DEPARTMENT OF INFORMATION TECHNOLOGY

B. Tech in Information Technology

As Per NEP 2020
(Version 3)

Scheme of Instruction
&
Syllabyus

From AY. 2025-26

GAIKWAD-PATIL
GROUP OF INSTITUTIONS

Vision Mission of Institution

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

Mission -

- 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.

Vision Mission of Department

Vision - To emerge as a learning hub and centre of excellence in the domain of Information Technology

Mission -

- 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.

Program Specific Outcomes

PSO1: Develop and apply logical and programing 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.

Program Educational Outcomes

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.

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 New NEP 2020)

Semester- III

Sr. No	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	III	PCC	IT	BIT42301	Data Structure	T	3	-	3	03	30	10	60	3 Hrs.	**100**
2		PCC	IT	BIT42302	Advanced Computer Networks	T	3	-	3	03	30	10	60	3 Hrs.	**100**
3		MDM	SH	BSH42303	Numerical Methods and Statistical Analysis	T	2	-	2	02	14	06	30	2 Hrs.	**50**
4		OEC	IT	BIT42312	Open Elective-I (Operating System)	T	4	-	4	04	30	10	60	3 Hrs.	**100**
5		HSSM	MBA	BBA42303	Personal Finance Management	T	2	-	2	02	14	06	30	2 Hrs.	**50**
6		PCC	CE	BCE42308	Sustainable Development Goals	T	2	-	2	02	14	06	30	2 Hrs.	**50**
7		FP/CP	IT	BIT42304	Community Engineering Project	P	-	4	4	02	50	-	-	2 Hrs.	**50**
8		PCC	IT	BIT42305	Data Structure Lab	P	-	2	2	01	-	25	25	2 Hrs.	**50**
9		PCC	IT	BIT42306	Computer Networks Lab	P	-	2	2	01	-	25	25	2 Hrs.	**50**
10		AEC	BSH	BSH42XX	Liberal Learning Module -III	P	-	2	2	01	50	-	-	2 Hrs.	**50**
Total							**16**	**10**	**26**	**21**	**232**	**98**	**320**	**23 Hrs**	**650**

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	-	10	00	02	04	02	-	-	02	-	2	-	-	-
Cumulative Sum	16 / 13	12	04	02	04	04	02	-	02	-	2	-	-	04

PROGRESSIVE TOTAL CREDITS:43+21=64

Head of Dept. (Information Technology) Tulsiramji Gaikwad-Patil College of Engineering & Technology Nagpur	Director Academics Tulsiramji Gaikwad-Patil College Of Engineering And Technology, Nagpur	Patel	Dr. Premanand Naktode Principal TGPCET, Nagpur	June, 2026	3.00
Chairperson	Vice-Principal/ Director Academics	Director Administration	Principal	Date of Release	Version

Applicable for AY2025-26 Onwards

Tulsiramji Gaikwad-Patil College of Engineering &Technology, Nagpur

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SCHEME OF INSTRUCTION & SYLLABI

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

Semester- IV

Sr. No	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	IV	PCC	IT	BIT42401	Operating System	T	3	-	3	03	30	10	60	3 Hrs.	**100**
2		PCC	IT	BIT42402	Database Management System	T	3	-	3	03	30	10	60	3 Hrs.	**100**
3		MDM	SH	BSH42401	Discrete mathematics & Graph Theory	T	2	-	2	02	14	6	30	2 Hrs.	**50**
4		OEC	IT	BIT42413	Open Elective-II (Artificial Intelligence)	T	2	-	2	02	14	6	30	2 Hrs.	**50**
5		VSEC	IT	BIT42403	Object Oriented Programming with C++	P	-	4	4	02	-	50	50	2 Hrs.	**100**
6		AEC	SH	BSH42404	Leadership and Team Dynamics	P	-	4	4	02	-	50	50	2 Hrs.	**100**
7		HSSM	MBA	BBA42402	Innovation and Entrepreneurship	T	2	-	2	02	14	6	30	2 Hrs.	**50**
8		VEC	SH	BSH42403	Human Value for Professional Society	T	2	-	2	02	14	6	30	2 Hrs.	**50**
9		PCC	IT	BIT42404	Operating System using Python Lab (Idea Lab)	P	-	2	2	01	-	25	25	2 Hrs.	**50**
10		PCC	IT	BIT42405	Database Management System Lab	P	-	2	2	01	-	25	25	2 Hrs.	**50**
11		AEC	BSH	BSH42XX	Liberal Learning Module-IV	P	-	2	2	01	50	-	-	-	**50**
Total							**14**	**14**	**28**	**21**	**166**	**194**	**390**	**22 Hrs**	**750**

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	-	08	02	02	02	02	-	02	02	-	-	-	-	-
Cumulative Sum	16 / 13	20	06	04	06	06	02	02	04	-	2	-	-	04

PROGRESSIVE TOTAL CREDITS:64+21=85

Chairperson	Vice-Principal/ Director Academics	Director Administration	Principal	Date of Release	Version	
Head of Dept. (Information Technology) Tulsiramji Gaikwad-Patil College of Engineering & Technology Nagpur	Director Academics Tulsiramji Gaikwad-Patil College Of Engineering And Technology, Nagpur	Patil	Dr. Premanand Naktode Principal TGPCET, Nagpur	June, 2026	3.00	Applicable for AY2025-26 Onwards

Tulsiramji Gaikwad-Patil College of Engineering &Technology, Nagpur

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SCHEME OF INSTRUCTION & SYLLABI

Programme: B. Tech. in Information Technology

Scheme of Instructions: B. Tech. Information Technology (As Per New 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	BIT43501	Advanced Programming with Java	T	3	-	3	03	30	10	60	3 Hrs	**100**
2		PCC	IT	BIT43502	Theory of Computation	T	3	-	3	03	30	10	60	3 Hrs	**100**
3		PCC	IT	BIT43503	Design and Analysis of Algorithms	T	3	-	3	03	30	10	60	3 Hrs	**100**
4		PEC	IT	BIT43504-06	Program Elective-I	T	4	-	4	04	30	10	60	3 Hrs	**100**
5		MDM	ECE	BEC43510	Digital Logic and Fundamental of Microprocessor	T	4	-	4	04	30	10	60	3 Hrs	**100**
6		OEC	IT	BIT43514	Open Elective-III	T	2	-	2	02	14	6	30	2 Hrs	**50**
7		PCC	IT	BIT43507	Advanced Programming with Java Lab	P	-	2	2	01	-	25	25	-	**50**
8		VSEC	IT	BIT43508	Data Analytics (Lab)	P	-	2	2	01	-	25	25	-	**50**
9		PCC	IT	BIT43509	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	-	11 / 04	01	04	02	-	-	-	-	-	-	-	-	-
Cumulative Sum	16 / 13	31 / 04	07	08	08	06	02	04	04	-	2	-	-	04

PROGRESSIVE TOTAL CREDITS:85+22=107

Chairperson	Vice-Principal/ Director Academics	Director Administration	Principal	Date of Release	Version
Head of Dept. (Information Technology) Tulsiramji Gaikwad-Patil College of Engineering & Technology Nagpur	Director Academics Tulsiramji Gaikwad-Patil College Of Engineering And Technology, Nagpur	Patil	Dr. Premanand Naktode Principal TGPCET, Nagpur	June, 2026	3.00

Applicable for AY2025-26 Onwards

Tulsiramji Gaikwad-Patil College of Engineering &Technology, Nagpur

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Semester- VI

Sr. No	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	VI	PCC	IT	BIT43601	Interactive Web Programing	T	3	-	3	03	30	10	60	3 Hrs	**100**
2		PCC	IT	BIT43602	Artificial Intelligence & Machine Learning	T	3	-	3	03	30	10	60	3 Hrs	**100**
3		PEC	IT	BIT43603-05	Program Elective-II	T	4	-	4	04	30	10	60	3 Hrs	**100**
4		PEC	IT	BIT43606-08	Program Elective-III	T	4	-	4	04	30	10	60	3 Hrs	**100**
5		MDM	ECE	BEC43611	Internet of Things	T	2	-	2	02	14	6	30	2 Hrs	**50**
6		PRO	IT	BIT43509	Mini Project	P	-	2	2	01	-	25	25	-	**50**
7		PCC	IT	BIT43610	Interactive Web Programing Lab	P	-	2	2	01	-	25	25	-	**50**
8		PCC	IT	BIT43611	Artificial Intelligence & Machine Learning	P	-	2	2	01	-	25	25	-	**50**
9		PCC	IT	BIT43612	Prompt Engineering Lab	P	-	2	2	01	-	25	25	-	**50**
Total							**16**	**8**	**26**	**20**	**164**	**158**	**430**	**18 Hrs**	**750**

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	-	09/08	-	2	-	-	-	-	-	-	-	01	-	-
Cumulative Sum	16 / 13	40/12	07	10	08	04	02	04	04	-	2	01	-	04

PROGRESSIVE TOTAL CREDITS:107+20=127

Chairperson	Vice-Principal/ Director Academics	Director Administration	Principal	Date of Release	Version	
Head of Dept. (Information Technology) Tulsiramji Gaikwad-Patil College of Engineering & Technology, Nagpur	Director Academics Tulsiramji Gaikwad-Patil College Of Engineering And Technology, Nagpur	Patil	Dr. Premanand Naktode Principal TGPCET, Nagpur	June, 2026	3.00	Applicable for AY2025-26 Onwards

Tulsiramji Gaikwad-Patil College of Engineering &Technology, Nagpur

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Semester- VII

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	VIII	PCC	IT	BIT44701	Cryptography and Information Security	T	3	-	3	3	30	10	60	3 Hrs	**100**
2		PCC	IT	BIT44702	Cryptography and Information Security lab	P	2	2	2	1	-	25	25	2 Hrs	**50**
3		PCC	IT	BIT44703	Software Testing & Quality Assurance	T	3	-	3	4	30	10	60	3 Hrs	**100**
4		PEC	IT	BIT44704-06	Program Elective-IV *	T	4	-	4	4	30	10	60	3 Hrs	**100**
5		PEC	IT	BIT44707-09	Program Elective-V*	T	4	-	4	4	30	10	60	3 Hrs	**100**
6		MDM	ECE	BEC44710	Embedded Systems and Interfacing	T	4	-	4	4	30	10	60	3 Hrs	**100**
7		PRO	IT	BIT44710	Project	P	-	8	8	4	-	75	75	-	**150**
Total							**17**	**10**	**25**	**24**	**120**	**140**	**340**	**14**	**600**

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	-	08/08	-	4	-	-	-	-	-	-	-	04	12	-
Cumulative Sum	16 / 13	48/20	7	14	08	04	02	04	04	-	2	05	12	04

PROGRESSIVE TOTAL CREDITS:127+24=151

Head of Dept. (Information Technology) Tulsiramji Gaikwad-Patil College of Engineering & Technology Nagpur	Director Academics Tulsiramji Gaikwad-Patil College Of Engineering And Technology, Nagpur	Patil	Dr. Premanand Naktode Principal TGPCET, Nagpur	June, 2026	3.00	Applicable for AY2025-26 Onwards
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Tulsiramji Gaikwad-Patil College of Engineering &Technology, Nagpur

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

Semester- VIII

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	VIII	OJT	IT	BIT44801	Industry Internship	P	-	26	26	13	-	100	100	3 Hrs	**200**
2		RM	ME	BME4802	Research Methodology (Online)	T	4	-	4	4	30	10	60	3 Hrs	**100**
Total							**4**	**26**	**30**	**17**	**30**	**110**	**160**	**6 Hrs**	**300**

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	-	-	-	-	-	-	-	-	-	04	-	-	13	-
Cumulative Sum	16 / 13	48/20	7	14	08	04	02	04	04	04	2	05	13	04

PROGRESSIVE TOTAL CREDITS:151+17=168

Head of Dept. (Information Technology) Tulsiramji Gaikwad-Patil College of Engineering & Technology Nagpur	Director Academics Tulsiramji Gaikwad-Patil College Of Engineering And Technology, Nagpur	Patil	Dr. Premanand Naktode Principal TGPCET, Nagpur	June, 2026	3.00	Applicable for AY2025-26 Onwards
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Tulsiramji Gaikwad-Patil College of Engineering &Technology, Nagpur

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SCHEME OF INSTRUCTION & SYLLABI

Programme: B. Tech. in Information Technology

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

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 VII**
BIT43504- Software Engineering & Project Management	**BIT43603-** Ethical Hacking	**BIT43606-** Digital Forensics	**BIT44704-** Reinforcement Learning	**BIT44707-** Generative AI
BIT43505- Data Warehousing and Mining	**BIT43604-** Social Media Analytics	**BIT43607-** Big Data Analytics	**BIT44705-** Deep Learning	**BIT44708-** Information Retrieval
BIT43506- Cloud Computing	**BIT43605-** Cyber Laws and Ethics	**BIT43608-** Natural Language Processing	**BIT44706-** Computer Vision	**BIT44709-** 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
BIT42312- Operating Systems	BIT42413- Artificial Intelligence	BIT43514- Cyber Security

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HONORS SPECIALIZATION IN CYBER SECURITY

Sr. No	Sem	Course Code	Subject	Nature of Evaluation	Credits
1	III	BIT42325	Computer Networks and Internet Protocol	ESE	03
2	IV	BIT42425	Foundations of Cryptography	ESE	03
3	V	BIT43525	Secure Computation	ESE	03
4	VI	BIT43625	Cyber Security and Privacy	ESE	03
		BIT43626	Online Privacy	ESE	
5	VII	BIT44725	Block Chain and its Applications	ESE	03
6	VIII	BIT44825	Internship (Cyber Security 1 month)	ESE	03
7		BIT44826	Capstone Project	ESE	
Total					18

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MINORS SPECIALIZATION IN INFORMATION TECHNOLOGY

Sr. No	Sem	Course Code	Subject	Nature of Evaluation	Credits
1	III	BIT42321	Introduction to Operating System	ESE	03
2	IV	BIT42421	Programming Using C++	ESE	03
3	V	BIT43521	Introduction to Database Systems	ESE	03
4	VI	BIT43621	Programming In Java	ESE	03
5	VII	BIT44721	An Introduction to Artificial Intelligence	ESE	03
6	VIII	BIT44821	Internship(8 Weeks)/ Capstone Project	ESE	03
Total					18

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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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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**

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Tulsiramji Gaikwad-Patil College of Engineering and Technology

Wardha Road, Nagpur-441 108

NAAC Accredited (A+ Grade)

Second Year (Semester-III) B. Tech. Information Technology

BIT42301: - Data Structure

Teaching Scheme		Examination Scheme	
Theory	**3 Hrs/week**	CT-I	15 Marks
Tutorial	**-**	CT-II	15 Marks
Total Credits	**3**	CA	10 Marks
Duration of ESE: 3Hrs		ESE	60 Marks

Course Objectives:

1.	To gain knowledge about basic concepts of data structures.
2.	To acquire knowledge of stacks and queues with their applications
3.	To aware about the concepts of trees with their applications.
4.	To learn and design the algorithm for graphs with their applications.
5.	To implement basic operation on link list.

Course Contents

Unit I	**Introduction:** Concept and need of data structure, Abstract data type, Types of data structure : Linear data structure and Nonlinear data structure, **Searching & Sorting:** linear search and binary search methods, Sorting Techniques: Algorithms for Bubble sort, Selection sort, Insertion sort, Shell sort, Radix sort, Quick sort and Merge sort. Searching Techniques: Algorithms for Sequential search, Binary search,
Unit II	**Linked List:** Introduction of link list terminologies: Node, Address, Pointer, Information field/ data field, Next pointer, Null pointer, Empty list. Types of lists: Linear list, Circular list, Operation on link list: Inserting new node in link list, deleting node from link list.
Unit III	**Stack & Queue:** **Stacks:** Concept of stack as ADT, stack Representation in memory using array. Applications of Stacks: Arithmetic expression conversion, evaluation, operation of stack: push& pop stack conditions: stack overflow, stack underflow. **Queues:** Concept of queue as ADT, Representation and implementation of linear queue & circular queue using sequential organization. Types of Queues: Linear queue, circular queue, priority queue, queue operation: Insert, Delete
Unit IV	**Graph:** Graph as an ADT, operations, graphs storage structures: Adjacency list, Adjacency Matrix, Traversals: DFS, BFS, Minimum spanning trees: Kruskal's and Prim's. Algorithm for shortest path.
Unit V	**Tree:** Basic tree concepts, binary trees and their properties, full and complete binary trees, converting tree to a binary tree, binary tree traversals, Binary search trees & operations. BST as an ADT, threaded binary trees, Insertion, and deletion of nodes in in-order threaded binary tree, pre-order, in-order and post order traversals of in-order threaded binary tree, AVL tree.

Text Books	
T.1	Data structures Dr, Rajendra Kawale Devraj publication
T.2	Practical C programming, OReilly Media
Reference Books	
R.1	Fundamentals of data structures, Ellis Horowitz, 1993
R.2	Data structures and algorithms, Adam Drozdek, 1995
Useful Links	
1	https://www.geeksforgeeks.org/learn-data-structures-and-algorithms-dsa-tutorial/
2	https://www.w3schools.com/dsa/dsa_intro.php

	Course Outcomes	CL	Class Sessions
BIT42301.1	**Demonstrate** the concept of analysis of algorithms, and implement various sorting searching algorithm	3	9
BIT42301.2	**Discuss** the operation on linked list through implementation	2	9
BIT42301.3	**Implement** ADT such as Stack & Queue	3	9
BIT42301.4	**Use** an appropriate non- linear data structures like graph and techniques for data representation for solving data organization problem	3	9
BIT42301.5	**Select** and use appropriate non- linear data structures like tree for data representation	5	9

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Second Year (Semester-III) B. Tech. Information Technology

BIT42302: - Advanced Computer Networks

Teaching Scheme		Examination Scheme	
Theory	**3 Hrs/week**	CT-I	15 Marks
Tutorial	**-**	CT-II	15 Marks
Total Credits	**3**	CA	10 Marks
Duration of ESE: 3Hrs		ESE	60 Marks

Course Contents

Unit I	**Data communication Components:** Representation of data and its flow Networks, Various Connection Topology, Protocols and Standards, OSI model, Transmission Media, LAN: Wired LAN, Wireless LANs, Techniques for Bandwidth utilization: Multiplexing - Frequency division, Time division and Wave division.
Unit II	**Data Link Layer**: Error Detection and Error Correction - Fundamentals, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait, Go back – N ARQ, Selective Repeat ARQ. Medium Access Sub Layer: Switching, Random Access, Multiple access protocols - Pure ALOHA, Slotted ALOHA, CSMA/CD, CDMA/CA, IEEE 802 standard protocols.
Unit III	**Network Layer:** Internet Protocol (IP) – Logical Addressing: IPV4, IPV6; Address mapping: ARP, RARP, BOOTP and DHCP–Delivery, Forwarding and Unicast Routing protocols.
Unit IV	**Transport Layer:** Elements of Transport protocols: Addressing, Connection establishment, Connection release, Crash recovery, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), TCP Congestion Control; Quality of Service, QoS improving techniques: Leaky Bucket and Token Bucket algorithm.
Unit V	**Application Layer**: Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls; AI in network infrastructure, Self-Healing Networks.

Text Books

T.1	Internetworking with TCP/IP, Volume 1, 6th Edition Douglas Comer, Prentice Hall of India.
T.2	TCP/IP Protocol Suite, Behrouz A Forouzan, McGraw Hill Fourth Edition

Reference Books

R.1	TCP/IP Illustrated Volume 1, W. Richard Stevens, Addison-Wesley, United States of America.

Useful Links

1	https://nptel.ac.in/courses/106/105/106105080/
2	https://nptel.ac.in/courses/106/106/106106091/
3	http://www.nptelvideos.in/2012/11/computer-networks.html

	Course Outcomes	CL	Class Sessions
BIT42302.1	**Illustrate** basics of computer networks and reference models.	2	9
BIT42302.2	**Identify** the Design issues of each layer of OSI model.	2	9
BIT42302.3	**Implement** the protocols of OSI model.	3	9
BIT42302.4	**Compare** the aspects and functions of Transport Layer	4	9
BIT42302.5	**Identify** the different types of network topologies and protocols.	2	9

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BSH42303: Numerical Method and Statistical Analysis

Teaching Scheme			Examination Scheme (Th)	
Theory (Th)	2 Hrs/week		**CT-I**	7 Marks
Practical (P)			**CT-II**	7 Marks
Total Credits	**2**		**CA**	6 Marks
Duration of ESE: 2 Hrs			**ESE**	30 Marks

Course Objective:

1.	To make students aware about error handling in numerical methods and solving of algebraic equations
2.	Aware students about probability and mathematical expectation to real-world Phenomena.
3.	Make students use appropriate Stochastic and sampling techniques for a given applied problem

Course Contents

Unit I	**Numerical Methods**: Error in numerical calculations, Errors in series approximation, Rounding off errors. **Solution of Algebraic and Transcendental Equation:** Bisection method, False position method Newton –Raphson method, Solution of system of simultaneous linear equations: Gauss elimination method, Gauss Jordon method. Gauss Seidel method.
Unit II	**Probability Distributions & Mathematical Expectation:** Random variables, discrete and continuous random variable, joint distributions. **Mathematical Expectations:** Definition of mathematical expectation, the variance and standard deviations, moment generating function Binomial, Geometric distribution, Poisson distribution.
Unit III	**Stochastic Process & Sampling Techniques-** **Stochastic Process:** Introduction of Stochastic Process, Classification of Random Process, Stochastic Matrix. Markov Chain, Transition Matrix and state transition Diagram. **Sampling Techniques:** Population, sample, standard error, confidence intervals, Testing a hypothesis, Null hypothesis, Alternative hypothesis, t-test and Chi-square test.

Text Books

T.1	Higher Engineering Mathematics by B.S. Grewal, 40th Edition, Khanna Publication
T.2	Advanced Engineering Mathematics by Erwin Kreyszig, 8th Edition, Wiley India
T.3	Applied Mathematics for Engineers & Physicist by L.R. Pipes and Harville

T.4	Probability, Statistics and Random Processes T. Veerarajan.
T.5	Fundamentals of Mathematical Statistics (Modern Approach) S.C. Gupta and V. K. Kapoor 10th Edition
Reference Books	
R.1	A Text Book of applied Mathematics, Volume I &II, by P.N. Wartikar& J.N. Wartikar, Poona Vidyarthi Griha Prakashan
R.2	Introductory methods of Numerical Analysis, by S.S. Sastry, PHI
R.3	Mathematics for Engineers by Chandrika Prasad
R.4	A text book of Engineering Mathematics by N. P. Bali & M. Goyal, Laxmi Publication

Course Code	Course Outcomes	CL	Class Sessions
BSH42303.1	**Analyze** numerical techniques to find the roots of equations different types of equations.	4	9
BSH42303.2	**Apply** the concept of probability and mathematical expectation to real-world Phenomena.	3	9
BSH42303.3	**Apply** the most appropriate Stochastic and sampling techniques for a given applied problem	3	9

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BIT42312: Operating Systems

Teaching Scheme		Examination Scheme	
Theory	**4 Hrs/week**	CT-I	15 Marks
Tutorial	**-**	CT-II	15 Marks
Total Credits	**4**	CA	10 Marks
Duration of ESE: 3 Hrs		ESE	60 Marks
		Total	100 Marks

Course Objectives:

1.	Introduces general idea, structure and functions of operating system.
2.	Making students aware of basic mechanisms used to handle processes, memory, storage devices and files.
3.	Recent trends in the operating system

Course Contents

Unit I	Evolution of OS, Types of OS, Basic h/w support necessary for modern operating systems, services provided by OS, system programs and system calls, system design and implementation.
Unit II	Process concept, process control block, Types of schedulers, context switch, threads, multithreading model, goals of scheduling and different scheduling algorithms, Process Synchronization
Unit III	Memory management techniques, contiguous and non-contiguous, paging and segmentation, Relocation, Paging, Segmentation, Segmentation with paging, demand paging, Virtual Memory Concepts, Thrashing.
Unit IV	Deadlock definitions, Prevention, Avoidance, detection and Recovery, Goals of Protection, access matrix, Deadlock implementation
Unit V	File concept, Access methods space allocation strategies, disk arm scheduling strategies, file attributes, File operations.

Text Books

T.1	Operating System concepts – Silberchatz; Galvin, Addison Wesley, 6thEdn.
T.2	Modern Operating Systems – Tanenbaum, Pearson Edn. 2 ndedn
T.3	Operating Systems: Internals and Design Principles -- William Stallings

Reference Books	
R.1	Operating Systems – S R Sathe, Macmillan Publishers, India, 2008
R.2	Operating System –Milan Milenkovik, McGraw-Hill, 1987
R.3	Operating Systems - 3 rd Edition by Gary Nutt, Pearson Education.
Useful Links	
1	https://nptel.ac.in/courses/106/108/106108101/

	Course Outcomes	CL	Class Sessions
BIT42312.1	Identify basic structure and purpose of operating system.	2	9
BIT42312.2	Interpret the concepts of process and illustrate various CPU scheduling algorithms.	3	9
BIT42312.3	Differentiate between contiguous and non-contagious memory allocation strategies.	4	9
BIT42312.4	Schematize Deadlock & security mechanisms in operating systems.	4	9
BIT42312.5	Design and implement file systems.	6	9

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BBA42301: Personal Finance Management

Teaching Scheme		Examination Scheme	
Theory	**2 Hrs/week**	CT-I	07 Marks
Tutorial	**-**	CT-II	07 Marks
Total Credits	**2**	CA	06 Marks
Duration of ESE: 3Hrs		ESE	30 Marks
		Total	50 Marks

Course Objectives:

1.	To introduce basic principles for managing personal finance.
2.	To help individual learn investment decisions.
3.	To assist Investment in Physical Assets.

Course Contents

Unit I	**Basics of Personal Financial Management**: Basics of Personal Financial Management: Budget, The Personal Financial Planning Process, Preparation of Personal Budget, Personal Financial Statements, Personal Income Tax Planning. Case studies on personal financial planning of individuals.
Unit II	**Personal Savings & Investment**: Investment Criteria- liquidity, safety and profitability. Savings instruments of Post Office and Banks. Chit Funds. Investment in Shares, Debentures, Corporate and Government Bonds, Mutual Fund.
Unit III	**Investment in Physical Assets**: Real Estate, Gold and Silver, Gold certificates. Risk and Return associated with these investments. Case studies on risk and return perception of retail investors on various investments.

Text Books

T.1	Personal Finance by Jack R. Kapoor, Les R. Dlabay and Robert J. Hughes, Tat McGraw-Hill Publishing Company Ltd. New Delhi.
T.2	Fundamentals of Financial Management" by Eugene F. Brigham and Joel F. Houston, 15th Edition, published by Cengage Learning.

Reference Books	
R.1	Foundations of Financial Management" by Stanley B. Block, Geoffrey A. Hirt, Bartley R. Danielsen, and Doug Short, 17th Edition, published by McGraw-Hill Education.
R.2	Personal Finance by E. Thomas Garman and Raymond E. Forgue, 13th Edition, published by Cengage Learning.
Useful Links	
1	https://nptel.ac.in/courses/ Q7k-7H6kxJg
2	https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs12/

	Course Outcomes	CL	Class Sessions
BBA42301.1	**Classify** the different aspect of Basics of Personal Financial Management.	2	9
BBA42301.2	**Illustrate** the Personal Savings & Investment.	2	9
BBA42301.3	**Outline** the different types of assets like real estate, gold and silver Risk and Return associated with these investments.	2	9

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Second Year (Semester-III) B.Tech. Information Technology

BIT42305: Data Structure Lab

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

Sr. No	List of Practical	CO
1	To study and understand basic concepts of data structures.	CO1
2	Implement a C program for search a particular data from the given array using linear search.	CO1
3	Implement a C program to perform following operation on singly linked list: Insertion and Deletion.	CO2
4	Implement a C program to perform following operation on circular linked list: Insertion, Deletion.	CO2
5	Write a C program to perform PUSH and POP on stack using array.	CO3
6	To write a C program to perform INSERT and DELETE on queue using array.	CO3
7	Write a C program for Depth First Search.	CO4
8	Implement a C program to Breadth First Search.	CO4
9	Write a C program to implement BST.	CO5
10	Write a C program to traverse the tree in order, preorder & post order.	CO5

Text Books	
1	Data structures Dr, Rajendra Kawale Devraj publication
2	Practical C programming, OReilly Media
Reference Books	
1	Fundamentals of data Structures, Ellis Horowitz, 1993
2	Data structures and algorithms, Adam Drozdek, 1995
Useful Links	
1	https://nptel.ac.in/courses
2	https://nptel.ac.in/courses/106102064

	Course Outcomes	CL	Lab Sessions
BIT42305.1	Understand practical knowledge on the operations of arrays	2	4
BIT42305.2	Understand the concept of linked list.	2	4
BIT42305.3	Implement operation on linked list.	3	4
BIT42305.4	Implement practical knowledge of Stack & Queue	3	4
BIT42305.5	Explain Graphs and related concepts.	2	4

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BIT42306: Computer Networks Lab

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

Sr. No	List of Practical	CO
1	Study of different types of Network cables and practically implement the cross-wired cable and straight through cable using clamping tool.	CO1
2	Study of Network Devices in Detail.	CO1
3	Write a program for error detecting code using CRC-CCITT (16- bits).	CO2
4	Write a program to find the shortest path between vertices using bellman-ford algorithm.	CO2
5	Using TCP/IP sockets, write a client – server program to make the client send the file name and to make the server send back the contents of the requested file if present	CO3
6	Write a program on datagram socket for client/server to display the messages on client side, typed at the server side.	CO3
7	Write a program for simple RSA algorithm to encrypt and decrypt the data.	CO4
8	Write a program for congestion control using leaky bucket algorithm.	CO4
9	Implement Dijkstra's algorithm to compute the shortest path through a graph.	CO5
10	Write a program that illustrates communication between two processes using named pipes or FIFO.	CO5

Text Books	
1	TCP/IP Protocol Suite, Behrouz A Forouzan, McGraw Hill Fourth Edition
2	Internetworking with TCP/IP, Volume 1, 6th Edition Douglas Comer, Prentice Hall of India.
Reference Books	
1	Computer Networks, Fifth Edition, Andrew Tanenbaum (Pearson Education)
2	TCP/IP Illustrated Volume 1, W. Richard Stevens, Addison-Wesley, United States of America.
Useful Links	
1	https://nptel.ac.in/courses/106/106/106106091/
2	http://www.nptelvideos.in/2012/11/computer-networks.html

	Course Outcomes	CL	Lab Sessions
BIT42306.1	Understand basics of computer networks and reference models.	2	4
BIT42306.2	Identify the Design issues of each layer of OSI model.	2	4
BIT42306.3	Implement the protocols of OSI model.	3	4
BIT42306.4	Categorize the aspects and functions of Transport Layer	4	4
BIT42306.5	Identify the different types of network topologies and protocols.	2	4

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Final Year (Semester-VII) B. Tech. Information Technology

BCE4804: Sustainable Development Goals

Teaching Scheme		Examination Scheme	
Lectures	2 Hrs./week	**CIE**	20 Marks
Tutorial	-	**ESE**	30 Marks
Total Credit	2	**Total**	50 Marks
		Duration of ESE: 01 Hrs. 00 Min.	

Course Objectives:

1.	To develop a comprehensive understanding of the UN Sustainable Development Goals (SDGs) and their interconnections.
2.	To analyze the global challenges addressed by the SDGs and their impact on various sectors.
3.	To explore innovative solutions and best practices for implementing the SDGs.
4.	To evaluate the progress made towards achieving the SDGs at national and international levels.
5.	To foster a sense of global citizenship and social responsibility among students.

Course Contents		Hours
Unit I	**Introduction to Sustainable Development Goals (SDGs):** Definition of Sustainability, Aspects of sustainability, historical perspective of sustainable development, Climate Change Conferences and Summits, the Brundtland Commission Report, transition from Millennium Development Goals (MDGs) to SDGs, the role of UN and the need for SDGs and Adoption by the World, scope and inclusion of the 2030 Agenda for Sustainable Development.	**(7)**
Unit II	**Framework & Structuring of the 17 SDGs:** SDG 1: No Poverty, SDG 2: Zero Hunger, SDG 3: Good Health and Well-being, SDG 4: Quality Education, SDG 5: Gender Equality, SDG 6: Clean Water and Sanitation, SDG 7: Affordable and Clean Energy, SDG 8: Decent Work and Economic Growth, SDG 9: Industry, Innovation and Infrastructure, SDG 10: Reduced Inequalities, SDG 11: Sustainable Cities and Communities, SDG 12: Responsible Consumption and Production, SDG 13: Climate Action, SDG 14: Life below Water, SDG 15: Life on Land, SDG 16: Peace, Justice and Strong Institutions, SDG 17: Partnerships for the Goal	**(7)**
Unit III	**SDGs Implementation and Future Perspectives:** Interconnections between the SDGs, the role of technology and innovation in SDG implementation, financing the SDGs, measuring SDG progress, future challenges and opportunities, Climate change and its impact on sustainable development, Case studies of successful SDG implementation – India, World	**(7)**

Text Books

1	Hazra, Somnath., Bhukta, Anindya (2020) Sustainable Development Goals An Indian Perspective, Springer International Publishing, Switzerland
2	Ziai, Aram (2016) Development Discourse and Global History from colonialism to the sustainable development goals. Routledge, London & New York

Reference Books	
1	Sachs, J., Schmidt-Traub, G., Kroll, C., Lafortune, G., Fuller, G., Woelm, F. 2020. The Sustainable Development Goals and COVID-19. Sustainable Development Report 2020. Cambridge: Cambridge University Press.
2	OECD (2019), Sustainable Results in Development: Using the SDGs for Shared Results and Impact, OECD Publishing, Paris, https://doi.org/10.1787/368cf8b4-en.

Useful Links
1. https://nptel.ac.in/courses/109106200
2. https://www.un.org/sustainabledevelopment/

BCE4804	Course Outcomes	CL
CO 1	To explore the historical origins and evolution of the UN-SDGs.	2
CO 2	To analyze the 17 SDGs and their interlinkages.	2
CO 3	To analyze the role of technology and innovation in achieving the SDGs along with future challenges and opportunities.	2