Amar Sewa Mandal's

Govindrao Wanjari College of Engineering and Technology, Nagpur

(NAAC Accredited Autonomous Institute)

Affiliated toDr. Babasaheb Ambedkar Technological University (DBATU), Lonere, Raigad

Department of Information Technology

DEPARTMENT OF INFORMATION TECHNOLOGY



Teaching Scheme for B.Tech Information Technology as per NEP-2020

From

Academic Year 2026-27

Amar Sewa Mandal's

Govindrao Wanjari College of Engineering and Technology, Nagpur

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Department of Information Technology

Teaching & Examination Scheme for B.Tech Information Technology (UG) III SEMESTER

SR.NO.	COURSECATEGORY	NAME OFCOURSE	COURSECODE	TEACHING SCHEME (Hrs.)			TOTAL CREDIT	EXAMINATIONSCHEME							TOTAL	BOS
								THEORY				PRACTICAL				
				TH	TU	P		EXAM HRS.	ESE	CIE	MIN ESE.	ESE	CIE	MIN		
1	PCC	Mathematics for IT	25BIT301T	3	-	-	3	3	60	40	40	-	-	-	100	ASH
2	PCC	Data Structure	25BIT302T	3	-	-	3	3	60	40	40	-	-	-	100	IT
3	PCC	Data StructureLab	25BIT302P	-	-	2	1	-	-	-	-	25	25	25	50	IT
4	PCC	Operating System	25BIT303T	2	-	-	2	2	30	20	20	-	-	-	50	IT
5	PCC	Operating System Lab	25BIT303P	-	-	2	1	-	-	-	-	25	25	25	50	IT
6	MDM	MDM-I (Refer Basket)	25BIT304T	3	-	-	3	3	60	40	40	-	-	-	100	IT
7	OE	Open Elective-I (Refer OE Basket)	25BIT305T	3	-	-	3	3	60	40	40	-	-	-	100	IT
8	HSSM	Universal Human Values	25BIT306T	2	-	-	2	2	30	20	20	-	-	-	50	ASH
9	VEC	Ethics & Managerial Skills in IT	25BIT307T	2	-	-	2	2	30	20	20	-	-	-	50	IT
10	ELC (CEP/FP)	Community-Based Project	25BIT308P	-	-	4	2	-	-	-	-	50	50	50	100	IT
TOTAL				18	-	08	22		330	220		100	100		750	

BOS Chairman	Dean Academic	Principal	External Subject Expert	External Subject Expert	External Subject Expert	External Subject Expert	Version 1.1	Applicable for 2026-27 onwards

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Department of Information Technology

Teaching & Examination Scheme for B.Tech Information Technology (UG) IVSEMESTER

SR.NO.	COURSECATEGORY	NAME OFCOURSE	COURSECODE	TEACHING SCHEME(Hrs.)			TOTAL CREDIT	EXAMINATIONSCHEME							TOTAL	BOS
								THEORY				PRACTICAL				
				TH	TU	P		EXAM HRs.	ESE	CIE	MIN ESE.	ESE	CIE	MIN		
1	PCC	Object-Oriented Programming using Java	25BIT401T	3		-	3	3	60	40	40	-	-	-	100	IT
2	PCC	Object-Oriented Programming using Java Lab	25BIT401P	-	-	2	1	-	-	-	-	25	25	25	50	IT
3	PCC	Analysis of Algorithm	25BIT402T	2	-	-	2	2	30	20	20	-	-	-	50	IT
4	PCC	Computer Network	25BIT403T	3	-	-	3	3	60	40	40	-	-	-	100	IT
5	PCC	Computer Network Lab	25BIT403P	-	-	2	1	-	-	-	-	25	25	25	50	IT
6	MDM	Multidisciplinary Minor-II (Refer Basket)	25BIT404T	2	-	-	2	2	30	20	20	-	-	-	50	IT
7	OE	Open Elective-II (Refer OE Basket)	25BIT405T	2	-	-	2	2	30	20	20	-	-	-	50	IT
8	VSEC	Python Programming Lab	25BIT406P	-	-	4	2	-	-	-	-	50	50	50	100	IT
9	AEC	Effective Technical Communication	25BIT407T	2	-	-	2	2	30	20	20	-	-	-	50	IT
10	HSSM	Entrepreneurship in IT	25BIT408T	2	-	-	2	2	30	20	20	-	-	-	50	IT
11	VEC	Constitution of India	25BIT409T	2	-	-	2	2	30	20	20	-	-	-	50	IT
12	Audit Courses	Audit Course-I Environmental Studies	25BIT410	-	-	-	-	-	-	-	-	-	-	-	Grade	IT
TOTAL				16	-	12	22		240	160		150	150		700	

BOS Chairman	Dean Academic	Principal	External Subject Expert	External Subject Expert	External Subject Expert	External Subject Expert	Version 1.1	Applicable for 2026-27 onwards

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Teaching & Examination Scheme for B.Tech Information Technology (UG)V SEMESTER

SR.NO.	COURSE CATEGORY	NAMEOFCOURSE	COURSE CODE	TEACHING SCHEME(HRs.)			TOTAL CREDIT	EXAMINATIONSCHEME							TOTAL	BOS
								THEORY				PRACTICAL				
				(TH)	TU	P		EXAM HRs.	ESE	CIE	MIN ESE.	ESE	CIE	MIN		
1	PCC	Theory of Computation	25BIT501T	2	-	-	2	2	30	20	20	-	-	-	50	IT
2	PCC	Database Management System	25BIT502T	3	-	-	3	3	60	40	40	-	-	-	100	IT
3	PCC	Database Management System Lab	25BIT502P	-	-	2	1	-	-	-	-	25	25	25	50	IT
4	PCC	Software Engineering	25BIT503T	3	-	-	3	3	60	40	40	-	-	-	100	IT
5	PCC	Software Engineering Lab	25BIT503P	-	-	2	1	-	-	-	-	25	25	25	50	IT
6	PEC	ProgramElective–I(Refer ElectiveBasket)	25BIT504T	3	-	-	3	3	60	40	40	-	-	-	100	IT
7	PEC	Program Elective–I Lab (Refer Elective Basket)	25BIT504P	-	-	2	1	-	-	-	-	25	25	25	50	IT
8	MDM	Multidisciplinary Minor-III (Refer Basket)	25BIT505T	3	-	-	3	3	60	40	40	-	-	-	100	IT
9	OE	Open Elective-III (Refer OE Basket)	25BIT506T	3	-	-	3	3	60	40	40	-	-	-	100	IT
				17	-	6	20		330	220		75	75		700	

BOS Chairman	Dean Academic	Principal	External Subject Expert	External Subject Expert	External Subject Expert	External Subject Expert	Version 1.1	Applicable for 2027-28 onwards

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Teaching & Examination Scheme for B.Tech Information Technology (UG)VI SEMESTER

SR.NO.	COURSE CATEGORY	NAMEOFCOURSE	COURSE CODE	TEACHING SCHEME(Hrs.)			TOTAL CREDIT	EXAMINATIONSCHEME							TOTAL	BOS
								THEORY				PRACTICAL				
				(TH)	TU	P		EXAM Hrs.	ESE	CIE	MIN ESE.	ESE	CIE	MIN		
1	PCC	Artificial Intelligence	25BIT601T	3	-	-	3	3	60	40	40	-	-	-	100	IT
2	PCC	Compiler Design	25BIT602T	3	-	-	3	3	60	40	40	-	-	-	100	IT
3	PCC	Mobile Computing	25BIT603T	2	-	-	2	2	30	20	20	-	-	-	50	IT
4	PEC	ProgramElective–II(Refer BasketforElective)	25BIT604T	3	-	-	3	3	60	40	40	-	-	-	100	IT
5	PEC	Program Elective–II Lab	25BIT604P	-	-	2	1	-	-	-	-	25	25	25	50	IT
6	PEC	ProgramElective–III(Refer BasketforElective)	25BIT605T	3	-	-	3	3	60	40	40	-	-	-	100	IT
7	PEC	Program Elective–III Lab	25BIT605P	-	-	2	1	-	-	-	-	25	25	25	50	IT
8	MDM	Multidisciplinary Minor-IV (Refer Basket)	25BIT606T	3	-	-	3	3	60	40	40	-	-	-	100	IT
9	VSEC	Full Stack Development Practice Lab with Mini Project	25BIT607P	-	-	4	2	-	-	-	-	50	50	50	100	IT
10	Audit Course	Audit Course II Intellectual Property Rights (IPR)	25BIT608	-	-	-	-	-	-	-	-	-	-	-	Grade	
TOTAL				17	-	08	21		330	220	-	100	100		750	

BOS Chairman	Dean Academic	Principal	External Subject Expert	External Subject Expert	External Subject Expert	External Subject Expert	Version 1.1	Applicable for 2027-28 onwards

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Teaching & Examination Scheme for B.Tech Information Technology (UG) VII SEMESTER

SR.NO.	COURSE CATEGORY	NAME OF COURSE	CODE	TEACHING SCHEME(HRs.)			TOTAL CREDIT	EXAMINATION SCHEME							TOTAL	BOS
								THEORY				PRACTICAL				
				(TH)	TU	P		EXAM HRs.	ESE	CIE	MIN ESE.	ESE	CIE	MIN		
1	PCC	Cloud Computing	25BIT701T	3	-	-	3	3	60	40	40	-	-	-	100	IT
2	PCC	Cloud Computing Lab	25BIT701P	-	-	2	1	-	-	-	-	25	25	25	50	IT
3	PCC	Natural Language Processing	25BIT702T	3	-	-	3	3	60	40	40	-	-	-	100	IT
4	PCC	Internet of Things	25BIT703T	2	-	-	2	2	30	20	20	-	-	-	50	IT
5	PEC	Program Elective–IV (Refer Basket for Elective)	25BIT704T	3	-	-	3	3	60	40	40	-	-	-	100	IT
6	PEC	Program Elective–IV Lab	25BIT704P	-	-	2	1	-	-	-	-	25	25	25	50	IT
7	PEC	Major Program Elective- V (Refer Basket)	25BIT705T	3	-	-	3	3	60	40	40	-	-	-	100	IT
8	MDM	Multidisciplinary Minor-V (Refer Basket)	25BIT706T	3	-	-	3	3	60	40	40	-	-	-	100	IT
9	PROJ	Seminar & Project	25BIT707	-	-	2	1	-	-	-	-	25	25	50	50	IT
TOTAL				17	–	06	20		330	220	200	75	75		700	

BOS Chairman	Dean Academic	Principal	External Subject Expert	External Subject Expert	External Subject Expert	External Subject Expert	Version 1.1	Applicable for 2028-29 onwards

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Department of Information Technology

Teaching & Examination Scheme for B.Tech Information Technology (UG) VIII SEMESTER

SR.NO.	COURSEC ATEGORY	NAME OF COURSE	COURSE CODE	TEACHING SCHEME (Hrs.)			TOTAL CREDIT	EXAMINATION SCHEME							TOTAL	BOS
								THEORY				PRACTICAL				
				(TH)	TU	P		EXAM HRs.	ESE	CIE	MIN ESE.	ESE	CIE	MIN		
1	RM	Research Methodology#	25BIT801T	4	-	-	4	3	-	-	-	60	40	40	100	
2	PROJ	Project	25BIT802P	-	-	8	4	-	-	-	-	75	75	75	150	
3	INT	Internship/OJT	25BIT803	-	-	24	12	-	-	-	-		200	100	200	
TOTAL				3	–	34	20	3	–	–	–	160	340	315	450	

Note:- #Indicates that online courses to be done from NPTEL examination will be conducted by NPTEL/Institute Level.

BOS Chairman	Dean Academic	Principal	External Subject Expert	External Subject Expert	External Subject Expert	External Subject Expert	Version 1.1	Applicable for 2028-29 onwards

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Department of Information Technology

EXIT OPTIONS

"The additional credits may be earned through SWAYAM/NPTEL/approved online certification courses as per institute guidelines and NEP-2020 provisions."

Award of UG Certificate in Major with 41 credits and an additional 8 credits (After First Year)

S.N	Course name	Mode of	Credits
1	Cyber Security and Privacy	Online / NPTEL	2
2	Excel for Data Analysis	Online / NPTEL	3
3	Developing Soft Skills and Personality	Online / NPTEL	3

Award of UG Diploma in Major with 85 credits and an additional 8 credits (After Second Year)

S.N	Course name	Mode of	Credits
1	Speaking Effectively	Online / NPTEL	2
2	Data Analytics with Python	Online / NPTEL	3
3	Introduction to Internet of Things	Online / NPTEL	3

Award of UG Degree in Major with 126 credits and an additional 8 credits (After Third Year)

S.N	Course name	Mode of	Credits
1	Entrepreneurship	Online / NPTEL	2
2	Cloud Computing	Online / NPTEL	3
3	Introduction to Machine Learning	Online / NPTEL	3

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Department of Information Technology

Multidisciplinary Minor (MDM) offered by Information Technology Department

Basket for Multi-Disciplinary Minor Courses (MDM)

Semester	Course Category	Course Code	Name of Course
III	MDM-I	25BIT304T	Fundamentals of Python Programming
IV	MDM-II	25BIT404T	Data Analytics using Python
V	MDM-III	25BIT505T	Data Warehousing and Mining
VI	MDM-IV	25BIT606T	Machine Learning using Python
VII	MDM-V	25BIT706T	Deep Learning using Python

Note: Information Technology department Students will choose a Multidisciplinary Minor (MDM) Bucket (a Set of Courses to be learnt from 2nd Year to Third/Final Year) offered by the other departments.

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Department of Information Technology

List of Open Elective offered by Information Technology Department
(Students of IT/CSE/CSE-DS and related branches will not be able to opt these OE Courses)

Basket for Open Elective (OE) subjects

Open Elective – I (T)	
25BIT305A	Introduction to Data Structure
25BIT305B	Introduction to Operating System
25BIT305C	Introduction to Web Technology

Open Elective – II (T)	
25BIT405A	Fundamentals of IoT
25BIT405B	IT Skills for Business
25BIT405C	Introduction to OOPs using Java

Open Elective – III (T)	
25BIT506A	Cyber Safety & Digital Ethics
25BIT506B	Introduction to Blockchain Technology
25BIT506C	Introduction to Database Management System

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Department of Information Technology

Basket for Program Elective Courses (PEC)

	Program Elective – I (T+P)
25BIT504A	Data Warehousing and Mining
25BIT504B	Graphics and Multimedia
25BIT504C	Data Visualization

	Program Elective-II (T+P)
25BIT604A	High Performance Computing Architecture
25BIT604B	Big Data Analytics
25BIT604C	Machine Learning

	Program Elective – III (T+P)
25BIT605A	Distributed Systems
25BIT605B	Ethical Hacking
25BIT605C	Cryptography & Network Security

	Program Elective-IV (T+P)
25BIT704A	Salesforce Technology
25BIT704B	UI/UX Engineering
25BIT704C	Cyber Security

	Program Elective-V (T)
25BIT705A	Cluster and Grid Computing
25BIT705B	Generative AI
25BIT705C	Blockchain &Crypto currency Fundamentals

BOS Chairman	Dean Academic	Principal	External Subject Expert	External Subject Expert	External Subject Expert	External Subject Expert	Version 1.1	Applicable for 2026-27 onwards

List of Courses offered for Double Minor Degree by Department of Information Technology Department

Double Minor (DM) Courses

SR.NO.	COURSE CATEGORY	SEM	NAME OF COURSE	COURSE CODE	TEACHING SCHEME(HRs.)			TOTAL CREDIT	EXAMINATION SCHEME							TOTAL	BOS
									THEORY				PRACTICAL				
					(TH)	TU	P		EXAM HRs.	ESE	CIE	MIN ESE	ESE	CIE	MIN		
1	MINOR	III	Computer Networks Fundamentals	25BITM301T	3	-	-	3	3	60	40	40	-	-	-	100	
2	MINOR	IV	Data science and visualization	25BITM402T	3	-	-	3	3	60	40	40	-	-	-	100	
3	MINOR	V	IT Service Management (ITSM)	25BITM503T	3	-	-	3	3	60	40	40	-	-	-	100	
4	MINOR	VI	DevOps (Development and operations)	25BITM604T	3	-	-	3	3	60	40	40	-	-	-	100	
5	MINOR	VI	UI/UX Design	25BITM605T	3	-	-	3	3	60	40	40	-	-	-	100	
6	MINOR	VII	Data Security	25BITM706T	3	-	-	3	3	60	40	40	-	-	-	100	
TOTAL					18	–	-	18	18	360	240	240	-	-	-	600	

Note: Student are required to select a minor program from a department ***other than their major programme*** *(Students who enrolled in their first year of engineering is the major programme.) and it* ***must different*** *from the* ***Multidisciplinary Minorprogramme.***

BOS Chairman	Dean Academics	Principal	External Subject Expert	External Subject Expert	External Subject Expert	External Subject Expert	1.1 Version	Applicable for 2026-2027

List of Honor Courses offered by Department of Information Technology

Honor Courses

SR.NO.	COURSE CATEGORY	SEM	NAME OF COURSE	COURSE CODE	TEACHING SCHEME(HRs.)			TOTAL CREDIT	EXAMINATION SCHEME							TOTAL	BOS
									THEORY				PRACTICAL				
					(TH)	TU	P		EXAM HRs.	ESE	CIE	MIN ESE.	ESE	CIE	MIN		
1	HONOUR	III	Optimization Techniques	25BITH301T	3	-	-	3	3	60	40	40	-	-	-	100	
2	HONOUR	IV	Advanced Algorithm sand Data Structures	25BITH402T	3	-	-	3	3	60	40	40	-	-	-	100	
3	HONOUR	V	Advanced Computer Architecture	25BITH503T	3	-	-	3	3	60	40	40	-	-	-	100	
4	HONOUR	VI	Human Computer Interface	25BITH604T	3	-	-	3	3	60	40	40	-	-	-	100	
5	HONOUR	VI	Robotics and Embedded Systems	25BITH605T	3	-	-	3	3	60	40	40	-	-	-	100	
6	HONOUR	VII	Artificial Neural Networks	25BITH301T	3	-	-	3	3	60	40	40	-	-	-	100	
TOTAL					18	–	-	18	18	360	240	240	-	-	-	600	

Note: *Students with a* ***CGPA≥7.5*** *after the first year are* ***eligible*** *to opt for 6 additional courses (18–20 credits) from their* ***parent (major) department.***

BOS Chairman	Dean Academics	Principal	External Subject Expert	External Subject Expert	External Subject Expert	External Subject Expert	1.1 Version	Applicable for 2026-2027

List of Honor Courses offered by Department of Information Technology

Honor with Research (HR)Courses

SR.NO.	COURSE CATEGORY	SEM	NAME OF COURSE	COURSE CODE	TEACHING SCHEME(HRs.)			TOTAL CREDITS	EXAMINATION SCHEME							TOTAL	BOS
									THEORY				PRACTICAL				
					TH	TU	P		EXAM HRs.	ESE	CIE	MIN ESE	ESE	CIE	MIN		
1	HR	VII	**Research Orientation, Literature Review & Proposal Approval** *(Includes: problem identification ,research gap analysis, and proposal defense)*	25BITHR701P	-	-	6	3	-	-	-	-	50	50	50	100	
2	HR	VII	**Project Implementation – Phase I & IPR Awareness** *(Initial design, development, and Intellectual Property Rights & Research Ethics training)*	25BITHR702P	-	-	6	3	-	-	-	-	50	50	50	100	
3	HR	VIII	**Project Implementation – Phase II & Documentation** *(Final implementation, validation, and thesis preparation)*	25BITHR803P	-	-	6	3	-	-	-	-	50	50	50	100	
4	HR	VIII	**Research Paper Writing & Publication** *(Target: Scopus/Web of Science/IEEE/UGC-CARE journals or reputed conferences)*	25BITHR804P	-	-	6	3	-	-	-	-	50	50	50	100	
5	HR	VIII	**Final Viva / Project Defense** *(Internal & External evaluation, defense of research work)*	25BITHR805P	-	-	12	6	-	-	-	-	100	100	100	200	
TOTAL					-	–	36	18	-	340	260	260	300	300	300	600	

*Note: Students with a **CGPA ≥ 7.5 or 75% after the 6th semester** are eligible for the **UG Researchdegree**andmustcompleteana**dditional18-credit**researchproject/dissertationin the 4th year within their major discipline.*

BOS Chairman	Dean Academics	Principal	External Subject Expert	External Subject Expert	External Subject Expert	External Subject Expert	1.1 Version	Applicable for 2026-2027

Credit Distribution:

1. B.Tech. degree with a multidisciplinary minor:

SEM-I	SEM-II	SEM-III	SEM-IV	SEM-V	SEM-VI	SEM-VII	SEM–VIII	TOTAL
21	20	22	22	20	21	20	20	**166 (160-176)**

2. B.Tech. honour with multidisciplinary minor:

SEM-I	SEM-II	SEM-III	SEM-IV	SEM-V	SEM-VI	SEM-VII	SEM–VIII	TOTAL
21	20	22+3	22+3	20+3	21+6	20+3	20	**166+18 =184** (180-194)

3. B.Tech. honour with Research and multidisciplinary minor:

SEM-I	SEM-II	SEM-III	SEM-IV	SEM-V	SEM-VI	SEM-VII	SEM–VIII	TOTAL
21	20	22	22	20	21	20+6	20+12	**166+18 =184** (180-194)

4. B.Tech. degree with Double Minors (Multidisciplinary and Specialization Minors) :

SEM-I	SEM-II	SEM-III	SEM-IV	SEM-V	SEM-VI	SEM-VII	SEM–VIII	TOTAL
21	20	22+3	22+3	20+3	21+6	20+3	20	**166+18 =184** (180-194)

Criteria for Re-entry or Lateral Entry under NEP 2020

S.N.	Re-entry or Lateral Entry (NEP2020)
1.	**Re-entry Option**: Students exiting at any level can **rejoin** the same or another institution **within 4 years** to complete their degree.
2.	**Maximum Duration**: The entire degree must be completed **within 8 years** from the date of first admission.
3.	**Based on Credits**: Re-entry or lateral entry is allowed based on **valid earned credits** stored in the **Academic Bank of Credits (ABC)**.
4.	**Multiple Entry Paths**: Students can re-enter into **UG Diploma, UG Degree, Minor, Honors, or Research** programs.
5.	**Subject to Availability**: Admission depends on **intake capacity** and **validation of prior learning outcomes**.

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Semester-wise Credit Distribution

Semester	Total Credits	Observation
Sem I	21	Foundation courses: Mathematics, Physics, Chemistry, Basic Engineering Sciences)
Sem II	20	Foundation courses: Mathematics, Physics, Chemistry, Basic Engineering Sciences)
Sem III	22	Balanced start with core + OE + HSSM
Sem IV	22	Similar load, slightly more practical exposure
Sem V	20	Introduction of electives (PEC)
Sem VI	21	Increased lab + skill-based courses
Sem VII	20	Heavy internship/OJT component
Sem VIII	20	Project + research-oriented
Total	166	

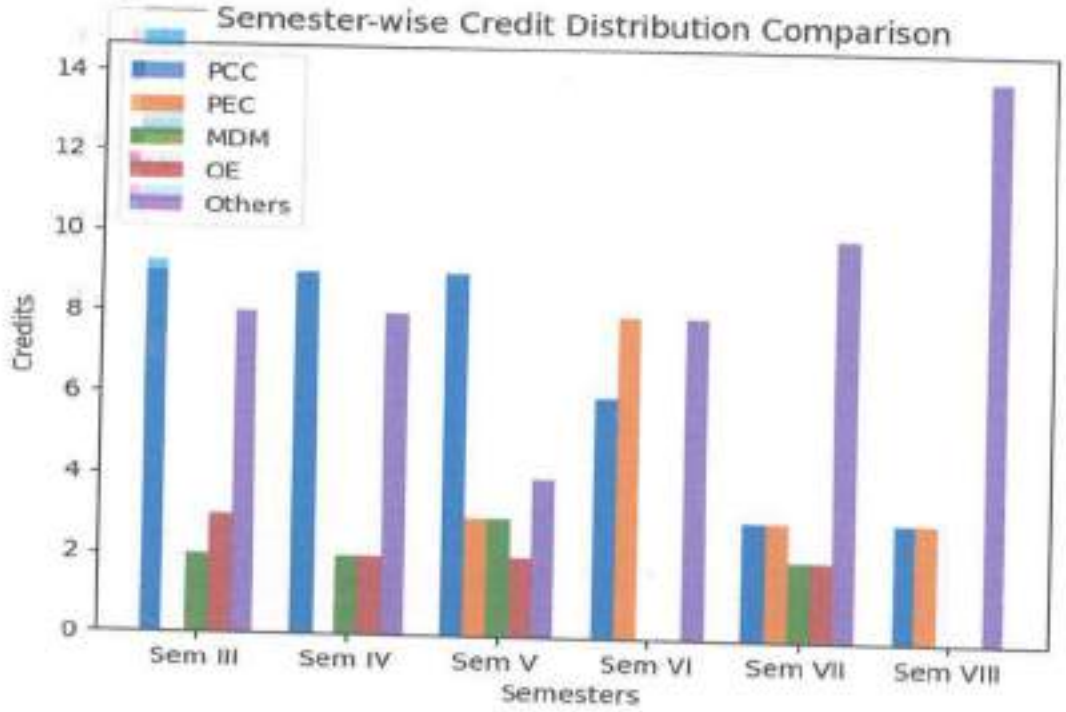
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Department of Information Technology

CREDIT DISTRIBUTION (APPROX ANALYSIS)

Category-wise Distribution

Category	Credits	Percentage
PCC (Core)	47	50%
PEC (Professional Elective)	19	35%
MDM	14	
OE	08	
HSSM	08	10%
Internship/Project	17	15%

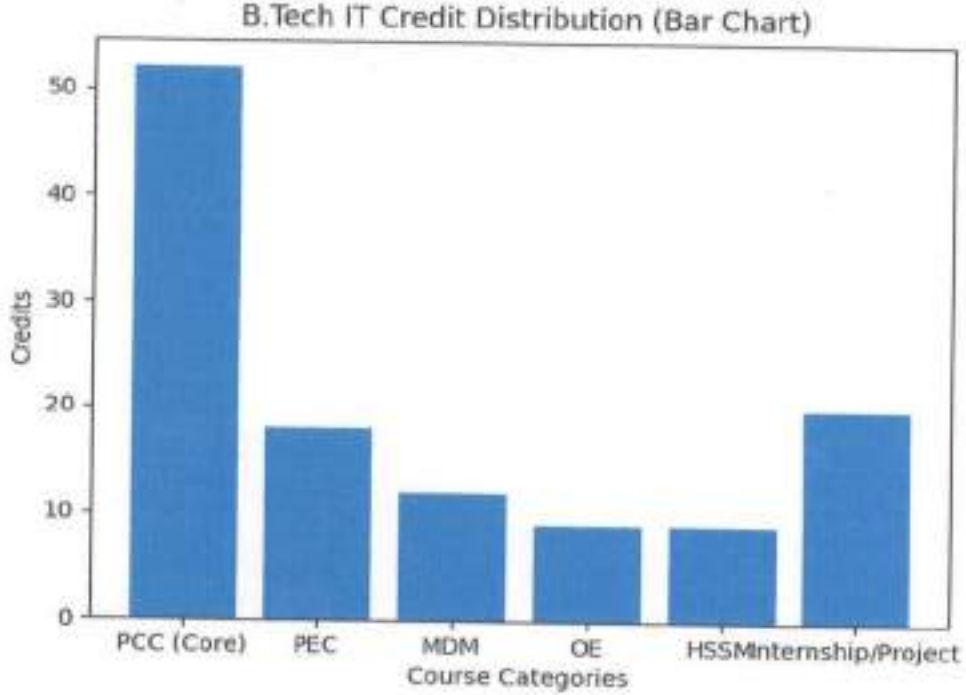
Amar Sewa Mandal's

Govindrao Wanjari College of Engineering and Technology, Nagpur

(NAAC Accredited Autonomous Institute)

Affiliated toDr. Babasaheb Ambedkar Technological University (DBATU), Lonere, Raigad

Department of Information Technology



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Department of Information Technology

Courses Description	Type of Course	I	II	III	IV	V	VI	VII	VIII	Total Credits
Basic Science Course	BSC	08	07	-	-	--	--	--	--	15
Engineering Science Course	ESC	07	05	--	--	--	--	--	--	12
Program Core Course (PCC)	Program Courses	--	02	10	10	10	08	09	--	49
Program Elective Course (PEC)		--	--	--	--	04	08	07	--	19
Multidisciplinary Minor (MDM)	Multidisciplinary Courses	--	--	03	02	03	03	03	--	14
Open Elective (OE) Other than a particular program		--	--	03	02	03	--	--	--	08
Vocational and Skill Enhancement Course (VSEC)	Skill Courses	02	02	--	02	--	02	--	--	08
Ability Enhancement Course (AEC -01, AEC-02)	Humanities Social Science and Management (HSSM)	02	-	--	02	--	--	--	--	04
Entrepreneurship/Economics/Management Courses		--	--	02	02	--	--	--	--	04
Indian Knowledge System (IKS)		-	02	--	--	--	--	--	--	02
Value Education Course (VEC)		--	--	02	02	--	--	--	--	04
Research Methodology	Experiential Learning Courses	--	--	--	--	--	--	--	04	04
Comm. Engg. Project (CEP)/ Field Project (FP)		--	--	02	--	--	--	--	--	02
Project		--	--	--	--	--	--	01	04	05
Internship/OJT		--	--	--	--	--	--	--	12	12
Co-curricular Courses (CC)	Liberal Learning Courses	02	02	--	--	--	--	--	--	04
Total Credits (Major)		**21**	**20**	**22**	**22**	**20**	**21**	**20**	**20**	**166**

Syllabus of Second Year Bachelor of Technology (B.Tech.) in Information Technology Programme (SEMESTER-III)

"Syllabus Aligned with the National Education Policy (NEP) 2020"

							1.1	Applicable for 2026-2027 Onwards
BOS Chairman	Dean Academics	Principal	External Subject Expert	External Subject Expert	External Subject Expert	External Subject Expert	Version	

B.Tech: III– SEMESTER

COURSE CODE	COURSE NAME	TH	TU	PR	CREDITS	EVALUATION		
						ESE	CIE	TOTAL
25BIT301T	MATHEMATICS FOR IT	3	-	-	3	60	40	100

Prerequisites: -Engineering Mathematics – I and II

COURSE OBJECTIVE	COURSE OUTCOME
The objectives of this course are to impart knowledge of : 1. To apply Laplace, Inverse Laplace, and Fourier Transforms in solving engineering and mathematical problems. 2. To apply concepts of sets, logic, and proof techniques for mathematical reasoning. 3. To apply probability theory and combinatorics in solving mathematical problems. 4. To apply correlation and linear regression techniques for data analysis.	**After completing this course, the student will be able to:** **CO1:** Apply Laplace and Inverse Laplace Transform techniques to solve differential equations and engineering problems. **CO2:** Analyze functions and signals using Fourier Integrals and Fourier Transform methods. **CO3:** Apply concepts of sets, logic, and proof techniques to solve mathematical and computational problems. **CO4:** Apply probability theory and combinatory principles to analyze counting problems and random events. **CO5:** Apply correlation and linear regression analysis to study relationships between variables and make predictions from data.

UNIT I: **(10Hours)**

LAPLACE TRANSFORM AND INVERSE LAPLACE TRANSFORM

Transforms of elementary functions; Properties of Laplace transforms - Linearity property, Evaluation of integrals by using Laplace transform; Transforms of some special functions- periodic function, Heaviside-unit step function.

Inverse Laplace Transforms: Inverse transforms of some elementary functions; General methods of finding inverse transforms; Partial fraction method and Convolution Theorem for finding inverse Laplace transforms; Applications to find the solutions of linear differential equations and simultaneous linear differential equations with constant coefficients.

UNIT II: **(08Hours)**

FOURIER TRANSFORM

Definition: Fourier Integral Theorem, Fourier sine and cosine integrals, Fourier sine & cosine Transforms, Parseval's Identity for Fourier Transforms.

UNIT III: **(08 Hours)**

SETS,LOGICS AND TECHNIQUES

Set operations, relations, functions, Propositional logic, predicate logic, Truth tables, logical equivalence, Rules of inference (basic), Introduction to proof techniques (direct, induction)

UNIT IV: **(09Hours)**

PROBABILITY THEORY AND COMBINATORICS

Basic probability laws, Conditional probability, Bayes' Theorem (basic applications), Random variables (discrete only), Mean and variance. Combinatorics, Permutations and combinations, Pigeonhole principle, Basic recurrence relations (simple problems only), Applications in algorithms

UNIT V: **(10Hours)**

CORRELATION AND LINEAR OF REGRESSION ANALYSIS

Introduction, types of correlation, correlation &causation, Method of studying correlation, Karl Pearson's correlation coefficient, Spearman's rank correlation, coefficient.

Linear Regression Analysis: Introduction, Linear & Non-linear regression, lines of regression, Derivation of regression lines of y on x and x on y, Angle between the regression lines, Coefficients of regression.

Text Books:

1. Advanced Engineering Mathematics (Wiley), Erwin Kreyzig,9th Edition — 2006 ,10th Edition — 2011 ,11th Edition — 2025
2. Higher Engineering Mathematics (Khanna Publishers), B. S. Grewal,2020, 2022, 2024
3. Advanced Engineering Mathematics (S. Chand), H. K. Dass,2018, 2020, 2022.

Reference Books:

1. Mathematics for Engineers (Chandrika Prasad.)John Wiley & Sons,1985,1996 (6th Edition related record) ,2020
2. Applied Mathematics for Engineers(L.A. Pipes and Harville)McGraw Hill,1970 / 1971 (3rd Edition)
3. Probability and Statistics (Schaum's Outline Series), Murray Spiegel, John Schiller, R. A. Srinivasan.2009 (3rd Edition) / 2013 (4th Edition).
4. Fundamentals of Statistics (Himalaya Publishing House), S. C. Gupta.2007, 2011, 2014, 2018, 2021

BOS Chairman	Dean Academics	Principal	External Subject Expert	External Subject Expert	External Subject Expert	External Subject Expert	1.1 Version	Applicable for 2026-2027 Onwards

B.Tech: III– SEMESTER

COURSE CODE	COURSE NAME	TH	TU	PR	CREDITS	EVALUATION		
						ESE	CIE	TOTAL
25BIT302T	Data Structure	3	-	-	3	60	40	100

Prerequisites: -Basic knowledge of programming concepts, problem-solving techniques, and understanding of arrays, functions, and pointers is required to study Data Structure and application.

COURSE OBJECTIVE	COURSE OUTCOME
The objectives of this course are to impart knowledge of 1. To acquire knowledge of data structures, algorithm analysis, and asymptotic notations. 2. To analyze hashing techniques and collision resolution methods for efficient data retrieval. 3. To apply searching and sorting algorithms for organizing and processing data. 4. To implement linear data structures such as stacks, queues, and linked lists. 5. To develop solutions using tree-based data structures for efficient storage and retrieval of information.	**After completing this course, the student will be able to:** **CO1:** Analyze the efficiency of algorithms and data structures using asymptotic notations and complexity measures. **CO2:** Analyze and Implement searching, sorting, and hashing techniques for efficient data organization and retrieval. **CO3:** Design and implement stack and queue data structures and utilize them to solve computational problems involving expression conversion and evaluation. **CO4:** Develop solutions using linked list data structures and perform various operations such as insertion, deletion, searching, and traversal. **CO5:** Implement tree-based data structures including Binary Search Trees, AVL Trees, Heaps, and B-Trees, and perform traversal, insertion, deletion, and balancing operations.

UNIT I: **(09Hours)**

INTRODUCTION TO DATA STRUCTURE

General concepts of data structure: properties and Operations, Time and space analysis of algorithms, Big O, theta, and omega notations, Average, best and worst case analysis, Abstract data structure, Recursion and Recurrence Relations

Hashing: Hash tables, hash functions, hashing techniques, and Collision resolution techniques.

UNIT II: **(08Hours)**

SEARCHING, SORTING AND ALGORITHMS

Sorting and Algorithm Techniques: Selection Sort, Insertion Sort, Merge Sort, Shell Sort, Radix Sort, Quick Searching, Linear and Binary Search.

UNIT III: **(09Hours)**

STACK & QUEUE

Representation of Stack & queue using array: Application of stacks, Conversion from infix to postfix and Prefix expressions, Evaluation of postfix, Circular Queues, Linear Queue and Priority Queues.

UNIT IV: **(10Hours)**

LINKED LIST

Definition and representation in memory, Implementation of Linked List, Types of linked list: Singly linked list, circular Singly linked list, Doubly linked list and circular doubly linked list, and, Representation of Ordered list using array and its operation, Implementation of linked list using Static and Dynamic memory allocations, Operations of linked list (insertion, deletion, searching, traversing) Application of linked list such as polynomial expression, comparisons of linked lists.

UNIT V: **(09Hours)**

TREES

Definition and basic terminology, Representation of a tree. Basic operations of binary trees and binary search trees (traversals of trees, insertion and deletion of elements). Binary search trees, the concept of balancing: threaded Binary Trees, AVL Trees, Heap trees, B-Trees.

Text Books:

1. R. S. Salaria, Data Structures & Algorithms using C, 5th Edition (2024), Khanna Publishing House.
2. Cormen, Leiserson, Rivest, and Stein, Introduction to Algorithms, 4th Edition, MIT Press.
3. Hemant Jain, Problem Solving in Data Structures & Algorithms Using C, 2022 Edition, Hemant Jain Publications.

Reference Books:

1. Reema Thareja, Data Structures using C, 3rd Edition (2020), Oxford University Press.
2. Mark Allen Weiss, Data Structures and Algorithm Analysis in C, 2nd/3rd Edition (2020), Pearson Education.
3. Narasimha Karumanchi, Data Structures and Algorithms Made Easy (C Version), 2nd/3rd Edition (2020–2021), Career Monk Publications.

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BOS Chairman	Dean Academics	Principal	External Subject Expert	External Subject Expert	External Subject Expert	External Subject Expert	Version	

B.Tech: III– SEMESTER

COURSE CODE	COURSE NAME	TH	TU	PR	CREDITS	EVALUATION		
						ESE	CIE	TOTAL
25BIT302P	Data Structure Lab	-	-	2	1	25	25	50

Prerequisites: -Basic knowledge of programming fundamentals, implementation of arrays, functions, pointers, and logical problem-solving skills is required for Data Structure and Application Lab.

COURSE OBJECTIVE	COURSE OUTCOME
The objectives of this course are to impart knowledge of 1. To impart knowledge of notations and basic concepts of Data Structure and Algorithm. 2. To emphasize the application of Data Structure in developing and implementing efficient programs and algorithms using searching and sorting. 3. To understand the basic concepts Stack & Queue.	**After completing this course, the student will be able to:** **CO1:** Implement searching, sorting, stacks, and queue operations using appropriate data structures and programming techniques. **CO2:** Develop programs using linked lists, binary search trees, and AVL trees to perform insertion, deletion, searching, and traversal operations. **CO3:** Design and implement suitable data structures to solve computational problems using recursion and tree-based techniques.

List of Experiments:

1. To study the concept of Data Structure and Asymptotic Notations.
2. To write and execute a program in C for sorting an array of integer with Bubble Sort.
3. Write a C++ Program to implement recursive Linear Search.
4. Write a C++ Program to implement recursive Binary Search.
5. Write a program to implement Stack (its operations) using Array.
6. Write a program to implement Queue (its operations) using Array.
7. To study the concept of Linear Queue, Circular Queues, and Priority Queues.
8. Write a program that uses functions to perform the following operations on singly linked list
   i) Creation ii) Insertion iii) Deletion iv) Traversal.
9. To Study the Implementation of linked list using Static and dynamic memory allocations.

BOS Chairman	Dean Academics	Principal	External Subject Expert	External Subject Expert	External Subject Expert	External Subject Expert	1.1 Version	Applicable for 2026-2027 Onwards

10. Write a C Program to implement Binary Search Tree.
11. To implement AVL Tree.
12. Create a Binary Tree perform tree traversal (Preorder, Postorder, Inorder) using the concept of Recursion.

Text Books:

1. Data Structures and Algorithms Implementation Through *C*, 2018–19 Edition, BPB Publications.
2. Dr. G. Sekar and Dr. R. Anandhi, *Data Structures*, 2020–21 Edition, VR1 Publications.
3. Dr. Bhakti Raul-Palkar, *Data Structures*, 2022–23 Edition, Tech Knowledge Publications.

Reference Books:

1. Seymour Lipschutz, Data Structures with C, Schaum's Outline Series, Tata McGraw-Hill.
2. Ellis Horowitz, Sartaj Sahni, and Susan Anderson-Freed, Fundamentals of Data Structures in C, 2nd Edition, Universities Press.
3. Aaron M. Tenenbaum, Yedidyah Langsam, and Moshe J. Augenstein, Data Structures Using C, Pearson Education.

							1.1	Applicable for 2026-2027 Onwards
BOS Chairman	Dean Academics	Principal	External Subject Expert	External Subject Expert	External Subject Expert	External Subject Expert	Version	

B.Tech: III– SEMESTER

COURSE CODE	COURSE NAME	TH	TU	PR	CREDITS	EVALUATION		
						ESE	CIE	TOTAL
25BIT303T	Operating System	2	-	-	2	30	20	50

Prerequisites: -Basic understanding of computer fundamentals, programming concepts, memory management, and computer organization is required to study Operating System.

COURSE OBJECTIVE	COURSE OUTCOME
The objectives of this course are to impart knowledge of 1. To introduce the fundamental concepts, structure, and functions of operating systems. 2. To develop understanding of process management, memory management, and scheduling techniques. 3. To provide knowledge of file systems, deadlocks, and device management in modern operating systems.	**After completing this course, the student will be able to:** **CO1:** Analyze the fundamentals of operating systems, process management, threads, and CPU scheduling algorithms for efficient process execution. **CO2:** Apply memory management, process synchronization, and deadlock handling techniques to manage system resources effectively. **CO3:** Analyze virtual memory concepts, page replacement algorithms, file systems, device management, and security mechanisms in modern operating systems.

UNIT I: **(09Hours)**

INTRODUCTION TO OPERATING SYSTEMS AND PROCESSES

Introduction to Operating System: Definition, objectives and functions of operating systems, Types of operating systems, Components of operating systems, System calls and services.

Process Management: Process concept, Process states, Process Control Block (PCB), Threads, Introduction to CPU scheduling.

CPU Scheduling Algorithms: FCFS, SJF, Priority Scheduling, Round Robin Scheduling.

UNIT II: **(09Hours)**

MEMORY MANAGEMENT AND DEADLOCKS

Memory Management: Memory allocation methods, Contiguous and non-contiguous allocation, Paging, Segmentation, Virtual memory basics.

Deadlocks: Introduction to deadlocks, Necessary conditions, Deadlock prevention and avoidance basics. Process Synchronization: Critical section problem, Semaphores and Mutex basics.

UNIT III: **(08Hours)**
FILE SYSTEM, DEVICE MANAGEMENT AND SECURITY

File System Concepts and Operations, File Access Methods (Sequential, Indexed, Direct), File Allocation Techniques (Contiguous, Linked, Indexed), Directory Structures (Single-Level, Two-Level, Tree-Structured, Acyclic Graph), Disk Structure, Disk Scheduling.

Text Books:

1. Silberschatz and P. Galvin, *Operating System Concepts*, 10th Edition, Wiley Publication.
2. S. Tanenbaum and H. Bos, *Modern Operating Systems*, 4th Edition, Pearson Education.

Reference Books:

1. D. M. Dhamdhere, Systems Programming and Operating Systems, 2nd Edition, Tata McGraw-Hill.
2. G. Nutt, Operating Systems Concepts, 3rd Edition, Addison-Wesley.
3. H. M. Deitel, An Introduction to Operating Systems, 3rd Edition, Pearson Education.

B.Tech: III– SEMESTER

COURSE CODE	COURSE NAME	TH	TU	PR	CREDITS	EVALUATION		
						ESE	CIE	TOTAL
25BIT303P	Operating System Lab	-	-	2	1	25	25	50

Prerequisites: -Basic knowledge of operating system concepts, command-line operations, programming fundamentals, and process management is required for Operating System Lab.

COURSE OBJECTIVE	COURSE OUTCOME
The objectives of this course are to impart knowledge of 1. To provide practical knowledge of operating system concepts and system utilities. 2. To understand process management, memory management, file handling, and CPU scheduling techniques. 3. To develop shell scripting and Linux command proficiency. 4. To familiarize students with synchronization and deadlock handling concepts. 5. To enable students to analyze operating system performance through practical implementation.	**After completing this course, the student will be able to:** **CO1:** Apply Linux commands, shell scripting, and process management concepts to perform operating system-related tasks in a Linux environment. **CO2:** Implement CPU scheduling, inter-process communication, synchronization, and semaphore-based solutions for process coordination and resource sharing. **CO3:** Analyze and simulate memory management and deadlock handling algorithms, including page replacement, deadlock avoidance, and deadlock detection techniques.

List of Experiments:

1. Study and execution of basic Linux/Unix commands.
2. Study of file and directory management commands in Linux.
3. Write a shell script for basic arithmetic operations and conditional statements.
4. Write a shell script to implement looping and file handling operations.
5. Program to demonstrate Process Creation using fork () system call in Linux.
6. Program to implement CPU Scheduling Algorithms (FCFS, SJF, Round Robin).
7. Program to demonstrate Inter Process Communication using Pipes.
8. Program to implement Producer-Consumer problem using Semaphores.

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9. Program to simulate Page Replacement Algorithms (FIFO, LRU, Optimal).
10. Program to simulate Deadlock Avoidance using Banker's Algorithm.
11. Implement Semaphores
12. Implement an algorithm for deadlock detection.

Text Books:

1. A. Silberschatz and P. Galvin, Operating System Concepts, 10th Edition, Wiley Publication.
2. A. S. Tanenbaum and H. Bos, Modern Operating Systems, 4th Edition, Pearson Education.

Reference Books:

1. D. M. Dhamdhere, Systems Programming and Operating Systems, 2nd Edition, Tata McGraw Hill.
2. G. Nutt, Operating Systems Concepts, 3rd Edition, Addison Wesley.
3. H. M. Deitel, An Introduction to Operating Systems, 3rd Edition, Pearson Education.

B.Tech: III– SEMESTER

COURSE CODE	COURSE NAME	TH	TU	PR	CREDITS	EVALUATION		
						ESE	CIE	TOTAL
25BIT304T	Fundamentals of Python Programming (MDM-I)	3	-	-	3	60	40	100

Prerequisites: -Basic knowledge of computer fundamentals, logical problem-solving and programming concepts is required to study Fundamentals of Python Programming.

COURSE OBJECTIVE	COURSE OUTCOME
The objectives of this course are to impart knowledge of 1. To understand the fundamentals and syntax of Python programming. 2. To learn decision-making, looping, functions, and modular programming concepts. 3. To develop problem-solving skills using Python data structures and file handling. 4. To understand object-oriented programming concepts in Python. 5. To implement simple real-world applications using Python programming.	**After completing this course, the student will be able to:** **CO1**: Apply Python syntax, data types, operators and input/output operations in developing programs. **CO2**: Apply conditional statements, loops, and functions for problem-solving. **CO3**: Implement Python data structures such as lists, tuples, sets, and dictionaries. **CO4**: Implement file handling operations and object-oriented programming concepts using Python. **CO5**: Develop Python programs using appropriate programming constructs to solve real-world problems.

UNIT I: **(09Hours)**

INTRODUCTION TO PYTHON

Features of Python, history and applications, installation and Python environment, Python syntax, variables, keywords, identifiers, input/output functions, comments.

Data types: int, float, string, Boolean, type conversion, operators in Python.

UNIT II **(09Hours)**

CONTROL STRUCTURES AND LOOPS

Conditional statements: if, if-else, nested if, elif ladder. Looping statements: for loop, while loop, nested loops. Loop control statements: break, continue, and pass

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UNIT III: **(09Hours)**

FUNCTIONS AND MODULES

Functions: definition, function arguments, return values, scope of variables, recursive functions, lambda functions. Modules and packages: importing modules, built-in modules, and user-defined modules.

UNIT IV: **(09Hours)**

DATA STRUCTURES AND FILE HANDLING

Lists, tuples, sets, and dictionaries: creation, operations, and applications. String operations and methods. File handling: opening, reading, writing, and appending files.

UNIT V: **(09Hours)**

OBJECT-ORIENTED PROGRAMMING BASICS

Introduction to Object-Oriented Programming, classes and objects, constructors, inheritance, polymorphism basics, Simple Python applications based on real-world problem-solving.

Text Books:

1. Eric Matthes, Python Crash Course, 2nd Edition, And No Starch Press.
2. Mark Lutz, Learning Python, 5th Edition, O'Reilly Media.
3. Mark Summerfield, Programming in Python 3, 2nd Edition, Addison-Wesley.

Reference Books:

1. R. Nageswara Rao, Core Python Programming, Dreamtech Press.
2. Paul Barry, Head First Python, 2nd Edition, O'Reilly Media.

B.Tech: III– SEMESTER

COURSE CODE	COURSE NAME	TH	TU	PR	CREDITS	EVALUATION		
						ESE	CIE	TOTAL
25BIT305T-A	Introduction to Data Structure (OE-I)	3	-	-	3	60	40	100

Prerequisites: - Basic knowledge of programming concepts, problem-solving techniques, and understanding of arrays, functions, and pointers is required to study Data Structure and application.

COURSE OBJECTIVE	COURSE OUTCOME
The objectives of this course are to impart knowledge of 1. To acquire knowledge of data structures, algorithm analysis, and asymptotic notations. 2. To analyze hashing techniques and collision resolution methods for efficient data retrieval. 3. To apply searching and sorting algorithms for organizing and processing data. 4. To implement linear data structures such as stacks, queues, and linked lists. 5. To develop solutions using tree-based data structures for efficient storage and retrieval of information.	**After completing this course, the student will be able to:** **CO1:** Analyze the efficiency of algorithms and data structures using asymptotic Notations and complexity measures. **CO2:** Implement and analyze searching, sorting, and hashing techniques for efficient data organization and retrieval. **CO3:** Design and implement stack and queue data structures and utilize them to solve computational problems involving expression conversion and evaluation. **CO4:** Develop solutions using linked list data structures and perform various operations such as insertion, deletion, searching, and traversal. **CO5:** Implement tree-based data structures including Binary Search Trees, AVL Trees, Heaps, and B-Trees, and perform traversal, insertion, deletion, and balancing operations.

UNIT I: **(10Hours)**

INTRODUCTION TO DATA STRUCTURE

General concepts of data structure: properties and Operations, Time and space analysis of algorithms, Big O, theta, and omega notations, Average, best and worst case analysis, Abstract data structure

Hashing: Hash tables, hash functions, hashing techniques, and Collision resolution techniques.

UNIT II **(08Hours)**

SEARCHING, SORTING AND ALGORITHMS

Sorting and Algorithm Techniques: Selection Sort, Insertion Sort, Merge Sort, Shell Sort, Radix Sort, Linear Searching, and Binary Search.

UNIT III: **(8 Hours)**

STACK & QUEUE

Representation of Stack & queue using array: Application of stacks, Conversion from infix to postfix and Prefix expressions, Evaluation of postfix, Circular Queues, Linear Queue and Priority Queues.

UNIT IV: **(10Hours)**

LINKED LIST

Definition and representation in memory, Implementation of Linked List, Types of linked list: Singly linked list, circular Singly linked list, Doubly linked list and circular doubly linked list, and, Representation of Ordered list using array and its operation, Implementation of linked list using Static and Dynamic memory allocations, Operations of linked list (insertion, deletion, searching, traversing) Application of linked list such as polynomial expression, comparisons of linked lists.

UNIT V: **(09Hours)**

TREES

Definition and basic terminology, Representation of a tree. Basic operations of binary trees and binary search trees (traversals of trees, insertion and deletion of elements). Binary search trees, the concept of balancing: threaded Binary Trees, AVL Trees, Heap trees, B-Trees.

Text Books:

4. R. S. Salaria, Data Structures & Algorithms using C, 5th Edition (2024), Khanna Publishing House.
5. Cormen, Leiserson, Rivest, and Stein, Introduction to Algorithms, 4th Edition, MIT Press.
6. Hemant Jain, Problem Solving in Data Structures & Algorithms Using C, 2022 Edition, Hemant Jain Publications.

Reference Books:

4. Reema Thareja, Data Structures using C, 3rd Edition (2020), Oxford University Press.
5. Mark Allen Weiss, Data Structures and Algorithm Analysis in C, 2nd/3rd Edition (2020), Pearson Education.
6. Narasimha Karumanchi, Data Structures and Algorithms Made Easy (C Version), 2nd/3rd Edition (2020–2021), Career Monk Publications.

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B.Tech: III– SEMESTER

COURSE CODE	COURSE NAME	TH	TU	PR	CREDITS	EVALUATION		
						ESE	CIE	TOTAL
25BIT305T-B	Introduction to Operating System (OE-I)	3	-	-	3	60	40	100

Prerequisites: - Basic understanding of computer fundamentals, programming concepts, memory management, and computer organization is required to study Operating System.

COURSE OBJECTIVE	COURSE OUTCOME
The objectives of this course are to impart knowledge of 1. To study the basic concepts and functions of operating systems. 2. To understand the structure of operating systems. 3. To learn about Processes, Threads and Scheduling algorithms. 4. To understand the principles of Concurrency and Deadlocks. 5. To learn various memory management schemes.	**After completing this course, the student will be able to:** **CO1**: Analyze and compare CPU scheduling algorithms. **CO2**: To apply the principles of concurrency. **CO3**: Apply deadlock prevention, avoidance and detection techniques. **CO4**: To compare and contrast various memory management schemes. **CO5**: To design and Implement a prototype file system.

UNIT I:
INTRODUCTION TO OPERATING SYSTEMS AND SYSTEM STRUCTURES **(09Hours)**
Operating System Structures: Definition, Types of operating system, System components, System services, Systems calls, System programs, System structure, Virtual machines, System design and implementation.

UNIT II
PROCESSES, THREADS AND CPU SCHEDULING **(09Hours)**
Processes and CPU scheduling: Process concept, Process scheduling, Operation on a process, Cooperating Processes, Threads, Inter process communication, Scheduling criteria, Scheduling algorithms, Multiple-processor scheduling, Real-time scheduling, Scheduling algorithms and performance evaluation.

UNIT III:
DEADLOCKS AND DEADLOCK MANAGEMENT **(09Hours)**
Deadlocks: Systems model, Deadlock characterization, Methods for handling deadlocks, Deadlock Prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock, combined approach to

Deadlock handling.

UNIT IV:
MEMORY MANAGEMENT AND VIRTUAL MEMORY **(09Hours)**

Memory Management and Virtual Memory: Logical versus physical address space, Swapping, Contiguous allocation, Paging, Segmentation with paging, Demand paging, Page replacement Algorithms, Thrashing.

UNIT V:
FILE MANAGEMENT **(08Hours)**

File Management: File system and secondary storage devices, Real-time operating systems.

Text Books:

1. A. Silberschatz, P. Galvin, "Operating System Concepts", Wiley Publication, 10th Edition, 2018..
2. A. S. Tanenbaum, H. Bos, "Modern Operating Systems", Pearson Education, 4th Edition, 2016.

Reference Books:

1. D.M. Dhamdhere,"Systems Programming and Operating Systems", Tata McGraw Hill Publication, 2nd Edition, 2001.
2. G. Nutt, "Operating Systems Concepts", Addison Wesley Publication, 3rd Edition.
3. H. M. Deitel, "An Introduction to Operating Systems", Pearson education Publication, 3rd Edition, 2007.

							1.1	Applicable for 2026-2027 Onwards
BOS Chairman	Dean Academics	Principal	External Subject Expert	External Subject Expert	External Subject Expert	External Subject Expert	Version	

B.Tech: III– SEMESTER

COURSE CODE	COURSE NAME	TH	TU	PR	CREDITS	EVALUATION		
						ESE	CIE	TOTAL
25BIT305T-C	Introduction to Web Technology (OE-I)	3	-	-	3	60	40	100

Prerequisites: -Basic computer literacy and familiarity with Internet browsing. No prior programming knowledge is required.

COURSE OBJECTIVE	COURSE OUTCOME
The objectives of this course are to impart knowledge of 1. Introduce students to the fundamentals of the World Wide Web and Internet technologies. 2. Familiarize students with web page design and website creation tools. 3. Develop the ability to create simple and attractive web pages using HTML and CSS. 4. Provide awareness of modern web applications and digital platforms. 5. Enable students to use web technologies for professional and academic purposes.	**After completing this course, the student will be able to:** **CO1:** Explain the fundamentals of Internet and Web technologies. **CO2:** Design basic web pages using HTML elements. **CO3:** Apply CSS techniques to improve the appearance of web pages. **CO4:** Develop simple interactive web pages using JavaScript. **CO5:** Understand modern web applications and create a basic professional web presence.

UNIT I: **(9 Hours)**

UNIT I: INTRODUCTION TO WEB TECHNOLOGY

Internet and World Wide Web, Evolution of Web Technologies, Web Browsers and Search Engines, Website, Web Page and Web Portal, URL, Domain Name and Web Hosting, Static and Dynamic Websites

UNIT II HTML FUNDAMENTALS **(8 Hours)**

Introduction to HTML, Structure of HTML Document, Headings, Paragraphs and Text Formatting, Lists and Hyperlinks, Tables and Images, Forms and Multimedia Elements

UNIT III: WEB PAGE STYLING USING CSS **(09Hours)**

Introduction to CSS, Inline, Internal and External CSS, Colors, Fonts and Backgrounds, CSS Selectors, Designing Attractive Web Pages, Responsive Web Design Concepts

UNIT IV: INTERACTIVE WEB PAGES **(09Hours)**

Introduction to JavaScript, Variables and Basic Operators, Input and Output Functions, Events and Event Handling, Simple Form Validation, Dynamic Content on Web Pages

UNIT V: MODERN WEB APPLICATIONS AND DIGITAL PRESENCE **(09Hours)**

Introduction to Web Applications, E-Commerce and Online Services, Social Media and Professional Networking, Personal Portfolio Websites, Website Security and Safe Browsing Practices, Future Trends in Web Technology

Text Books

1. ***Randy Connolly and Ricardo Hoar***, Fundamentals of Web Development, *3rd Edition, Pearson Education, 2022.*
2. ***Jon Duckett***, HTML and CSS: Design and Build Websites, *Wiley Publications, 2019.*
3. ***Jon Duckett***, JavaScript and jQuery: Interactive Front-End Web Development, *Wiley Publications, 2018.*

Reference Books

1. ***Deitel & Deitel***, Internet and World Wide Web: How to Program, *5th Edition, Pearson Education, 2019.*
2. ***Robin Nixon***, Learning PHP, MySQL & JavaScript, *6th Edition, O'Reilly Media, 2021.*
3. ***Thomas A. Powell***, HTML & CSS: The Complete Reference, *5th Edition, McGraw-Hill Education, 2017.*
4. ***Jennifer Niederst Robbins***, Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics, *5th Edition, O'Reilly Media, 2018.*
5. ***Laura Lemay, Rafe Colburn, and Jennifer Kyrnin***, Mastering HTML, CSS & JavaScript Web Publishing, *BPB Publications.*

							1.1	Applicable for 2026-2027 Onwards
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B.Tech: III– SEMESTER

COURSE CODE	COURSE NAME	TH	TU	PR	CREDITS	EVALUATION		
						ESE	CIE	TOTAL
25BIT306T	Universal Human Values	2	-	-	2	30	20	50

Prerequisites: -Basic awareness of self, family, society, and ethical values.

COURSE OBJECTIVE	COURSE OUTCOME
The objectives of this course are to impart knowledge of 1. To understand the importance of human values in personal and professional life. 2. To develop a holistic perspective of life and well-being. 3. To promote ethical behavior and harmony in society.	**After completing this course, the student will be able to:** **CO1:** Describe the significance of human values in personal and professional life. **CO2:** Analyze self-exploration and self-development for holistic well-being. **CO3:** Apply the principles of harmony in relationships and society.

UNIT I: **(09Hours)**

Introduction to Human Values: Need and importance of Human Values, Self-exploration and self-awareness, Happiness and Prosperity: Meaning and significance, Right Understanding vs. Assumptions Role of values in personal and professional life

UNIT II **(09Hours)**

Harmony in the Human Being: Activities of the Self: Thinking, Feeling, and Desire, Relationship between Self and Body, Harmony in the Self, Self-regulation and self-discipline, Development of Right Understanding and responsible behavior

UNIT III: **(09Hours)**

Harmony in Relationships and Society: Importance of Human Relationships, Values in Relationships: Trust, Respect, Affection, Care, Guidance, Reverence, Gratitude, and Love, Family as the basic unit of society Ethical Human Conduct and Social Responsibility, Value-based Living for Sustainable Development

Text Books:

1. A Foundation Course in Human Values and Professional Ethics by R. R. Gaur; R. Sangal; G. P. Bagaria
2. Universal Human Values: An Activity-Based Course by R. R. Gaur; R. Sangal; G. P. Bagaria

Reference Books:

1. Human Values and Professional Ethics by A. N. Tripathi
2. Ethics in Engineering by Mike W. Martin, Roland Schinzinger

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B.Tech: III– SEMESTER

COURSE CODE	COURSE NAME	TH	TU	PR	CREDITS	EVALUATION		
						ESE	CIE	TOTAL
25BIT307T	Ethics & Managerial Skills in IT	2	-	-	2	30	20	50

Prerequisites: -Basic understanding of professional environment, communication skills, and awareness of information technology applications.

COURSE OBJECTIVE	COURSE OUTCOME
The objectives of this course are to impart knowledge of 1. To understand professional ethics and ethical practices in Information Technology. 2. To develop managerial, leadership, and communication skills required in IT organizations. 3. To create awareness about organizational behavior, cyber ethics, and professional responsibilities.	**After completing this course, the student will be able to:** **CO1:** Analyze professional ethics, ethical values, and responsibilities of IT professionals. **CO2:** Apply managerial, leadership, communication, and teamwork skills in organizational environments. **CO3:** Evaluate organizational behavior, cyber ethics, and social responsibilities in IT industries.

UNIT I: **(09Hours)**
PROFESSIONAL ETHICS AND IT PRACTICES
Meaning and importance of ethics, Professional ethics, Ethical values, Code of conduct in IT profession, Responsibilities of IT professionals, Ethical issues in Information Technology. Cyber ethics, Intellectual property rights, Privacy and data protection basics.

UNIT II **(09Hours)**
MANAGERIAL SKILLS AND COMMUNICATION
Introduction to management, Functions of management – planning, organizing, directing, and controlling. Leadership qualities and leadership styles, Motivation techniques, Time management and stress management. Communication process, Verbal and non-verbal communication, Teamwork and interpersonal skills.

UNIT III: **(09Hours)**
ORGANIZATIONAL BEHAVIOR AND SOCIAL RESPONSIBILITIES
Introduction to organizational behaviour, Organizational culture, Workplace discipline and professionalism. Decision-making and problem-solving techniques, Professional responsibilities and accountability. Social

responsibilities of IT professionals, Environmental and societal impact of technology, Case studies related to ethics in IT.

Text Books:

1. Mike W. Martin and Roland Schinzinger, Ethics in Engineering, 4th Edition, McGraw-Hill.
2. P. Tripathi and P. N. Reddy, Principles of Management, Tata McGraw-Hill.
3. B. S. Moshal, Business Communication and Organizational Behavior, Ane Books Pvt. Ltd.

Reference Books:

1. Charles B. Fleddermann, Engineering Ethics, Pearson Education.
2. Robbins S. P., Organizational Behavior, Pearson Education.
3. Ashok Aradhya, Professional Ethics and Human Values, Sapna Book House.

B.Tech: III– SEMESTER

COURSE CODE	COURSE NAME	TH	TU	PR	CREDITS	EVALUATION		
						ESE	CIE	TOTAL
25BIT308P	Community-Based Project (Lab)	-	-	4	2	50	50	100

Prerequisites: -Basic understanding of teamwork, problem-solving, communication skills, and social responsibility is required for Community-Based Project (Lab).

COURSE OBJECTIVE	COURSE OUTCOME
The objectives of this course are to impart knowledge of 1. To expose students to real-world community problems and social issues. 2. To develop skills in problem identification, teamwork, and field-based learning. 3. To encourage social responsibility, sustainability, and ethical values.	**After completing this course, the student will be able to:** **CO1**: Identify and analyze community problems through field investigation. **CO2**: Apply technical and analytical skills to develop feasible community-oriented solutions. **CO3**: Design, implement, and present projects addressing social and community needs.

Flow of Project Work:

1. Introduction to Community Engagement and Social Responsibility
2. Identification of Local Community Problems (survey/observation)
3. Field Visit to Community (village/urban area/NGO)
4. Data Collection and Analysis (questionnaire/interview)
5. Problem Definition and Need Assessment
6. Brainstorming Solutions for Identified Problems
7. Planning a Community-Based Project
8. Implementation of Small-Scale Solution/Prototype
9. Evaluation of Project Impact and Feedback Collection
10. Final Report Writing and Project Presentation

Text Books:

1. Service-Learning Essentials by Andrew Furco and Shelley H. Billig explains the principles, practices, and benefits of integrating community service with academic learning.

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2. Community-Based Research and Higher Education by Kerry Strand et al. discusses collaborative research approaches that connect higher education institutions with community development initiatives.
3. Development as Freedom by Amartya Sen explores the relationship between freedom, human capabilities, and socio-economic development.

Reference Books:

1. Participatory Rural Appraisal by Robert Chambers explains participatory approaches and methods for involving rural communities in development planning and decision-making.
2. The Community Development Handbook by James M. Kelly and John L. R. provides practical guidance on community organization, participation, and sustainable development practices.
3. Social Work and Community Development by Meenakshi Malhotra discusses the principles, methods, and role of social work in community welfare and development.

Amar Seva Mandal's
Govindrao Wanjari College of Engineering and Technology, Nagpur
(Autonomous Institute)
Affiliated to
Dr. Babasaheb Ambedkar Technological University (DBATU), Lonere, Raigad
NAAC Accredited with B++ Grade
ISO 9001:2015 & ISO 14001:2015 Certified Institute
Department of Information Technology

Syllabus of Second Year Bachelor of Technology (B.Tech.) in Information Technology Programme (SEMESTER-IV)

"Syllabus Aligned with the National Education Policy (NEP) 2020"

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B.Tech: IV– SEMESTER

COURSE CODE	COURSE NAME	TH	TU	PR	CREDITS	EVALUATION		
						ESE	CIE	TOTAL
25BIT401T	Object-Oriented Programming using Java	3	-	-	3	60	40	100

Prerequisites: -Basic knowledge of programming concepts, data types, control structures, functions, and logical problem-solving is required to study Object Oriented Programming using Java.

COURSE OBJECTIVE	COURSE OUTCOME
The objectives of this course is to impart knowledge of 1. Understand and use the basic programming constructs of Java. 2. Apply object-oriented programming concepts such as classes, objects, inheritance, polymorphism, and abstraction in Java applications. 3. Develop problem-solving skills using Java programming techniques, control structures, arrays, and methods. 4. Implement exception handling, multithreading, and package concepts in Java programs. **5.** Design and develop Java-based applications using standard programming practices and object-oriented principles.	**After completing this course, the student will be able to:** **CO1:** Apply the fundamental concepts of object-oriented programming using Java. **CO2:** Apply the concepts of classes, objects, methods, and constructors in Java programming. **CO3:** Develop Java programs using control structures, arrays, strings, and exception handling techniques. **CO4:** Implement inheritance, polymorphism, interfaces, and abstraction for designing object-oriented applications. **CO5:** Design and develop multithreaded and package-based Java applications using standard programming practices.

UNIT I: **(10Hours)**

PRINCIPLES OF OBJECT ORIENTED PROGRAMMING USING JAVA

Procedure Oriented Programming (POP) versus Object Oriented Programming (OOP), Features of Object Oriented Programming, Applications of OOP, Introduction to Java, Java program structure, Data types, Variables, Dynamic initialization of variables, Reference variables, Type casting, Operators, Control structures, Arrays in Java.

UNIT II: **(09Hours)**

CLASSES AND OBJECTS

Introduction to Classes and Objects, Defining a class, Access specifier, Methods in Java, Creating objects,

Memory allocation for objects, Constructors, Method overloading, Arrays of objects, String handling, Wrapper classes, Input/output in Java, Packages and Interfaces.

UNIT III:
FUNCTIONS **(08Hours)**

Methods in Java, Parameter passing, Return types, Static methods and variables, Final keyword, Constructors: Default constructor, Parameterized constructor, Copying objects, Constructor overloading, Garbage collection, Exception handling: try, catch, throw, throws, finally, User-defined exceptions.

Unit IV:
POLYMORPHISM **(09Hours)**

Introduction to Polymorphism, Types of Polymorphism: Compile-time Polymorphism and Run-time Polymorphism, Method Overloading, Method Overriding, Dynamic Method Dispatch, Abstract classes, Interfaces, Type Conversion and Casting in Java.

Unit V: **(09Hours)**

INHERITANCE, PACKAGES & MULTITHREADING

Inheritance: Single, Multilevel and Hierarchical inheritance, Use of super keyword, Abstract classes, Interfaces, Packages in Java, Multithreading: Thread life cycle, Creating threads, Thread synchronization, Exception handling in threads, Introduction to Collection Framework.

Text Books:

1. Object Oriented Programming through Java explains Java programming fundamentals, object-oriented concepts, and application development techniques.
2. Java: The Complete Reference provides comprehensive coverage of Java programming concepts, syntax, object-oriented features, and advanced programming techniques.
3. Core Java Volume I – Fundamentals introduces Java programming concepts, problem-solving techniques, and practical software development.

Reference Books:

1. Head First Java explains Java concepts with practical examples and object-oriented programming principles.
2. Programming with Java discusses Java programming fundamentals, classes, inheritance, polymorphism, and application development.
3. Introduction to Java Programming provides detailed coverage of Java programming, GUI development, exception handling, and multithreading.

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B.Tech: IV– SEMESTER

COURSE CODE	COURSE NAME	TH	TU	PR	CREDITS	EVALUATION		
						ESE	CIE	TOTAL
25BIT401P	Object-Oriented Programming using Java Lab	-	-	2	1	25	25	50

Prerequisites: -Basic knowledge of Java programming concepts, classes, objects, methods, and debugging techniques is required for Object-Oriented Programming using Java Lab.

COURSE OBJECTIVE	COURSE OUTCOME
The objectives of this course are to impart knowledge of 1. Create and use classes and objects in Java. 2. Develop Java programs using constructors, methods, and object-oriented concepts. 3. Implement inheritance, polymorphism, abstraction, and encapsulation in Java applications.	**After completing this course, the student will be able to:** **CO1:** Construct Java programs using classes and objects. **CO2:** Develop Java programs using constructors, methods, and object management techniques. **CO3:** Implement object-oriented concepts such as encapsulation, inheritance, polymorphism, and abstraction in Java applications.

List of Experiments:

1. Study and Installation of Object-Oriented Programming (OOP) using Java.
2. Write programs to demonstrate the use of classes and objects in Java.
3. Write programs using methods, constructors, access specifier, and static members.
4. Write a program that initializes values using a parameterized constructor.
5. Write a program to demonstrate constructor overloading in Java.
6. Write a program to demonstrate the use of object cloning and copying techniques.
7. Write a program to demonstrate garbage collection and object destruction concepts.
8. Write programs to show the use of method overloading.
9. Write programs to demonstrate method overriding and dynamic method dispatch.
10. Write programs to implement multilevel inheritance.

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11. Write programs to implement hierarchical inheritance.
12. Write programs to implement interfaces and abstract classes.
13. Write programs using packages and exception handling.
14. Write programs to create and execute multithreading applications.
15. Write a Java program to swap two numbers using methods and objects.

Text Books:

1. Programming with Java explains Java programming fundamentals, object-oriented concepts, and application development techniques.
2. Java: The Complete Reference provides comprehensive coverage of Java programming concepts, syntax, object-oriented features, and advanced programming techniques.
3. Core Java Volume I – Fundamentals introduces programming concepts, problem-solving techniques, and practical software development using Java.

Reference Books:

1. Head First Java explains object-oriented programming concepts and Java application development with practical examples.
2. Introduction to Java Programming discusses Java programming fundamentals, inheritance, polymorphism, GUI, and multithreading concepts.
3. Object Oriented Programming through Java provides detailed coverage of Java programming, classes, inheritance, and software development concepts.

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B.Tech: IV– SEMESTER

COURSE CODE	COURSE NAME	TH	TU	PR	CREDITS	EVALUATION		
						ESE	CIE	TOTAL
25BIT402T	Analysis of Algorithm	2	-	-	2	30	20	50

Prerequisites: -Basic knowledge of data structures, programming concepts, mathematical logic, and problem-solving techniques is required to study Analysis of Algorithm.

COURSE OBJECTIVE	COURSE OUTCOME
The objectives of this course is to impart knowledge of 1. To understand the fundamental concepts of algorithm design and analysis including asymptotic notations, recurrence relations, and complexity analysis. 2. To apply divide and conquer, greedy, and graph algorithms for solving computational and optimization problems efficiently. 3. To analyze the computational complexity of problems and understand advanced concepts such as spanning trees, graph traversal, and NP theory.	**After completing this course, the student will be able to:** **CO1:** Analyze the efficiency of algorithms using asymptotic notations and recurrence relation methods. **CO2:** Design and implement efficient solutions using divide and conquer, greedy, and graph algorithms. **CO3:** Apply graph traversal and spanning tree algorithms and evaluate computational complexity using NP theory concepts.

UNIT I: **(09Hours)**
ALGORITHM ANALYSIS AND RECURRENCE RELATIONS
Asymptotic notation, Necessity of time and space analysis of algorithms, Different types of method for solving recurrence relations: Master theorem method, Substitutions method, Best Case, Average Case, and Worst Case Analysis, Introduction to Amortized Analysis and its Applications

UNIT II: **(09Hours)**
DIVIDE AND CONQUER
Divide and Conquer: Binary search, Finding maximum and minimum, Merge sort, Quick sort, Insertion Sort, Heap sort, Strassen's Matrix Multiplication.
Greedy Algorithms: Knapsack problem, Job sequencing with deadlines, Huffman code

UNIT III: **(09Hours)**
GRAPH THEORY

Elementary Algorithms: DFS, BFS and Topological Sort, Minimum spanning trees (Kruskal's and Prim's algorithms).

NP theory: Relation of P, NP Hard and NP complete problems.

Text Books:

1. Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein provides comprehensive coverage of algorithm design, analysis, and computational problem-solving techniques.
2. Computer Algorithms by E. Horowitz, S. Sahni, and S. Rajasekaran explains fundamental algorithms, data structures, and methods for efficient program development and analysis.

Reference Books:

1. Data Structures and Algorithms in C++ by B. K. Joshi explain fundamental data structures, algorithm design, and implementation techniques using C++.
2. Algorithms in a Nutshell by George T. Heineman, Gary Pollice, and Stanley Selkow provides concise explanations of common algorithms and practical problem-solving approaches in computer science.
3. Mastering Algorithms with C by Kyle Loudon discusses advanced algorithmic techniques and efficient programming methods using the C language.

B.Tech: IV– SEMESTER

COURSE CODE	COURSE NAME	TH	TU	PR	CREDITS	EVALUATION		
						ESE	CIE	TOTAL
25BIT403T	Computer Network	3	-	-	3	60	40	100

Prerequisites: -Basic knowledge of computer fundamentals, communication systems, networking concepts, and internet usage is required to study Computer Network.

COURSE OBJECTIVE	COURSE OUTCOME
The objectives of this course is to impart knowledge of 1. To understand the fundamentals, architecture, and models of computer networks and data communication. 2. To learn networking protocols, addressing schemes, routing mechanisms, and transmission techniques. 3. To develop understanding of transport and application layer services used in computer networks. 4. To gain knowledge of network security concepts, wireless communication, and emerging networking technologies. 5. To analyze modern networking applications, IoT communication, and performance issues in networks.	**After completing this course, the student will be able to:** **CO1:** Explain the fundamentals, architecture, models, and components of computer networks. **CO2:** Apply networking protocols, IP addressing, switching, and routing techniques in communication systems. **CO3:** Analyze transport and application layer protocols for reliable data communication. **CO4:** Analyze network security mechanisms and secure communication techniques. **CO5:** Evaluate emerging networking technologies, IoT communication models, and modern network applications.

UNIT I: **(09Hours)**
FUNDAMENTALS OF COMPUTER NETWORKS
Introduction to computer networks, data communication concepts, network criteria, components of communication systems, network models (OSI and TCP/IP), types of networks (LAN, MAN, WAN), network topologies, transmission modes, transmission media, and basics of physical layer communication.

UNIT II: **(09Hours)**
DATA LINK AND NETWORK LAYER CONCEPTS
Functions of data link layer, framing, error detection and correction, flow control, switching techniques, MAC protocols, IPv4 and IPv6 addressing, subnetting, routing algorithms, routing protocols, congestion control, and packet forwarding techniques, Error Detection and Correction.

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UNIT III:
TRANSPORT LAYER AND NETWORK PROTOCOLS **(09Hours)**

Transport layer services, TCP and UDP protocols, connection-oriented and connectionless communication, multiplexing and demultiplexing, congestion and flow control, quality of service, socket programming basics, and network performance parameters.

UNIT IV:
APPLICATION LAYER AND NETWORK SECURITY **(09Hours)**

Application layer protocols and services including DNS, HTTP, HTTPS, FTP, SMTP, POP3, IMAP, TELNET, and DHCP; fundamentals of network security, cryptography basics, firewalls, intrusion detection systems, authentication methods, and secure communication techniques.

UNIT V:
WIRELESS NETWORKS AND EMERGING TECHNOLOGIES **(09Hours)**

Wireless communication concepts, Wi-Fi, Bluetooth, mobile networks, wireless sensor networks, Internet of Things (IoT), cloud networking basics, software-defined networking, network virtualization, and emerging trends in computer networks.

Text Books:

1. Data Communications and Networking by Behrouz A. Forouzan explains the fundamentals of data communication, networking models, protocols, and network technologies.
2. Computer Networking: A Top-Down Approach by James F. Kurose and Keith W. Ross provides a layered approach to understanding computer networks, internet protocols, and network applications.
3. Computer Networks by Andrew S. Tanenbaum and David J. Wetherall discusses network architectures, communication protocols, and modern networking concepts in detail.

Reference Books:

1. Data and Computer Communications by William Stallings provides comprehensive coverage of data communication systems, networking concepts, protocols, and network security fundamentals.
2. Computer Networking: A Systems Approach by Larry L. Peterson and Bruce S. Davie explains network architecture, communication protocols, and advanced networking technologies with practical examples.

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B.Tech: IV– SEMESTER

COURSE CODE	COURSE NAME	TH	TU	PR	CREDITS	EVALUATION		
						ESE	CIE	TOTAL
25BIT403P	Computer Network Lab	-	-	2	1	25	25	50

Prerequisites: -Basic knowledge of computer fundamentals, operating systems, networking concepts, IP addressing, and logical problem-solving is required for Computer Network Lab.

COURSE OBJECTIVE	COURSE OUTCOME
The objectives of this course are to impart knowledge of 1. Understand the fundamentals of computer networks and communication protocols. 2. Configure and analyze network devices, IP addressing, and routing techniques. 3. Develop practical skills in network simulation, troubleshooting, and protocol analysis.	**After completing this course, the student will be able to:** **CO1**: Demonstrate the basic concepts of computer networks, communication protocols, and network models through practical implementation. **CO2**: Configure IP addressing, subnetting, and routing techniques in networking environments. **CO3**: Analyze network performance and troubleshoot networking issues using simulation and monitoring tools.

List of Experiments:

1. Study and installation of networking tools and simulation software such as Packet Tracer or Wire shark.
2. Study of network devices, cables, and network topologies.
3. Configure IP addressing and subnetting in a LAN environment.
4. Configure and test peer-to-peer network communication.
5. Configure switches and basic VLAN settings.
6. Configure static routing between different networks.
7. Configure dynamic routing protocols such as RIP and OSPF.
8. Study and analyze TCP/IP protocol suite using networking tools.
9. Capture and analyze network packets using Wireshark

10. Implement client-server communication using socket programming.
11. Write programs for TCP socket communication.
12. Write programs for UDP socket communication.
13. Configure DNS and DHCP services in a network environment.
14. Study network security concepts such as firewall and access control.
15. Perform network troubleshooting and connectivity testing using networking commands.

Text Books:

1. Computer Networks explains networking fundamentals, protocols, architectures, and communication techniques.
2. Data Communications and Networking provides comprehensive coverage of computer networking concepts, TCP/IP protocols, and network applications.
3. Computer Networking: A Top-Down Approach introduces networking concepts, internet protocols, and practical communication techniques.

Reference Books:

1. TCP/IP Protocol Suite discusses TCP/IP architecture, protocols, routing, and network services.
2. Network Security Essentials explains network security principles, cryptography, and secure communication methods.
3. Internetworking with TCP/IP provides detailed knowledge of TCP/IP networking and internet communication techniques.

B.Tech: IV– SEMESTER

COURSE CODE	COURSE NAME	TH	TU	PR	CREDITS	EVALUATION		
						ESE	CIE	TOTAL
25BIT404T	Data Analytics Using Python (MDM-II)	2	-	-	2	30	20	50

Prerequisites: -Basic knowledge of programming concepts, mathematics, statistics, and computer fundamentals is required to study Data Analytics Using Python.

COURSE OBJECTIVE	COURSE OUTCOME
The objectives of this course is to impart knowledge of 1. Understand the fundamentals of data analytics and the Python programming environment for data analysis. 2. Develop skills in data collection, cleaning, transformation, and visualization using Python tools. 3. Apply statistical and analytical techniques to extract insights from structured datasets.	**After completing this course, the student will be able to:** **CO1:** Explain the concepts of data analytics and utilize Python libraries for data processing and analysis. **CO2:** Perform data preprocessing, visualization, and exploratory data analysis using Python. **CO3:** Apply analytical methods and Python-based tools to solve real-world data-driven problems and support decision-making.

UNIT I: **(10Hours)**

INTRODUCTION TO DATA ANALYTICS AND PYTHON

Introduction to Data Analytics, Data Analytics Lifecycle, Types of Data and Data Sources, Applications of Data Analytics, Introduction to Python for Data Analytics, Python Data Types, Variables and Operators, Control Structures, Functions, Introduction to NumPy Arrays, Array Operations, Mathematical and Statistical Functions, Data Handling using Pandas Data Frames and Series.

UNIT II: **(09Hours)**

DATA PREPROCESSING AND VISUALIZATION

Data Collection and Importing Datasets, Data Cleaning and Data Quality Issues, Handling Missing Values and Outliers, Data Transformation and Feature Engineering, Data Aggregation and Filtering, Exploratory Data Analysis (EDA), Data Visualization using Matplotlib and Seaborn, Line Charts, Bar Charts, Histograms, Pie Charts, Scatter Plots, Correlation Analysis and Data Interpretation.

UNIT III: **(09Hours)**

STATISTICAL ANALYSIS AND PREDICTIVE ANALYTICS

Descriptive Statistics, Measures of Central Tendency and Dispersion, Probability Concepts for Data Analysis, Hypothesis Testing Basics, Correlation and Regression Analysis, Introduction to Machine Learning, Supervised and Unsupervised Learning Concepts, Classification and Clustering Overview,

Predictive Analytics using Scikit-Learn, Model Evaluation Metrics, Real-World Data Analytics Case Studies.

Text Books:

1. Python for Data Analysis by Wes McKinney, O'Reilly Media.
2. Data Analytics using Python by Bharti Motwani, Wiley India.
3. Practical Statistics for Data Scientists by Peter Bruce, Andrew Bruce, and Peter Gedeck, O'Reilly Media.

Reference Books:

1. Introduction to Data Science by Laura Igual and Santi Seguí, Springer.
2. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow by Aurélien Géron, O'Reilly Media.
3. Data Science from Scratch by Joel Grus, O'Reilly Media.
4. Think Stats: Exploratory Data Analysis by Allen B. Downey, O'Reilly Media.
5. Fundamentals of Data Visualization by Claus O. Wilke, O'Reilly Media.

B.Tech: IV– SEMESTER

COURSE CODE	COURSE NAME	TH	TU	PR	CREDITS	EVALUATION		
						ESE	CIE	TOTAL
25BIT405T-A	Fundamentals of IOT (OE-II)	2	-	-	2	30	20	50

Prerequisites: -Basic knowledge of computer networks, sensors, embedded systems, and internet communication concepts is required to study Fundamentals of IoT.

COURSE OBJECTIVE	COURSE OUTCOME
The objectives of this course is to impart knowledge of 1. To introduce the basic concepts, architecture, and components of the Internet of Things (IoT). 2. To develop understanding of IoT communication technologies, sensors, and embedded systems. 3. To provide knowledge about IoT applications, cloud integration, and security challenges in real-world environments.	**After completing this course, the student will be able to:** **CO1:** Understand the fundamental concepts, architecture, and components of IoT systems. **CO2:** Apply IoT communication protocols and networking technologies in connected devices and systems. **CO3:** Analyze IoT applications, security challenges, and develop basic IoT-based solutions for real-world problems.

UNIT I: **(09Hours)**
INTRODUCTION TO IoT
Introduction to Internet of Things (IoT), Characteristics of IoT, Physical and Logical Design of IoT, IoT Architecture, IoT Enabling Technologies, Sensors and Actuators, Embedded Systems and Microcontrollers, IoT Communication Models and APIs, IoT Platforms and Applications.

UNIT II: **(09Hours)**
IoT COMMUNICATION AND NETWORKING
IoT Communication Protocols: RFID, NFC, Bluetooth, ZigBee, Wi-Fi, LoRaWAN, MQTT, CoAP. IoT Networking Concepts, Wireless Sensor Networks (WSN), Cloud Computing for IoT, Edge and Fog Computing, Data Acquisition and Processing in IoT Systems.

UNIT III: **(09Hours)**
IoT APPLICATIONS, SECURITY AND CASE STUDIE
Applications in Smart Homes, Smart Cities, Healthcare, Agriculture, Industrial IoT, Smart Transportation. IoT Security Challenges, Privacy Issues, Data Protection, Cyber security in IoT. Case Studies and Mini IoT Project Design.

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Text Books:

1. Internet of Things: A Hands-On Approach by Arshdeep Bahga and Vijay Madisetti explains IoT concepts, architectures, sensors, and practical implementation techniques through hands-on applications.
2. Internet of Things by Raj Kamal provides comprehensive coverage of IoT technologies, communication protocols, embedded systems, and smart applications.
3. Designing the Internet of Things by Adrian McEwen and Hakim Cassimally discusses IoT system design, connected devices, and development of smart products and services.
4. Building the Internet of Things by Maciej Kranz explores IoT strategies, industrial applications, and the role of connected technologies in digital transformation.

Reference Books:

1. The Internet of Things: Key Applications and Protocols by Olivier Hersent, David Boswarthick, and Omar Elloumi explain IoT architectures, communication protocols, and major application areas of connected systems.
2. IoT Fundamentals by David Hanes, Gonzalo Salgueiro, and Patrick Grossetete provides foundational knowledge of IoT networking, sensors, connectivity, and smart device communication.
3. Architecting the Internet of Things by Dieter Uckelmann, Mark Harrison, and Florian Michahelles discusses IoT architectures, integration frameworks, and design principles for connected environments.
4. Practical Internet of Things Security by Brian Russell and Drew Van Duren focuses on IoT security challenges, risk management, and techniques for securing connected devices and networks.

B.Tech: IV– SEMESTER

COURSE CODE	COURSE NAME	TH	TU	PR	CREDITS	EVALUATION		
						ESE	CIE	TOTAL
25BIT405T-B	IT Skills for Business (OE-II)	2	-	-	2	30	20	50

Prerequisites: -Basic understanding of computer applications, office automation tools, communication technologies, and problem-solving skills is required to study IT Skills for Business.

COURSE OBJECTIVE	COURSE OUTCOME
The objectives of this course is to impart knowledge of 1. Understand the role and importance of Information Technology in modern business organizations. 2. Develop practical skills in office automation tools, digital communication, and business data management. 3. Apply IT tools and techniques for business productivity, collaboration, and decision-making. Enhance digital literacy, cyber awareness, and professional communication skills required in business environments.	**After completing this course, the student will be able to:** **CO1:** Explain the fundamentals of Information Technology and its applications in business organizations. **CO2:** Demonstrate proficiency in office automation tools, digital communication, and business data management. **CO3:** Apply IT-enabled business tools and digital technologies for effective communication, collaboration, and decision-making.

UNIT I:
FUNDAMENTALS OF IT IN BUSINESS **(09 Hours)**

Introduction to Information Technology, Role of IT in business organisations, Computer hardware and software basics, Operating systems and file management, Networking and Internet fundamentals, Digital transformation in business, E-commerce and digital business concepts

UNIT II:
OFFICE AUTOMATION AND DIGITAL COMMUNICATION **(09 Hours)**

Word processing using MS Word/LibreOffice Writer, Spreadsheet operations using MS Excel/LibreOffice Calc, Presentation tools using MS PowerPoint/LibreOffice Impress, Email communication and professional etiquette, Cloud computing and online collaboration tools Business documentation and report preparation

BOS Chairman	Dean Academics	Principal	External Subject Expert	External Subject Expert	External Subject Expert	External Subject Expert	1.1 Version	Applicable for 2026-2027

UNIT III:

BUSINESS PRODUCTIVITY AND EMERGING IT TOOLS **(09 Hours)**

Data analysis and visualisation using spreadsheets, Introduction to Management Information Systems (MIS) Business Intelligence and decision support systems, Cyber security awareness and safe digital practices Artificial Intelligence and Machine Learning in business, emerging technologies: IoT, Blockchain, and Robotic Process Automation (RPA), Digital productivity and workflow management tools

Text Books:

1. Information Technology for Management by Efraim Turban and Linda Volonino explains the role of information technology in business management, decision-making, and organizational strategy.
2. Fundamentals of Information Technology by Alexis Leon and Mathews Leon provides an introduction to computer systems, software, networking, and information technology applications.
3. Business Information Systems by James O'Brien discusses information systems, business processes, and the use of technology for organizational efficiency and management.

Reference Books:

1. Management Information Systems by Kenneth C. Laudon and Jane P. Laudon explains the use of information systems for business operations, management, and strategic decision-making.
2. Information Technology and Management by Carol V. Brown discusses the integration of information technology with business management and organizational processes.
3. Using Information Technology by Brian K. Williams and Stacey Sawyer provides an introduction to computer technologies, digital tools, and their applications in everyday and professional environments.
4. Digital Business and E-Commerce Management by Dave Chaffey focuses on e-commerce strategies, digital business models, and online marketing management.

B.Tech: IV– SEMESTER

COURSE CODE	COURSE NAME	TH	TU	PR	CREDITS	EVALUATION		
						ESE	CIE	TOTAL
25BIT405T-C	Introduction to OOPs using Java (OE-II)	2	-	-	2	30	20	50

Prerequisites: -Basic knowledge of programming concepts, problem-solving techniques, algorithms, and computer fundamentals is required to study Introduction to OOPs using Java.

COURSE OBJECTIVE	COURSE OUTCOME
The objectives of this course is to impart knowledge of 1. Understand the principles of Object-Oriented Programming and their implementation using Java. 2. Develop programming skills using Java syntax, data types, operators, and control structures. 3. Design and implement Java programs using classes, objects, inheritance, and polymorphism.	**After completing this course, the student will be able to:** **CO1:** Explain the concepts of Object-Oriented Programming and develop Java programs using classes and objects. **CO2:** Apply object-oriented concepts such as inheritance, polymorphism, abstraction, and encapsulation in Java applications. **CO3:** Develop and debug Java programs utilizing exception handling, packages, and basic collection classes.

UNIT I: **(09Hours)**
FUNDAMENTALS OF JAVA PROGRAMMING
Introduction to Object-Oriented Programming, Features of OOP, Introduction to Java and Java Virtual Machine (JVM), Structure of a Java Program, Data Types, Variables and Constants, Operators and Expressions, Input and Output Operations, Control Statements (Selection and Iteration), Arrays, Methods and Parameter Passing, Introduction to Classes and Objects.

UNIT II: **(09Hours)**
OBJECT-ORIENTED PROGRAMMING CONCEPTS
Classes and Objects, Constructors, Access Specifier, Encapsulation, Inheritance and Types of Inheritance, Method Overloading and Method Overriding, Polymorphism, Dynamic Method Dispatch, Abstract Classes and Methods, Interfaces, Packages, Object Class and String Handling in Java.

UNIT III: **(09Hours)**
ADVANCED JAVA FEATURES
Exception Handling (try, catch, throw, throws, finally), User-Defined Exceptions, File Handling Basics,

BOS Chairman	Dean Academics	Principal	External Subject Expert	External Subject Expert	External Subject Expert	External Subject Expert	1.1	Applicable for 2026-2027
							Version	

Java Collections Framework Overview, Array List, Linked List, Hash Map, Iterator Interface, Wrapper Classes, Introduction to Multithreading, Thread Lifecycle and Synchronization, Basic Event Handling and Real-World Java Application Development.

Text Books:

1. Java: The Complete Reference by Herbert Schildt, McGraw-Hill Education.
2. Programming with Java: A Primer by E. Balagurusamy, McGraw-Hill Education.
3. Object-Oriented Programming with Java by C. Thomas Wu, McGraw-Hill Education.

Reference Books:

1. Core Java Volume I – Fundamentals by Cay S. Horstmann, Pearson Education.
2. Head First Java by Kathy Sierra and Bert Bates, O'Reilly Media.
3. Java Programming by D.S. Malik, Cengage Learning.
4. Introduction to Java Programming and Data Structures by Y. Daniel Liang, Pearson Education.
5. Object-Oriented Programming through Java by P. Radha Krishna, Universities Press.

B.Tech: IV– SEMESTER

COURSE CODE	COURSE NAME	TH	TU	PR	CREDITS	EVALUATION		
						ESE	CIE	TOTAL
25BIT406P	Python Programming Lab	-	-	4	2	50	50	100

Prerequisites: -Basic knowledge of Python syntax, programming fundamentals, functions, and logical problem-solving skills is required for Python Programming Lab.

COURSE OBJECTIVE	COURSE OUTCOME
The objectives of this course are to impart knowledge of 1. Understand the fundamentals of Python programming and its development environment. 2. Develop Python programs using control structures, functions, strings, lists, tuples, dictionaries, and file handling concepts. 3. Implement object-oriented programming concepts and modular programming techniques in Python.	**After completing this course, the student will be able to:** **CO1**: Demonstrate Python programming constructs including variables, operators and control structures. **CO2**: Develop Python applications using functions, collections, modules and object-oriented programming. **CO3**: Implement file handling, exception handling and Python libraries (NumPy, Pandas) for solving computational problems..

List of Experiments:

1. Study and installation of Python IDEs (IDLE, PyCharm, VS Code) and execution of simple Python programs.
2. Programs based on data types, operators, input-output statements, and type conversion.
3. Programs using conditional statements and looping constructs.
4. Programs on strings, lists, tuples, dictionaries, and sets.
5. Implementation of user-defined functions and recursive functions.
6. Programs using modules and packages in Python.
7. Programs on file handling operations (read, write, append, and file handling modes).
8. Programs demonstrating exception handling techniques using try, except, finally, and custom exceptions.

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9. Programs based on classes, objects, constructors, inheritance, polymorphism, and encapsulation.
10. Programs demonstrating use of Python libraries such as NumPy and Pandas for basic data processing.
11. Programs for searching and sorting techniques using Python.
12. Programs to develop simple GUI applications using Tkinter.
13. Mini project/application development using Python for solving real-world computational problems.

Text Books:

1. Python Programming: Using Problem Solving Approach by Reema Thareja explains Python programming concepts, problem-solving techniques, and application development using practical examples.
2. Core Python Programming by Dr. R. Nageswara Rao provides comprehensive coverage of Python fundamentals, object-oriented programming, and advanced programming concepts.
3. Programming in Python 3 by Mark Summerfield discusses Python programming techniques, software development practices, and application design using Python 3.

Reference Books:

1. Learning Python by Mark Lutz provides in-depth coverage of Python programming concepts, syntax, and practical application development techniques.
2. Python Crash Course by Eric Matthes introduces Python fundamentals, problem-solving methods, and hands-on programming projects for beginners.
3. Head First Python by Paul Barry explains Python programming concepts through interactive examples, practical exercises, and real-world applications.
4. Think Python by Allen B. Downey focuses on computational thinking, programming fundamentals, and problem-solving using Python.

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B.Tech: IV– SEMESTER

COURSE CODE	COURSE NAME	TH	TU	PR	CREDITS	EVALUATION		
						ESE	CIE	TOTAL
25BIT407T	Effective Technical Communication	2	-	-	2	30	20	50

Prerequisites: -Basic understanding of English language, grammar, and communication skills.

COURSE OBJECTIVE	COURSE OUTCOME
The objectives of this course are to impart knowledge of	**After completing this course, the student will be able to:**
1: Develop effective written and oral communication skills required for academic, professional, and technical environments.	**CO1:** Demonstrate effective language proficiency and professional communication skills in academic and workplace settings.
2: Enhance language proficiency, presentation skills, and interview readiness for higher education and career opportunities.	**CO2:** Apply interview, presentation, business correspondence, and employability skills for career development.
3: Apply technical and professional writing principles for preparing reports, emails, resumes, and project-related documents.	**CO3:** Prepare technical reports, project documents, professional emails, and scientific write-ups following standard communication practices.

UNIT I:
LANGUAGE PROFICIENCY AND PROFESSIONAL COMMUNICATION **(09Hours)**
Fundamentals of Effective Communication, Common Errors in English Usage, Sentence Transformation: Voice, Narration, Simple, Compound and Complex Sentences, Vocabulary Building: Prefixes, Suffixes, Synonyms and Antonyms, Technical Terminology and Professional Expressions, Interpersonal and Workplace Communication Skills

UNIT II:
EMPLOYABILITY AND BUSINESS COMMUNICATION **(09Hours)**
Communication Skills for Competitive Examinations, Group Discussion and Presentation Skills , Interview Techniques and Mock Interviews , Resume and Cover Letter Writing, Essay writing.

UNIT III:

BOS Chairman	Dean Academics	Principal	External Subject Expert	External Subject Expert	External Subject Expert	External Subject Expert	1.1 Version	Applicable for 2026-2027

TECHNICAL AND SCIENTIFIC WRITING **(09Hours)**

Principles of Technical Writing , Technical Report Writing , Project Documentation and Proposal Writing , Research Paper and Scientific Writing Basics , Analytical and Technical Comprehension , Writing User Manuals and Technical Instructions , Use of AI and Digital Tools for Technical Communication

Text Books

1. **Meenakshi Raman and Sangeeta Sharma**, *Technical Communication: Principles and Practice*, 3rd Edition, Oxford University Press, 2019.
2. **M. Ashraf Rizvi**, *Effective Technical Communication*, 2nd Edition, McGraw Hill Education, 2017.
3. **R.C. Sharma and Krishna Mohan**, *Business Correspondence and Report Writing*, 5th Edition, Tata McGraw Hill, 2018.

Reference Books

1. **Sanjay Kumar and Pushp Lata**, *Communication Skills*, 2nd Edition, Oxford University Press, 2018.
2. **Raman Sharma**, *Technical Communications: Principles and Practice*, Oxford University Press, 2016.
3. **H. S. Mukherjee**, *Business Communication: Connecting at Work*, Oxford University Press, 2017.
4. **William Strunk Jr. and E.B. White**, *The Elements of Style*, 4th Edition, Pearson Education, 2019.
5. **Gerald J. Alred, Charles T. Brusaw, and Walter E. Oliu**, *Handbook of Technical Writing*, 12th Edition, Bedford/St. Martin's, 2020.

B.Tech: IV– SEMESTER

COURSE CODE	COURSE NAME	TH	TU	PR	CREDITS	EVALUATION		
						ESE	CIE	TOTAL
25BIT408T	Entrepreneurship in IT	2	-	-	2	30	20	50

Prerequisites: -Basic understanding of Information Technology, communication skills, and problem-solving concepts is required to study Entrepreneurship in IT.

COURSE OBJECTIVE	COURSE OUTCOME
The objectives of this course is to impart knowledge of 1. To understand the fundamentals of entrepreneurship and startup culture in the IT sector. 2. To develop knowledge of business planning, innovation, and management skills. 3. To understand financial, legal, and marketing aspects of IT entrepreneurship.	**After completing this course, the student will be able to:** **CO1:** Apply entrepreneurship concepts, start-up development, and opportunities in the IT industry. **CO2:** Apply business planning, management, and marketing skills for IT-based ventures. **CO3:** Analyze financial, legal, ethical and innovation aspects related to IT entrepreneurship.

UNIT I: **(09Hours)**

INTRODUCTION TO ENTREPRENEURSHIP AND IT STARTUPS

Introduction to entrepreneurship, Characteristics of entrepreneurs, Types of entrepreneurship, Importance of entrepreneurship in economic development. Start-up culture in IT industry, Innovation and creativity in entrepreneurship. Opportunities in Information Technology businesses, Digital start-ups, Role of entrepreneurs in technology development.

UNIT II: **(09Hours)**

BUSINESS PLANNING AND MANAGEMENT SKILLS

Business idea generation and opportunity analysis, Preparation of business plans. Functions of management – planning, organizing, leadership, and controlling. Communication and leadership skills, Marketing strategies, Digital marketing and branding. Sources of finance for start-ups, Budgeting and financial planning basics.

UNIT III: **(09Hours)**

LEGAL, ETHICAL AND EMERGING TRENDS IN IT ENTREPRENEURSHIP

Business registration procedures, Intellectual Property Rights (IPR), Patents, Copyrights, and Trademarks. Cyber laws and ethical issues in IT businesses. Challenges faced by IT entrepreneurs, Risk management and problem-solving techniques. Emerging trends in IT entrepreneurship: E-commerce, AI-based start-ups,

FinTech, and digital platforms. Case studies of successful IT entrepreneurs and start-ups.

Text Books:

1. Vasant Desai, *Dynamics of Entrepreneurial Development and Management*, Himalaya Publishing House.
2. Robert D. Hisrich, Michael P. Peters, and Dean A. Shepherd, *Entrepreneurship*, McGraw-Hill Education.
3. S. S. Khanka, *Entrepreneurial Development*, S. Chand Publishing.

Reference Books:

1. Peter F. Drucker, Innovation and Entrepreneurship, Harper Business.
2. Poornima M. Charantimath, Entrepreneurship Development and Small Business Enterprises, Pearson Education.
3. Donald F. Kuratko, Entrepreneurship: Theory, Process, Practice, Cengage Learning.
4. Rajeev Roy, Entrepreneurship, Oxford University Press.

B.Tech: IV – SEMESTER

COURSE CODE	COURSE NAME	TH.	TU	PR	CREDITS	EVALUATION		
						ESE	CIE	TOTAL
25BIT409T	Constitution of India HSSM-VEC-III	02	-	-	02	30	20	50

Prerequisites: Basic knowledge of Indian History, Civics, and the democratic system of India. No prior knowledge of Constitutional Law is required.

COURSE OBJECTIVE	COURSE OUTCOME
The Course aims to: 1.Highlight the characteristics of Indian Constitution 2.To understand the structures of governments in India 3.To create a politically aware and responsible citizen	**After completing this course, the student will be able to:** **CO1:** Understand the core philosophy of Indian constitution **CO2:** Understand the structure of Parliament **CO3:** Understand the structure of state legislature

UNIT – I: **(09Hours)**

FOUNDATIONS OF INDIAN CONSTITUTION & CITIZENSHIP

Making of Indian Constitution: Constituent Assembly-Composition, Objectives, Preamble and Salient features of the Indian Constitution, Fundamental Rights, Fundamental Duties, Directive Principles, citizenship act 1955, CAA 2019

UNIT – II: **(09Hours)**

UNION GOVERNMENT AND CONSTITUTIONAL INSTITUTIONS

Parliament- Loksabha, Rajyasabha, Union Government- structures of union government and Functions, President,- Discretionary powers, Emergency Provisions, Prime Minister and Council of Ministers, Executive powers of PM, Judiciary - supreme court of India – executive powers

UNIT – III: **(09Hours)**

STATE GOVERNMENT AND JUDICIAL ADMINISTRATION

State Government- Vidhansabha, Structures of state government and functions, Governor- Executive powers, Chief Minister- Executive powers, Council of Ministers, Judicial system in states- High court and subordinate courts

Text Books:

1) Durga Das Basu, Introduction to the Constitution of India, Gurgaon; LexisNexis,(23rdedn.)2018.
2) M. V. Pylee, India's Constitution, New Delhi; S. Chand Pub.,(16thedn.) 2017.

Reference Books:

1) K. Sharma, Introduction to the Constitution of India, Prentice Hall of India, New Delhi, 2002.

							1.1	Applicable for 2026-2027
BOS Chairman	Dean Academics	Principal	External Subject Expert	External Subject Expert	External Subject Expert	External Subject Expert	Version	

B.Tech: IV – SEMESTER

COURSE CODE	COURSE NAME	TH.	TU	PR	CREDITS	EVALUATION
Audit Course	**Environmental Studies**	-	-	-	-	**Grade**

COURSE OBJECTIVE	COURSE OUTCOME
The Course aims to: **1:** Understand the fundamental concepts of environment, ecosystems, natural resources, and environmental pollution. **2:** Develop awareness about environmental issues, sustainable development, waste management, and conservation practices. **3:** Recognize the importance of environmental protection, environmental laws, and individual responsibilities toward sustainable living.	**After completing this course, the student will be able to:** **CO1:** Identify different types of air pollution, explain their causes, detrimental effects on the environment, and suggest effective control measures. **CO2:** Analyze environmental problems related to air, water, soil pollution, and waste management, and suggest appropriate control measures. **CO3:** Demonstrate awareness of environmental sustainability, social issues, environmental legislation, and responsible environmental practices.

Activities

1. Environmental Audit/Field Survey & Report Writing
2. Case Study on Environmental Issues & Report Writing
3. Tree Plantation & Documentation
4. Awareness Campaign / Poster Presentation

BOS Chairman	Dean Academics	Principal	External Subject Expert	External Subject Expert	External Subject Expert	External Subject Expert	1.1 Version	Applicable for 2026-2027

Syllabus of Honor Courses (HON) offered by Information Technology at Second Year B.Tech Level

							1.1	Applicable for 2026-2027 Onwards
BOS Chairman	Dean Academics	Principal	External Subject Expert	External Subject Expert	External Subject Expert	External Subject Expert	Version	

B.Tech: III– SEMESTER

COURSE CODE	COURSE NAME	TH	TU	PR	CREDITS	EVALUATION		
						ESE	CIE	TOTAL
25BITH301T	Optimization Techniques	3	-	-	3	60	40	100

Prerequisites: -Engineering Mathematics – I and II , Discrete Mathematics, Data structure and algorithm

COURSE OBJECTIVE	COURSE OUTCOME
The objectives of this course are to impart knowledge of : 1. Understand the fundamental concepts and need for optimization in engineering and IT domains. **2.** Learn mathematical modeling techniques and classical methods for linear and non-linear optimization problems. **3.** Apply optimization algorithms to real-world IT and computer science problems. **4.** Explore modern optimization tools including evolutionary and nature-inspired algorithms.	**After completing this course, the student will be able to:** **CO1:** Formulate and classify optimization problems relevant to information technology. **CO2:** Solve linear programming problems using graphical and simplex methods. **CO3:** Apply unconstrained and constrained nonlinear optimization techniques. **CO4:** Implement dynamic programming and integer programming approaches in problem-solving. **CO5:** Apply modern heuristic and met heuristic algorithms like Genetic Algorithms and Particle Swarm Optimization for solving complex IT-related problems.

UNIT I: **(09Hours)**
Mathematical preliminaries: Linear algebra and matrices, Vector space, Eigen analysis, Elements of probability theory, Elementary multivariable
Calculus

UNIT II: **(09Hours)**
Linear Programming: Introduction to linear programming model, Simplex method, Duality, Karmarkar's method

UNIT III: **(09Hours)**
Unconstrained optimization: One-dimensional search methods, Gradient- based methods , Conjugate direction and quasi-Newton methods

UNIT IV: **(09Hours)**

BOS Chairman	Dean Academics	Principal	External Subject Expert	External Subject Expert	External Subject Expert	External Subject Expert	1.1 Version	Applicable for 2026-2027 Onwards

UNIT IV: **(09Hours)**
Constrained Optimization: Lagrange theorem, FONC, SONC, and SOSC conditions

UNIT V: **(09Hours)**
Non-linear problems: Non-linear constrained optimization models, KKT conditions, Projection methods

Text Books:

1. Rao, S. S., ***"Engineering Optimization: Theory and Practice"***, 4th Edition, Wiley India.
2. Diwekar, Urmila, ***"Introduction to Applied Optimization"***, 2nd Edition, Springer.
3. Antoniou, Andreas, and Lu, Wu-Sheng, ***"Practical Optimization: Algorithms and Engineering Applications"***, Springer.

Reference Books:

1. Rardin, Ronald L., ***"Optimization in Operations Research"***, Pearson.
2. Cavazzuti, Marco, ***"Optimization Methods: From Theory to Design"***, Springer.
3. Taha, H. A., ***"Operations Research: An Introduction"***, 10th Edition, Pearson.
4. Talbi, El-Ghazali, ***"Metaheuristics: From Design to Implementation"***, Wiley.

Alternative NPTEL/SWAYAM Digital Reference				
Sr.No.	**NPTEL/ SWAYAM Courses Name**	**Instructor**	**Host Institute**	**Links**
1.	Optimization from fundamentals	Prof. Ankur A. Kulkarni	IIT Bombay	https://nptel.ac.in/courses/112101298

							1.1	Applicable for 2026-2027 Onwards
BOS Chairman	Dean Academics	Principal	External Subject Expert	External Subject Expert	External Subject Expert	External Subject Expert	Version	

B.Tech: IV– SEMESTER

COURSE CODE	COURSE NAME	TH	TU	PR	CREDITS	EVALUATION		
						ESE	CIE	TOTAL
25BITH402T	Advanced Algorithms and Data Structures	3	-	-	3	60	40	100

Prerequisites: - Data structure, Analysis of algorithm and Discrete Mathematics

COURSE OBJECTIVE	COURSE OUTCOME
The objectives of this course are to impart knowledge of **1.** To analyze and apply advanced data structures for solving real-world computational problems. **2.** To explore optimization-focused algorithmic techniques including randomization and approximation. **3.** To understand computational geometry, string algorithms, and network flows in depth. **4.** To solve problems using advanced algorithm paradigms beyond traditional divide & conquer or dynamic programming. **5.** To implement complex algorithms using high-level languages and assess performance rigorously	**After completing this course, the student will be able to:** **CO1:** Analyze and implement advanced data structures such as AVL Trees, Red-Black Trees and Hashing techniques. **CO2:** Analyze and implement advanced graph algorithms including shortest paths and flows. **CO3:** Design algorithms using approximation, randomization, and online methods. **CO4:** Solve real-world problems using string algorithms and computational geometry techniques. **CO5:** Implement and evaluate advanced algorithms for solving real-world computational problems.

UNIT I: **(09Hours)**
Advanced Trees and Hashing: AVL Trees, Red-Black Trees, Splay Trees, B-Trees, Cuckoo Hashing, Extendible Hashing, Bloom Filters.

UNIT II: **(09Hours)**
Advanced Graph Algorithms: Bellman-Ford, Dijkstra's, Floyd-Warshall, Network Flows (Ford-Fulkerson, Edmonds-Karp), and Topological Sort.

UNIT III: **(09Hours)**
Approximation & Randomized Algorithms: Set Cover, Vertex Cover, Travelling Salesman Problem; Las

Approximation & Randomized Algorithms: Set Cover, Vertex Cover, Travelling Salesman Problem; Las Vegas vs. Monte Carlo, Hashing with Randomization.

UNIT IV: **(09Hours)**
String Algorithms and Computational Geometry: KMP, Rabin-Karp, Suffix Trees; Convex Hull (Graham Scan), Line Segment Intersection, Closest Pair.

UNIT V: **(09Hours)**
Online Algorithms and Real-World Applications: Paging, k-Server Problem, Online Bipartite Matching; Applications in Networking, Bioinformatics, AI.

Text Books:
1. Cormen, T. H., et al., ***"Introduction to Algorithms"***, MIT Press, 2022.
2. Levitin, Anany, ***"Introduction to Design and Analysis of Algorithms"***, Pearson, 2021.

Reference Books:
1. Horowitz, E., Sahni, S., and Rajasekaran, S., ***"Fundamentals of Computer Algorithms"***, Galgotia, 2021.
2. Mitzenmacher, Michael, and Upfal, Eli, ***"Probability and Computing"***, Cambridge University Press.

Alternative NPTEL/SWAYAM Digital Reference				
Sr.No.	**NPTEL/ SWAYAM Courses Name**	**Instructor**	**Host Institute**	**Links**
1.	Data Structure and Algorithms Using Java	Prof. Debasis Samanta	IIT Kharagpur	https://nptel.ac.in/courses/106105225
2.	Introduction to Algorithms and Analysis	Prof. Sourav Mukhopadhyay	IIT Kharagpur	https://onlinecourses.nptel.ac.in/noc25_cs150/preview

Syllabus of Double Minor Courses (DM) offered by Information Technology in at Second Year B.Tech Level

B.Tech: III– SEMESTER

COURSE CODE	COURSE NAME	TH	TU	PR	CREDITS	EVALUATION		
						ESE	CIE	TOTAL
25BITM301T	Computer Networks Fundamentals	3	-	-	3	60	40	100

Prerequisites: -Basic programming concepts and basic data communication

COURSE OBJECTIVE	COURSE OUTCOME
The objectives of this course are to impart knowledge of **1.** To introduce the fundamentals of computer networks and communication models. **2.** To explain key networking concepts such as protocols, architecture, and addressing. **3.** To provide insight into common networking devices and transmission media. **4.** To familiarize students with layered architecture (OSI and TCP/IP) and data flow.	**After completing this course, the student will be able to:** **CO1:** Describe basic concepts and terminology of computer networks. **CO2:** Explain the functions of various layers of the OSI and TCP/IP models. **CO3:** Analyze network topologies, transmission media and networking devices for suitable communication systems. **CO4:** Understand addressing schemes like IP, MAC, and domain names. **CO5:** Analyze the role of networking protocols in enabling reliable communication over computer networks.

UNIT I: **(09Hours)**

Introduction to Computer Networks: Definition and Uses of Computer Networks, Types of Networks: LAN, MAN, WAN, Network Topologies and Transmission Media, Network Devices: Router, Switch, Hub, Modem

UNIT II: **(09Hours)**

Network Models: OSI Reference Model: 7 Layers and Functions, TCP/IP Model and Comparison with OSI, Protocol Stack Overview

UNIT III: **(09Hours)**

Physical and Data Link Layer: Transmission Modes: Simplex, Half-Duplex, Full-Duplex, Error Detection Techniques (Parity, CRC), MAC Address and ARP Protocol

UNIT IV: **(09Hours)**

Network and Transport Layer: IP Addressing (IPv4 & Introduction to IPv6) , Subnetting Basics, Routing Concepts and Protocols (Static, Dynamic) , TCP vs. UDP

UNIT V: **(09Hours)**

Application Layer and Services: DNS, HTTP, FTP, Email (SMTP/POP3), Network Security Basics (Firewall, VPN, Encryption Overview) , Internet and Web Basics.

Text Books:
1. Behrouz A. Forouzan, ***Data Communications and Networking***, McGraw-Hill Education.

Reference Books:
1. James F. Kurose and Keith W. Ross, ***Computer Networking: A Top-Down Approach***, Pearson Education.
2. Andrew S. Tanenbaum, ***Computer Networks***, Pearson Education.

Alternative NPTEL/SWAYAM Digital Reference				
Sr.No.	**NPTEL/ SWAYAM Courses Name**	**Instructor**	**Host Institute**	**Links**
1.	Computer Networks	Dr. Karthik N	NIT, Puducherry	https://onlinecourses.swayam2.ac.in/ntr25_ed138/preview
2.	Computer Networks and Internet Protocol	Prof. Soumya Kanti Ghosh, Prof. Sandip Chakraborty	IIT Kharagpur	https://nptel.ac.in/courses/106105183

B.Tech: III– SEMESTER

COURSE CODE	COURSE NAME	TH	TU	PR	CREDITS	EVALUATION		
						ESE	CIE	TOTAL
25BITM402T	Data science and visualization	3	-	-	3	60	40	100

Prerequisites: - Programming fundamental, fundamental of Data Structure and algorithm.

COURSE OBJECTIVE	COURSE OUTCOME
The objectives of this course are to impart knowledge of 1. To introduce the basic concepts and techniques of data science. 2. To enable students to perform data preprocessing, exploration, and visualization. 3. To familiarize with tools and programming libraries used in data analysis and visualization. 4. To equip students with practical skills in interpreting and visualizing real-world datasets	**After completing this course, the student will be able to:** **CO1:** Understand the fundamental concepts of data science and analytics. **CO2:** Perform data preprocessing and cleaning using Python. **CO3:** Apply statistical techniques for data analysis. **CO4:** Develop effective visualizations using Matplotlib, Seaborn and Plotly for data interpretation. **CO5:** Analyze real-world datasets and generate meaningful data-driven insights for decision making.

UNIT I: **(09Hours)**

Introduction to Data Science: Data Science process, lifecycle, and applications, Types of data: structured, semi-structured, and unstructured, Basics of statistics: mean, median, mode, standard deviation, Introduction to Python for Data Science.

UNIT II: **(09Hours)**

Data Collection and Preprocessing: Data collection methods: web scraping, APIs, datasets, Data cleaning: handling missing data, outliers, duplicate data, Data transformation: normalization, encoding categorical data, Introduction to pandas and NumPy.

UNIT III: **(09Hours)**

Exploratory Data Analysis: Descriptive statistics and summary techniques, Correlation analysis and cross-tabulation, Grouping and aggregating data, Hands-on using pandas for EDA.

							1.1	Applicable for 2026-2027 Onwards
BOS Chairman	Dean Academics	Principal	External Subject Expert	External Subject Expert	External Subject Expert	External Subject Expert	Version	

UNIT IV: **(09Hours)**

Data Visualization Techniques: Principles of effective visualization, Plotting using Matplotlib and Seaborn, Advanced charts: heat maps, pair plots, histograms, box plots, Introduction to interactive visualizations using Plotly.

UNIT V: **(09Hours)**

Case Studies and Applications: Real-world applications of data science in various domains. Interpreting datasets from government, health, finance, and social media. Data storytelling and presentation best practices.

Textbooks:

1. Grus, J., ***"Data Science from Scratch: First Principles with Python"***, O'Reilly Media.
2. VanderPlas, J., ***"Python Data Science Handbook"***, O'Reilly.

Reference Books:

1. McKinney, W., ***"Python for Data Analysis"***, O'Reilly.
2. Wickham, H., ***"ggplot2: Elegant Graphics for Data Analysis"***, Springer.
3. Yau, N., ***"Data Points: Visualization That Means Something"***, Wiley.

Alternative NPTEL/SWAYAM Digital Reference				
Sr.No.	**NPTEL/ SWAYAM Courses Name**	**Instructor**	**Host Institute**	**Links**
1.	Data Science for Engineers	Prof. Shankar Narasimhan, Prof. Ragunathan Rengasamy	IIT Madras	https://nptel.ac.in/courses/106106179
2.	Data Science Using Python	Prof. Faisal Anwer, Prof. Mohammad Nadeem	Aligarh Muslim University	https://onlinecourses.swayam2.ac.in/ini25_cs04/preview