC33510	Digital Logic and Fundamental of Microprocessor	T	4	-	4	04	30	10	60	3 Hrs	100
6		OEC	IT	BIT33514	Open Elective-III	T	2	-	2	02	14	6	30	2 Hrs	50
7		PCC	IT	BIT33507	Advanced Programming with Java Lab	P	-	2	2	01	-	25	25	-	50
8		PCC	IT	BIT33508	Mini Project	P	-	2	2	01	-	25	25	-	50
9		PCC	IT	BIT33509	Design and Analysis of Algorithms Lab	P	-	2	2	01	-	25	25	-	50
Total							19	6	25	22	164	131	405	17 Hrs	700

Course Category	BSC/ ESC (Basic Science Course/ Engineering Science Course.)	PCC/PEC (Programme Core courses)	VSEC (Skill Course)	Multidisciplinary Courses		Humanities Social Science & Management				Experiential Learning Courses				CC (Co-Curricular Courses)
				MDM (Multidisciplinary minor)	OE(Open Elective)	AEC(Ability Enhancement Course)	IKS(Indian Knowledge System)	VEC(Value education Course)	Management Course	Research Methodology	Field Project	Project	Internship /OJT	
Credits	-	12 / 04	-	04	02	-	-	-	-	-	-	-	-	-
Cumulative Sum	16 / 13	30 / 04	06	08	08	04	02	04	04	-	2	-	-	04

PROGRESSIVE TOTAL CREDITS:83+22=105

 Chairperson Head of Dept. (Information Tec Tulsiramji Gaikwad-Patil Co Engineering & Technology, I	 Dean Academics Tulsiramji Gaikwad-Patil College Of Engineering and Technology, Nagpur	 Vice Principal Tulsiramji Gaikwad-Patil College Of Engineering & Technology, Nagpur	 Dr. Premanand Naktoda Principal TGPCET, Nagpur	June,2025	1.00	Applicable for AY 2025-26 Onwards
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Programme: B.Tech In Information Technology

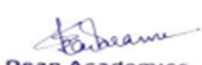
List of **Program Electives** offered by Information Technology Department

Program Elective- I	Program Elective-II	Program Elective- III	Program Elective- IV	Program Elective- V
Semester V	Semester VI	Semester VI	Semester VII	Semester VIII
BIT33504- Software Engineering & Project Management	BIT33603- Ethical Hacking	BIT33606- Digital Forensics	BIT34702- Reinforcement Learning	BIT34803- Generative AI
BIT33505- Data Warehousing and Mining	BIT33604- Social Media Analytics	BIT33607- Big Data Analytics	BIT34703- Deep Learning	BIT34804- Information Retrieval
BIT33506- Cloud Computing	BIT33605- Cyber Laws and Ethics	BIT33608- Natural Language Processing	BIT34704- Computer Vision	BIT34805- Multimedia Forensics

Program: B. Tech in Information Technology

List of **Open Electives** offered by Information Technology

Open Elective-I	Open Elective-II	Open Elective-III
Semester-III	Semester-IV	Semester-V
BIT32312- Operating Systems	BIT32413- Artificial Intelligence	BIT33514- Cyber Security

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HONORS SPECIALIZATION IN CYBER SECURITY

Sr. No	Sem	Course Code	Subject	Nature of Evaluation	Credits
1	III	BIT32307	Computer Networks and Internet Protocol	NPTEL/ESE	03
2	IV	BIT32406	Foundations of Cryptography	NPTEL/ESE	03
3	V	BIT33510	Secure Computation	NPTEL/ESE	03
4	VI	BIT33612	Cyber Security and Privacy	NPTEL/ESE	03
		BIT33613	Online Privacy	NPTEL/ESE	
5	VII	BIT34706	Block Chain and its Applications	NPTEL/ESE	03
6	VIII	BIT34807	Internship(Cyber Security 1 month)	ESE	03
7		BIT34808	Capstone Project	ESE	
Total					18

 Chairperson Head of Dept. (Information Tec Tulsiramji Gaikwad-Patil Co Engineering & Technology, I	 Dean Academics Tulsiramji Gaikwad-Patil College Of Engineering & Technology, Nagpur	 Vice Principal Tulsiramji Gaikwad-Patil College Of Engineering & Technology, Nagpur	 Dr. Premanand Naktoda Principal TGPCET, Nagpur	June,2025	1.00	Applicable for AY 2025-26 Onwards
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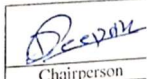
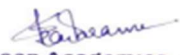
Programme: B. Tech. in Information Technology

Scheme of Instructions: B. Tech. Information Technology (As Per NEP 2020)



MINORS SPECIALIZATION IN INFORMATION TECHNOLOGY

Sr. No	Sem	Course Code	Subject	Nature of Evaluation	Credits
1	III	BIT32307	Operating System Fundamentals	NPTEL/ESE	03
2	IV	BIT32406	Programming in Modern C++	NPTEL/ESE	03
3	V	BIT33510	Introduction to Database Systems	NPTEL/ESE	03
4	VI	BIT33612	Programming In Java	NPTEL/ESE	03
5	VII	BIT34706	An Introduction to Artificial Intelligence	NPTEL/ESE	03
6	VIII	BIT34808	Internship(4 Weeks)/ Capstone Project	ESE	03
Total					18

 Chairperson Head of Dept. (Information Tec Tulsiramji Gaikwad-Patil Co Engineering & Technology, I	 Dean Academics Tulsiramji Gaikwad-Patil College Of Engineering & nd Technology, Nagpur	 Vice Principal Tulsiramji Gaikwad-Patil College Of Engineering & Technology, Nagpur	 Dr. Premanand Naktode Principal TGPCET, Nagpur	June,2025	1.00	Applicable for AY 2025-26 Onwards
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Programme: B. Tech. in Information Technology

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Exit Course

Award of UG Certificate (After First Year)

Sr. No	Course Name	Mode of conduction	Credits
01	Networking/IT support	Certification Online/Offline/NPTEL	04
02	Programming in C++	Certification Online/Offline/NPTEL	04
OR			
03	Internship(16 week)	-	08
Total			08

Award of Diploma (After 2 Year)

Sr. No	Course Name	Mode of conduction	Credits
01	Artificial Intelligence	Certification Online/Offline/NPTEL	04
02	Cloud Computing	Certification Online/Offline/NPTEL	04
OR			
03	Internship(16 week)	-	08
Total			08



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SCHEME OF INSTRUCTION & SYLLABI

Programme: B. Tech. in Information Technology

Scheme of Instructions: B. Tech. Information Technology (As Per NEP 2020)



Exit Course

Award of Vocational Degree (After 3 Year)

Sr. No	Course Name	Mode of conduction	Credits
01	Cyber Security	Certification Online/Offline/NPTEL	04
02	Industry 4.0	Certification Online/Offline/NPTEL	04
OR			
03	Internship(16 week)	-	08
Total			08

 Chairperson Head of Dept. (Information Tec Tulsiramji Gaikwad-Patil Co Engineering & Technology, I	 Dean Academics Tulsiramji Gaikwad-Patil College Of Engineering & nd Technology, Nagpur	 Vice Principal Tulsiramji Gaikwad-Patil College Of Engineering & Technology, Nagpur	 Dr. Premanand Naktodo Principal TGPCET, Nagpur	June,2025	1.00	Applicable for AY 2025-26 Onwards
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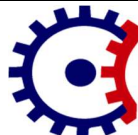
		Tulsiramji Gaikwad-Patil College of Engineering and Technology Wardha Road, Nagpur-441 108 NAAC Accredited (A+ Grade)			
Third Year (Semester-V) B. Tech. Information Technology					
BIT33501:-Advanced Programming with Java					
Teaching Scheme				Examination Scheme	
Theory	3 Hrs/week			CT-I	15 Marks
Tutorial	-			CT-II	15 Marks
Total Credits	3			CA	10 Marks
				ESE	60 Marks
		Total	100 Marks		
		Duration of ESE: 3Hrs			
Course Objectives:					
1.	To Classify Core Java Fundamentals.				
2.	To Analyze arrays, packages, and interfaces to develop modular and reusable Java applications.				
3.	To Develop and Manage Multithreaded Applications				
4.	To Utilize inheritance and polymorphism principles to create scalable Java applications				
5.	To Demonstrate Knowledge of JDBC for Database Connectivity				
Course Contents					
Unit I	Fundamentals of Java: Java virtual machine, Reflection byte codes, Data types: Primitive Data Types Integers, Floating Point type, Characters, Booleans, User Defined Data Types variable, Operators: Logical operators, Bitwise operators, Relational operators, Arithmetic operator, Control Structures: Working with control structure, Types of Control Structures, Decision Control Structure, Repetition Control Structure, Objects and Classes, Collections Framework, Functional Programming Concepts.				
Unit II	Array in Java: Introduction, Array types, Array variables, declaration, creating array object, accessing array element, changing array elements, multidimensional array. Packages: Built-in Packages, Creating User Defined Packages, accessing a Package, using a Package Interfaces: Defining Interfaces, Extending Interfaces, Implementing Interfaces, Accessing, Interface Variables. Exception Handling: Types of errors, exceptions, try-catch statement, multiple catch blocks, throw and throws keywords, finally clause, uses of exceptions, user defined exceptions				
Unit III	Multithreaded Programming: Creating thread, extending Thread class, implementing Runnable interface, life cycle of a thread, Thread priority & thread synchronization, exception handing in thread, Concurrency Utilities.				

Unit IV	Inheritance: Basics of Inheritance, Types of inheritance: single, multiple, multilevel, hierarchical and hybrid inheritance, concepts of method overriding, extending class, super class, subclass.
Unit V	String in Java: Date, Date Time, Calendar Class: Converting Date to String and String to Date using simple date format class. Java Database Connectivity Architecture: Introduction to JDBC, Java and JDBC, JDBC VS ODBC, JDBC DRIVER MODEL, JDBC Driver Types, Two-tier Architecture for Data Access, Three-tier Architecture for Data Access, SQL CONFORMANCE, Types of Driver Managers.
Text Books	
T.1	Java Programming Language Learn Java from Basic to Advance 2022 by Aamer Khan
T.2	A Textbook of Java Programming by Kakar Surbhi
Reference Books	
R.1	Programming with Java: Beginner to Advanced, 7ed (An Indian Adaptation) by Cay S. Horstmann, Wiley Editorial Team
R.2	Fundamentals of Java Programming by Ogihara
Useful Links	
1	https://onlinecourses.nptel.ac.in/noc22_cs47/preview
2	https://www.programiz.com/java-programming

	Course Outcomes	CL	Class Sessions
BIT33501.1	Classify the operators in Java for solving computational tasks.	2	9
BIT33501.2	Illustrate arrays, packages, & interfaces to develop modular and reusable Java applications.	2	9
BIT33501.3	Demonstrate the Multithreaded Applications in java programming using Thread.	3	9
BIT33501.4	Interpret inheritance & polymorphism principles to create scalable and maintainable Java applications	3	9
BIT33501.5	Apply JDBC architecture for database connectivity using appropriate driver types and access models.	3	9


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		Tulsiramji Gaikwad-Patil College of Engineering and Technology Wardha Road, Nagpur-441 108 NAAC Accredited (A+ Grade)			
Third Year (Semester-V) B. Tech. Information Technology					
BIT33502:- Theory of Computation					
Teaching Scheme				Examination Scheme	
Theory	3 Hrs/week			CT-I	15 Marks
Tutorial	-			CT-II	15 Marks
Total Credits	3			CA	10 Marks
				ESE	60 Marks
		Total	100 Marks		
				Duration of ESE: 3Hrs	
Course Objectives:					
1.	To illustrate finite state machines to solve problems in computing				
2.	To classify the theoretical foundations of computer science from the perspective of formal languages				
3.	To familiarize Regular grammars, context free grammar.				
4.	To enhance students' ability to understand and conduct mathematical proofs for computation and algorithms.				
5.	To explain the hierarchy of problems arising in the computer sciences				
Course Contents					
Unit I	Introduction: String, Alphabet, Symbols, Sets, Language, Finite Automata: Design of Finite Automata, Acceptance of strings and languages, Deterministic Finite Automation, Non-Deterministic Finite Automation, Equivalence between NFA and DFA , NFA with ϵ -transition, Minimization of FA, Equivalence between two FSM's Moore and Mealy machines.				
Unit II	Regular sets, Regular expressions, Manipulation of regular expressions, Equivalence between RE and FA. Pumping Lemma for regular languages, closure properties of regular sets, properties of regular languages, Chomsky hierarchy of languages, Regular grammars, Right linear and left linear regular grammars, Equivalence between regular grammar and FA, Inter conversion between RE and RG.				
Unit III	Context free grammar, Derivation trees (Parse tree), Syntax tree , Ambiguous Grammar, Context Free Language (CFL), Closure properties of CFL, Simplification of CFG, Normal Forms of grammar: Chomsky Normal Form (CNF), Greibach Normal Form (GNF), Push down automata, definition and model, acceptance of CFL by empty Stack and by final state, Introduction of DCFL and DPDA.				
Unit IV	Turing machine, Definition, Model of TM, Design of Turing Machine, Computable functions, Recursive enumerable language, Recursive Language, Properties of Recursive enumerable language, Variants of Turing machines, non-deterministic TMs and equivalence with deterministic TMs, context sensitive language (CSG), Linear bounded automata.				

Unit V	Decidability and Undecidability of problems, Properties of recursive & recursively enumerable languages, Halting problems, Post correspondence problem, Ackerman function, and Church's hypothesis. Recursive function: Basis functions and operations on them. Bounded minimization, unbounded minimization, preemptive recursive function and μ recursive function.
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Text Books

T.1	Introduction to Automata Theory, Languages and computation, 2nd edition, 2000 by John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman, Pearson Education Asia.
T.2	Introduction to Languages and the theory of Automata by John Martin, Third Edition (TMH)

Reference Books

R.1	Theory of Computer Science, Automata, Languages and Computation by K. L. P. Mishra and N. Chandrasekaran, Third Edition, PHI Learning.
R.2	Theory of Computation, edition 2008, O.G. Kakde, USP

Useful Links

1	https://onlinecourses.nptel.ac.in/noc21_cs83/preview
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	Course Outcomes	CL	Class Sessions
BIT33502.1	Illustrate the properties of formal languages to construct Finite automata.	2	9
BIT33502.2	Interpret Finite Automata's for Regular Expressions and Languages.	3	9
BIT33502.3	Compare the grammar & test the equivalence of pushdown automata and CFL.	4	9
BIT33502.4	Examine a computational model using Turing machine for the given problem.	4	9
BIT33502.5	Evaluate problems of decidability and computability using principles of computational theory.	5	9


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Third Year (Semester-V) B. Tech. Information Technology					
BIT33503:-Design Analysis of Algorithms					
Teaching Scheme				Examination Scheme	
Theory	3 Hrs/week			CT-I	15 Marks
Tutorial	-			CT-II	15 Marks
Total Credits	3			CA	10 Marks
				ESE	60 Marks
		Total	100 Marks		
		Duration of ESE: 3Hrs			
Course Objectives:					
1.	To Understand the foundational concepts, characteristics, and performance analysis of algorithms.				
2.	To explore algorithm design paradigms using algorithms.				
3.	To classify classical algorithms for appropriate strategies and recurrence relations.				
4.	To Develop efficient solutions for complex problems through structured algorithmic techniques.				
5.	To examine the complexity classes, and understand non-deterministic algorithms.				
Course Contents					
Unit I	Analysis of Algorithm Characteristics of algorithm, Principles of designing algorithm, Asymptotic notations, Best, average and worst-case behavior, Time & Space Complexity of Algorithm, Recurrences-Substitution method, recursion method, recurrence tree method, master method, Fundamental algorithmic Strategies.				
Unit II	Divide and Conquer Strategy Basic Strategy, Analysis of Quick Sort, Quick sort Randomized Version, Analysis of Merge Sort, Strassen's Matrix Multiplication, Maximum Array Problem Greedy Method Basic Strategy, Fractional Knapsack Problem, Huffman Coding, Minimum Cost Spanning Tree: Kruskal's and Prim's Algorithm				
Unit III	Dynamic Programming Basic strategy, Floyd War shall Algorithm, Multistage graphs, Optimal Binary Search Tree, traveling salesman problem, Longest Common Subsequence problem, 0/1 Knapsack Problem, Chained Matrix Multiplication.				

Unit IV	Backtracking Basic strategy, n queen problem, Sum of Subset, Graph Coloring, Hamilton Cycle Branch and Bound Method General method, Traveling salesman problem, 0/1 knapsack problem, LC branch and bound solution, FIFO Branch and Bound solution, LIFO Branch and Bound solution .
Unit V	NP Problems NP-Hard and NP Complete problems: Basic concepts, Non Deterministic algorithms, NP-Hard and NP Complete classes, NP- Hard problems, Cook's Theorem
Text Books	
T.1	Design & Analysis of Computer Algorithms by Aho, Pearson education. Horowitz, Sa Rajsekharam
T.2	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", Third Edition, Prentice Hall, 2010.
Reference Books	
R.1	Alfred V Aho, John E Hopcroft and Jeffrey D Ullman, "The Design and Analysis of Computer Algorithms", First Edition, Pearson Education, 2006.
R.2	Algorithm Design: Foundations, Analysis and Internet examples, M.T.Goodrich R. Tomassia, John Wiley and sons
Useful Links	
1	https://nptel.ac.in/courses/106/101/106101060/
2	https://nptel.ac.in/courses/106/106/106106131/

	Course Outcomes	CL	Class Sessions
BIT33503.1	Classify algorithm efficiency and fundamental algorithmic strategies.	2	9
BIT33503.2	Demonstrate Divide & Conquer and Greedy strategies to solve problems and analyze their efficiency	3	9
BIT33503.3	Implement Dynamic Programming techniques to solve complex optimization problems	3	9
BIT33503.4	Apply Backtracking and Branch & Bound strategies to solve combinatorial problem.	3	9
BIT33503.5	Analyze NP-Hard and NP-Complete problems by identifying problem classes	4	9


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Third Year (Semester-V) B. Tech. Information Technology					
BIT33504:-Software Engineering & Project Management (Program Elective-I)					
Teaching Scheme				Examination Scheme	
Theory	4 Hrs/week			CT-I	15 Marks
Tutorial	-			CT-II	15 Marks
Total Credits	4			CA	10 Marks
				ESE	60 Marks
		Total	100 Marks		
		Duration of ESE: 3Hrs			
Course Objectives:					
1.	To classify the nature and types of software, including the special characteristics of WebApps.				
2.	To Explore flow-oriented and behavioral modeling strategies.				
3.	To Understand the concept of agility and how it addresses the cost of change.				
4.	To Identify the factors contributing to project success or failure				
5.	To Explore quality models and their application in ensuring deliverable standards.				
Course Contents					
Unit I	Software and Software Engineering: The nature of Software, The unique nature of WebApps, Software Engineering, The software Process, Software Engineering Practice, Software Myths. Process Models: A generic process model, Process assessment and improvement, Prescriptive process models: Waterfall model, Incremental process models, Evolutionary process models, Concurrent models, Specialized process models. Unified Process , Personal and Team process models				
Unit II	Understanding Requirements: Requirements Engineering, Establishing the ground work, Eliciting Requirements, Developing use cases, Building the requirements model, Negotiating Requirements, Validating Requirements. Requirements Modeling Scenarios, Information and Analysis classes: Requirement Analysis, Scenario based modeling, UML models that supplement the Use Case, Data modeling Concepts, Class-Based Modeling. Requirement Modeling Strategies: Flow oriented Modeling , Behavioral Modeling.				
Unit III	Agile Development: Define Agility and its process, Agility and the cost of change. Extreme Programming (XP), Other Agile Process Models, A tool set for Agile process. Principles that guide practice: Software Engineering Knowledge, Core principles, Principles that guide each framework activity.				

Unit IV	Introduction to Project Management: Introduction, Project and Importance of Project Management, Contract Management, Activities Covered by Software Project Management, Plans, Methods and Methodologies, Some ways of categorizing Software Projects, Stakeholders, Setting Objectives, Business Case, Project Success and Failure, Management and Management Control, Project Management life cycle, Traditional versus Modern Project Management Practices. Project Evaluation: Evaluation of Individual projects, Cost–benefit Evaluation Techniques, Risk Evaluation
Unit V	Software Quality: Introduction, The place of software quality in project planning, Importance of software quality, Defining software quality, Software quality models, product versus process quality management. Software Project Estimation: Observations on Estimation, Decomposition Techniques, Empirical Estimation Models.
Text Books	
T.1	Roger S. Pressman: Software Engineering-A Practitioners approach, 7th Edition, Tata McGraw Hill
T.2	Bob Hughes, Mike Cotterell, Rajib Mall: Software Project Management, 6th Edition, McGraw Hill Education, 2018.
Reference Books	
R.1	“Software Engineering: Principles and Practice”, Hans van Vliet, Wiley India, 3rd Edition, 2010.
R.2	Pankaj Jalote: An Integrated Approach to Software Engineering, Wiley India.
Useful Links	
1	https://onlinecourses.nptel.ac.in/noc20_cs68/preview

	Course Outcomes	CL	Class Sessions
BIT33504.1	Explain the nature and fundamental principles of software engineering.	2	9
BIT33504.2	Classify requirements engineering techniques to identify, analyze, and model user requirements.	2	9
BIT33504.3	Demonstrate Agile methodologies and their use in dynamic project environments.	3	9
BIT33504.4	Discuss project management principles to plan, execute, and control software projects.	2	9
BIT33504.5	Analyze software quality and estimation techniques to improve project outcomes.	4	9

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Third Year (Semester-V) B. Tech. Information Technology					
BIT33505:- Data Warehousing and Mining (Program Elective-I)					
Teaching Scheme				Examination Scheme	
Theory	4 Hrs/week			CT-I	15 Marks
Tutorial	-			CT-II	15 Marks
Total Credits	4			CA	10 Marks
				ESE	60 Marks
		Total	100 Marks		
		Duration of ESE: 3Hrs			
Course Objectives:					
1.	To classify the fundamentals, need, structure, and cost of data warehousing for effective data management.				
2.	To classify data warehousing architecture, modeling techniques, ETL processes, and OLAP operations for efficient data analysis.				
3.	To explain data preprocessing techniques, and transformation, for improving data quality.				
4.	To provide fundamental knowledge of data mining concepts, techniques, and applications				
5.	To introduce classification techniques and equip students with the ability to compare and apply different classifiers effectively.				
Course Contents					
Unit I	Introduction to Data Warehousing, The need for data warehousing, Operational & Informational Data Stores, Data Warehouse Characteristics, Data Warehouse role & Structure, The cost of warehousing data.				
Unit II	Data Warehousing & modeling: Basic Concepts: Data Warehousing: A multitier Architecture, Data warehouse models: Enterprise warehouse, Data mart and virtual warehouse, Extraction, Transformation and loading, Data Cube: A multidimensional data model, Stars, Snowflakes and Fact constellations: Schemas for multidimensional Data models, Dimensions: The role of concept Hierarchies, Measures: Their Categorization and computation, Typical OLAP Operations				
Unit III	Data Preprocessing: Data Processing An overview: Data Quality, Major Task in data Preprocessing. Data Cleaning Missing Values, Noisy Data, Data cleaning as a Process. Data Integration, Data Reduction, Data Transformation Strategies Overview.				

Unit IV	Data Mining: Fundamentals of data mining, Relationship of data warehousing and data mining, what is data mining, kind of data mined, kind of patterns mined, Technologies used for mining, kind of application targeted by mining, Major issues in data mining, Data mining applications.
Unit V	Buisness Intilligence and Big Data: BI-Defining Business Intelligence, Important factors in BI, BI Architecture, BI framework. Development of BI system, BI applications in Marketing, Logistics and Production, Retail Industry. Big Data: Understanding the challenges of Big data, Big data meets hadoop. Hadoop: Meeting Big data challenges, Hadoop Ecosystem, Core components, developing applications with Hadoop.

Text Books

T.1	Pang-Ning Tan, Michael Steinbach, Vipin Kumar: Introduction to Data Mining, Pearson, First impression, 2014
T.2	Jiawei Han, Micheline Kamber, Jian Pei: Data Mining -Concepts and Techniques, 3rd Edition, Morgan Kaufmann Publisher, 2012

Reference Books

R.1	The Data Warehouse Toolkit: The Definitive Guide to Dimensional Modeling 3rd Edition by <u>Ralph Kimball</u> , <u>Margy Ross</u>
R.2	Agile Data Warehouse Design: Collaborative Dimensional Modeling, from Whiteboard to Star Schema 42745th Edition by <u>Lawrence Corr</u> , <u>Jim Stagnitto</u>

Useful Links

1	http://nptel.ac.in/courses/106106093/35
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	Course Outcomes	CL	Class Sessions
BIT33505.1	Classify data warehouse concepts and their role in enabling business intelligence.	2	9
BIT33505.2	Illustrate data warehouse models, and perform OLAP operations using multidimensional data models	2	9
BIT33505.3	Apply data preprocessing strategies to handle raw data for effective analysis.	3	9
BIT33505.4	Analyze data and patterns along with suitable mining technologies.	4	9
BIT33505.5	Examine the architecture, and framework of Business Intelligence using Hadoop ecosystem.	4	9

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Third Year (Semester-V) B. Tech. Information Technology					
BIT33506:-Cloud Computing (Program Elective-I)					
Teaching Scheme				Examination Scheme	
Theory	4 Hrs/week			CT-I	15 Marks
Tutorial	-			CT-II	15 Marks
Total Credits	4			CA	10 Marks
				ESE	60 Marks
		Total	100 Marks		
		Duration of ESE: 3Hrs			
Course Objectives:					
1.	To classify the fundamentals of cloud computing and virtualization				
2.	To gain insights into service deployment, performance, and scalability management.				
3.	To explore cloud-based data and resource management				
4.	To Evaluate security challenges and risk management strategies in cloud environments				
5.	To Familiarize with leading cloud platforms				
Course Contents					
Unit I	Introduction to Cloud Computing and Virtualization: Virtualization Concepts, Cloud Computing Fundamental: Overview of Computing Paradigm, Evolution of cloud computing, Defining cloud computing, Components of a computing cloud, Essential Characteristics of Cloud Computing, Cloud Taxonomy. Infrastructure as a Service(IaaS), Platform as a Service(PaaS), Software as a Service (SaaS), Hardware-as-a-service: (HaaS), Oriented Architecture (SOA)				
Unit II	Cloud Computing Architecture and Service Management in Cloud: Computing Cloud architectural principles, Role of Web services, Benefits and challenges to Cloud architecture, Cloud Service Models, cloud computing vendors. Cloud Services, Management, Performance and scalability of services, tools and technologies used to manage cloud services deployment				
Unit III	Management in Cloud: Data Management in Cloud Computing and Resource Management in Cloud, Big Data in the Cloud. Salesforce as Cloud CRM: Overview of Salesforce platform and services, Use of Salesforce for cloud-based customer relationship management, Case studies on Salesforce integration and deployment in cloud environments				
Unit IV	Cloud Security and Risk Management: Cloud Security: Understanding cloud based security issues and threats, Data security and Storage, Identity & Access Management, Risk Management in cloud, Governance and Enterprise Risk Management.				

Unit V	Open Source and Commercial Clouds: Openstack, AWS, Google Cloud, Microsoft Azure, Cloud Simulator and IoT Cloud Framework, Research trend in Cloud Computing, Fog Computing.
Text Books	
T.1	Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wiley, 2011
T.2	Enterprise Cloud Computing - Technology, Architecture, Applications, Gautam Shroff, Cambridge University Press, 2010
Reference Books	
R.1	Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010
R.2	Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley- India, 2010
Useful Links	
1	https://onlinecourses.nptel.ac.in/noc21_cs14/preview

	Course Outcomes	CL	Class Sessions
BIT33506.1	Explain the concepts of virtualization and the fundamental principles of cloud computing.	2	9
BIT33506.2	Classify cloud architecture principles and service management techniques.	2	9
BIT33506.3	Discuss concepts of data and resource management in cloud	2	9
BIT33506.4	Analyze cloud security mechanisms and risk mitigation strategies.	4	9
BIT33506.5	Compare open-source and commercial cloud platforms and examine modern cloud research trends.	4	9

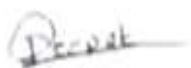

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		Tulsiramji Gaikwad-Patil College of Engineering and Technology Wardha Road, Nagpur-441 108 NAAC Accredited (A+ Grade)			
Third Year (Semester-V) B. Tech. Information Technology					
BEC33510: Digital Logic and Fundamental of Microprocessor					
Teaching Scheme				Examination Scheme	
Theory	4 Hrs/week			CT-I	15 Marks
Tutorial	-			CT-II	15 Marks
Total Credits	4			CA	10 Marks
				ESE	60 Marks
		Total	100 Marks		
		Duration of ESE: 3Hrs			
Course Objectives:					
1.	To classify the working principles of various combinational circuits and their applications in different digital systems.				
2.	To analyze and recognize various sequential components utilized in the design of combinational circuits.				
3.	To develop the skills to design and validate the operation of various combinational and sequential circuits.				
4.	To provide knowledge on the 8085 microprocessors, covering its architecture, functionalities, addressing modes, port types, and practical applications.				
5.	To explore the use of Assembly language programming for the 8085 microprocessor, emphasizing its timing, control features in industrial embedded systems.				
Course Contents					
Unit I	Logic Simplification: Number system, Binary Arithmetic, Boolean algebra and De Morgan's Theorem, Logic Gates, SOP & POS forms, Logic Optimization Technique, Karnaugh maps.				
Unit II	Combinational logic Design: Comparators, Multiplexers, Demultiplexer, Encoder, Decoder, Arithmetic Circuit Design, Adder, Subtractors. Minimization of combinational circuits.				
Unit III	Sequential Logic Design: Latches, Flip flop – S-R, J-K, D, T and Master-Slave JK FF, Counters, Shift registers. Excitation table, Conversion of one type of F/F to another.				
Unit IV	Microprocessor Introduction: 8085 microprocessor architecture, addressing modes, instruction sets.				
Unit V	Interrupts & Programming: Interrupts, Basic memory organization, Timing diagram, Programming in 8085.				

Text Books	
T.1	Fundamentals of Digital Circuits, A. Kumar, Prentice Hall India, 2016.
T.2	Modern Digital Electronics, R. P. Jain, McGraw Hill Education, 2009.
Reference Books	
R.1	Digital logic and Computer design, M. M. Mano, Pearson Education India, 2016.
R.2	Digital Electronic Principles, By Malvino PHI, 3 Edition. 2014
Useful Links	
1	https://onlinecourses.nptel.ac.in/noc21_ee10/preview

	Course Outcomes	CL	Class Sessions
BEC33510.1	Express number systems and logic simplification techniques using Boolean algebra and Karnaugh maps.	2	9
BEC33510.2	Identify the sequential components used in combinational circuits.	2	9
BEC33510.3	Demonstrate functionality of various combinational and sequential circuits.	3	9
BEC33510.4	Apply the features, addressing modes, and port types of the 8085 microprocessor in real-time applications	3	9
BEC33510.5	Interpret assembly language program for 8085 Microprocessor, Timing and Control Panel of 8085.	3	9


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Third Year (Semester-V) B. Tech. Information Technology					
BIT33514:- Cyber Security(Open Elective-III)					
Teaching Scheme				Examination Scheme	
Theory	2 Hrs/week			CT-I	07 Marks
Tutorial	-			CT-II	07 Marks
Total Credits	2			CA	06 Marks
				ESE	30 Marks
		Total	50 Marks		
		Duration of ESE: 2Hrs			
Course Objectives:					
1.	To Understand fundamental cybersecurity concepts, and types of cybercrimes				
2.	To Identify security challenges wireless computing, and comprehend organizational policies to evaluate associated risks.				
3.	To Explore emerging trends in cybersecurity.				
Course Contents					
Unit I	Fundamentals of Cybersecurity : Introduction to Cyber Security, CIA (Confidentiality, Integrity, and Availability) triad, threat, vulnerability, introduction to cybercrime ,Reasons of cybercrime, Types of cybercrime, Mobile and wireless device.				
Unit II	Mobile and Wireless Security : Credit Card Fraud in Smart Phone and Wireless Computing Era; Security challenges posed by Mobile devices; Authentication Service Security, Attacks on Mobile, Security implication for Organizations; Organizational Security polices and Measures in Mobile Computing Era, UPI Security.				
Unit III	Cyber Threats and Defense Mechanisms : Introduction to Emerging Trends in Cyber Security, Fighting cyber-Attacks-Authentication, Phishing Attacks, Password Cracking Techniques, Spyware, Viruses and Worms Basic Defense Mechanisms: Authentication Methods, Cryptography, Firewalls, Secure Web Browsing Practices Emerging Trends in Cybersecurity : Internet of Things (IoT) Security, Artificial Intelligence and Machine Learning in Cybersecurity, Blockchain Technology and Cybersecurity, Careers in Cybersecurity				
Text Books					
T.1	Cryptography and Network Security Principles and Practice, 8th Edition - Pearson - by William Stallings				
T.2	A. Basta, N. Basta, M. Brown, R. Kumar, Cyber Security and Cyber Laws, Cengage, 2018.				

Reference Books	
R.1	W. Stallings and L. Brown, Computer Security: Principles and Practice, 4th ed. Pearson, 2018.
R.2	R. Meeuwisse, Cybersecurity for Beginners (2nd ed.). Cyber Simplicity Ltd., 2017.
Useful Links	
1	https://onlinecourses.swayam2.ac.in/nou19_cs08/preview

	Course Outcomes	CL	Class Sessions
BIT33514.1	Explain key cybersecurity principles and types of cybercrimes.	2	10
BIT33514.2	Analyze security issues in mobile and wireless computing to mitigate risks through organizational policies..	4	10
BIT33514.3	Evaluate emerging technologies in cybersecurity, and assess their implications for future security challenges.	5	10


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Third Year (Semester-V) B. Tech Information Technology		
BIT33507: Advance Programming with Java Lab		
Teaching Scheme		Examination Scheme
Practical	2 Hrs/week	CA 25 Marks
Total Credits	1	ESE 25 Marks
		Total 50 Marks

Sr. No	List of Practical	CO
1	Apply core Java fundamentals by using primitive and user-defined data types in a program that performs arithmetic and relational operations based on user input.	CO1
2	Develop a Java program that applies core Java fundamentals by implementing control structures such as if, switch-case, and loops to process input, make decisions, and perform repetitive tasks.	CO1
3	Demonstrate the use of single and multidimensional arrays in Java through basic and advanced operations.	CO2
4	Implement Java exception handling using try-catch, multiple catch blocks, throw/throws, finally, and user-defined exceptions.	CO2
5	Design a multithreading program in Java by creating threads using both the Thread class and the Runnable interface, and by demonstrating the thread life cycle and thread priority.	CO3
6	Evaluate thread synchronization and exception handling in multithreaded Java programs, ensuring proper management of concurrent access and error handling.	CO3
7	Analyze the basic concepts and types of inheritance in Java, including single, multilevel, and hierarchical inheritance, and their practical applications.	CO4
8	Implement method overriding, and use of superclass and subclass concepts to illustrate real-world inheritance scenarios.	CO4
9	Demonstrate and apply the use of Date, Calendar, and Simple Date Format classes in Java for converting between Date and String.	CO5
10	Analyze Java Database Connectivity (JDBC) by connecting Java applications to a database using various JDBC drivers and executing basic SQL operations.	CO5

Text Books	
1	"Competitive Programming" by Steven Halim & Felix Halim
2	Introduction to Algorithms" by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein
Reference Books	
1	Elements of Programming Interviews in Java" by Adnan Aziz, Tsung-Hsien Lee, and Amit Prakash
2	Java Programming for Problem Solving" by P. S. Deshpande & O. G. Kakde.
Useful Links	
1	https://www.hackerrank.com/domains/tutorials/10-days-of-java
2	https://onlinecourses.nptel.ac.in/noc22_cs47/preview

	Course Outcomes	CL	Lab Sessions
BIT33507.1	Classify the operators in Java for solving computational tasks.	2	4
BIT33507.2	Illustrate arrays, packages, & interfaces to develop modular and reusable Java applications.	2	4
BIT33507.3	Demonstrate the Multithreaded Applications in java programming using Thread.	3	4
BIT33507.4	Interpret inheritance & polymorphism principles to create scalable and maintainable Java applications	3	4
BIT33507.5	Apply JDBC architecture for database connectivity using appropriate driver types and access models.	3	4


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Third Year (Semester-V) B.Tech. Information Technology

BIT33509: Design and Analysis of Algorithms Lab

Teaching Scheme				Examination Scheme	
Practical	2 Hrs/week			CA	25 Marks
Total Credits	1			ESE	25 Marks
				Total	50 Marks

Sr. No	List of Practical	CO
1	To classify the program to implement Recursive and iterative Linear and Binary Search	CO1
2	Write a program to implement Masters Theorem.	CO1
3	Classify a program to implement Quick sort and analyze its best, average and worst case	CO2
4	Write a program to implement minimum cost spanning tree using Krushkal's Algorithm	CO2
5	To write a program to implement Floyd's warshall algorithm.	CO3
6	Write a program to implement 0/1 Knapsack problem using Dynamic Programming	CO3
7	Write a program to implement N Queen Problem using Backtracking.	CO4
8	Design and implement C/C++ Program to find a subset of a given set $S = \{s_1, s_2, \dots, s_n\}$ of n positive integers whose sum is equal to a given positive integer d.	CO4
9	Write a program to implement Traveling salesman problem using Brach and Bound method	CO4
10	To demonstrate the concept of Cook's Theorem.	CO5

Text Books	
1	Design & Analysis of Computer Algorithms by Aho, Pearson education. Horowitz, Sa Rajsekham
2	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", Third Edition, Prentice Hall, 2010.
Reference Books	
1	Alfred V Aho, John E Hopcroft and Jeffrey D Ullman, "The Design and Analysis of Computer Algorithms", First Edition, Pearson Education, 2006.
2	Algorithm Design: Foundations, Analysis and Internet examples, M.T.Goodrich R. Tomassia, John Wiley and sons
Useful Links	
1	https://nptel.ac.in/courses/106/101/106101060/
2	https://nptel.ac.in/courses/106/106/106106131/

	Course Outcomes	CL	Lab Sessions
BIT33509.1	Classify algorithm efficiency and fundamental algorithmic strategies.	2	4
BIT33509.2	Demonstrate Divide & Conquer and Greedy strategies to solve problems and analyze their efficiency	3	4
BIT33509.3	Implement Dynamic Programming techniques to solve complex optimization problems	3	4
BIT33509.4	Apply Backtracking and Branch & Bound strategies to solve combinatorial problem.	3	4
BIT33509.5	Analyze NP-Hard and NP-Complete problems by identifying problem classes	4	4


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