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Pimpri Chinchwad Education Trust's

Pimpri Chinchwad University

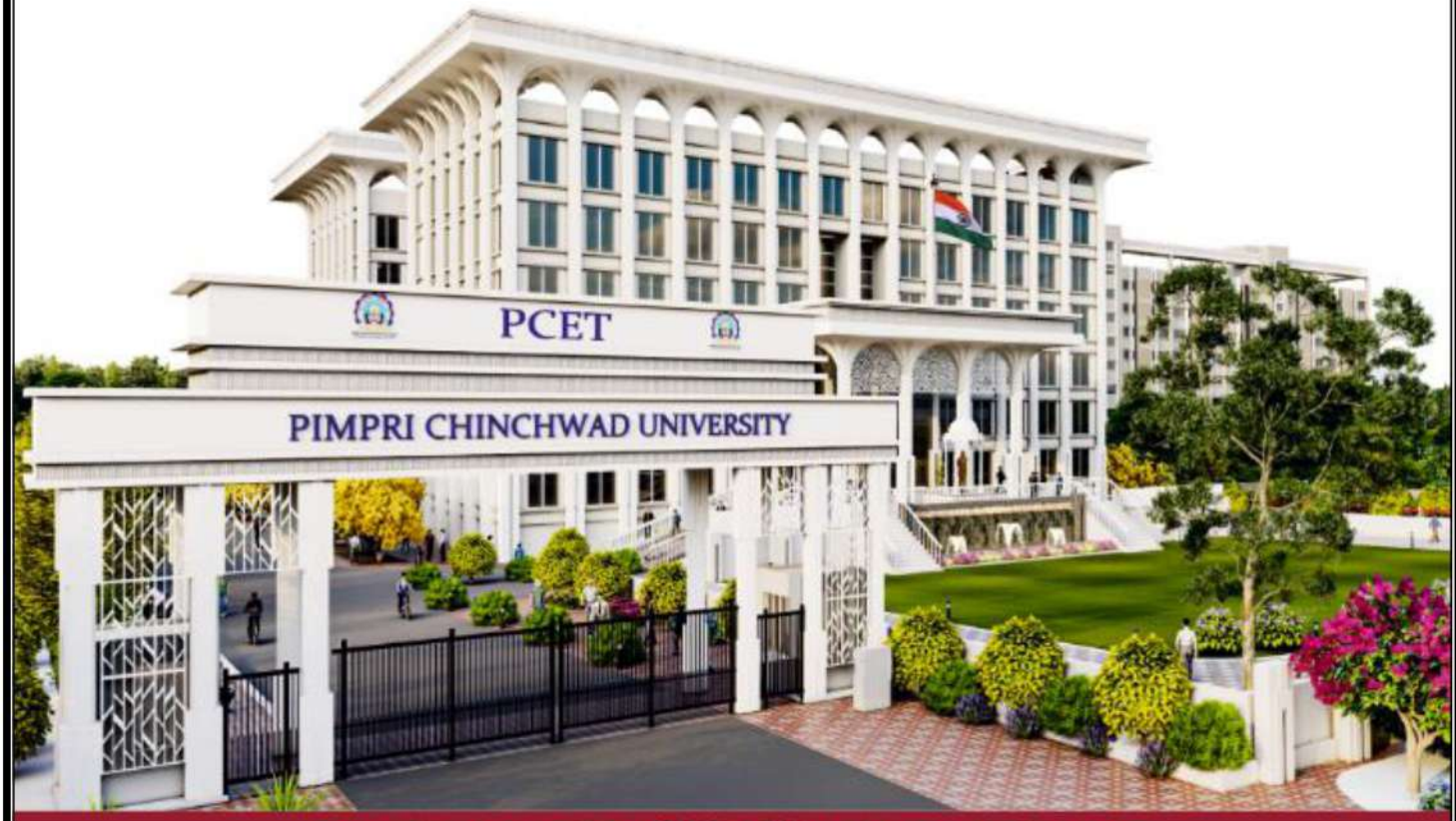
SCHOOL OF ENGINEERING AND TECHNOLOGY

(Established under Maharashtra Act No V of 2023)
Sate, Pune - 412 106. Maharashtra, India

B. TECH

Computer Science and Engineering (artificial Intelligence and Machine Learning)

(PATTERN 2024-2028)



EFFECTIVE FROM 2024-25 ACADEMIC YEAR

Pimpri Chinchwad Education Trust's

Pimpri Chinchwad University

Sathe, Pune - 412106

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Curriculum Structure

B. TECH
COMPUTER SCIENCE & ENGINEERING
(ARTIFICIAL INTELLIGENCE AND MACHIN LEARNING)

(Batch-2024-2028)

School of Engineering and Technology

Effective from

Academic Year 2024-25

Program Structure

Preamble:

The curriculum of B.Tech. Computer Science and Engineering (Artificial Intelligence & Machine Learning) program offered by the Department of Computer Science Engineering & Technology under Academic Regulation of NEP 2020 is prepared in accordance with the curriculum framework of AICTE, UGC and Maharashtra State Council of Higher Education, National Higher Education Qualifications Framework (NHEQF) and National Credit Framework (NCrF). Further this Outcome Based Curriculum (OBC) is designed with Choice Based Credit and Semester System (CBCSS) enabling the learners to gain professional competency with multi-disciplinary approach catering the minimum requirement (Program Specific Criteria) of Lead Societies like AICTE, ACM and other Professional Bodies as per the Engineering Accreditation Commission (EAC) of ABET and NBA. In addition, the curriculum and syllabi are designed in a structured approach by deploying Feedback Mechanism on Curriculum from various stakeholders viz. Industry, Potential Employers, Alumni, Academia, Professional Bodies, Research Organizations and Parents to capture their voice of the respective stakeholders. The Curriculum design, delivery, and assessment, the three major pillars of academic system is completely aligned in line with Outcome Based Education (OBE) to assess and evaluate the learning outcomes to facilitate the learners to achieve their Professional and Career Accomplishments.

After due deliberations, the scheme and syllabus have been formulated. Salient features of this model curriculum are enumerated as under:

1. Reduced number of credits.
2. Well defined learning objectives & outcomes for each course.
3. Inclusion of courses on socially relevant topics.
4. Built-in flexibility to the students in terms of professional elective and open elective courses and minor course.
5. Mandatory internship to equip the students with practical knowledge and provide them exposure to real time industrial environments.
6. Mapping of Courses to its equivalent NPTEL/SWAYAM Course.

Vision and Mission of Program:

Vision:

To develop engineers well versed with Critical Theory and Practical's (problem solving ability); and sensitive to National and Global challenges from Inter-disciplinary perspective. To create Industry ready; socially and ethically strong professionals.

Mission:

PO 1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Our mission is

- To develop the Computer Professionals by imparting computer engineering knowledge with professional ethics.
- To provide the service to the communities to which we belong at local and national levels, combined with a deep awareness of our ethical responsibilities to our profession and to society.

Program Educational Objectives:

Program Educational Objectives (PEOs) for a BTECH in Artificial Intelligence & Machine Learning program are as follows:

- **PEO 1:** To provide students with knowledge and skills to become leading experts in the field of computer science engineering.
- **PEO 2:** To provide an innovative and comprehensive curriculum that integrates theoretical knowledge with practical experience, research opportunities, and professional development
- **PEO 3:** To groom the student's overall personality for professional growth.
- **PEO 4:** To inculcate values and ethics among the students and making them aware about their social commitments.

Program Outcome

Program Outcomes (POs) At the end of program, students should be able to

Program Specific Object

Program Specific Outcomes (PSOs) At the end of program, students should be able to

PSO1	Use knowledge to write programs and integrate them with the hardware/software products in the domains of artificial Intelligent systems, data Science, networking and web technology.
PSO2	Participate in planning and implement solutions to cater to business specific requirements, displaying team dynamics and professional ethics.

INDEX

Sr. No.	Type of course	Abbreviations
1	Basic Science Course (BSC)	**BSC**
2	Engineering Science Course (ESC)	**ESC**
3	Programme Core Course (PCC)	**PCC**
4	Programme Elective Course (PEC)	**PEC**
5	Multidisciplinary Minor (MD M)	**MIN**
6	Open Elective (OE) Other than a particular program	**OE**
7	"Vocational and Skill Enhancement Course (VSEC)"	**VSEC**
8	Ability Enhancement Course (AEC -01, AEC-02)	**AEC**
9	Entrepreneurship/Economics/ Management Courses	**MGMT**
10	Indian Knowledge System (IKS)	**IKS**
11	Value Education Course (VEC)	**VEC**
12	Research Methodology	**RM**
13	Comm. Engg. Project (CEP)/Field Project (FP)	**CEP/FP**
14	Project	**PROJ**
15	Internship/ OJT	**OJT**
16	Co-curricular Courses (CC)	**CC**
17	Massive Open Online Courses (MOOC)	**MOOC**

Sr. No.	Type of course	No. of Courses	Total Credits	
			No	%
1	Basic Science Course (BSC)	**04**	**16**	**9.9**
2	Engineering Science Course(ESC)	**05**	**14**	**8.6**
3	Programme Core Course (PCC)	**29**	**62**	**38.2**
4	Programme Elective Course (PEC)	**10**	**25**	**15.4**
5	Multidisciplinary Minor (MD M)	**05**	**11**	**6.8**
6	Open Elective (OE) Other than a particular program	**04**	**08**	**5**
7	"Vocational and Skill Enhancement Course (VSEC)"	**02**	**03**	**2**
8	Ability Enhancement Courses / Co-curricular Courses (CC) (AEC -01, AEC-02)	**02**	**04**	**2.5**
9	Indian Knowledge System (IKS)	**02**	-	-
10	Value Education Course (VEC)	**02**	-	-
11	Research Methodology	**01**	**02**	**1.2**
12	Comm. Engg. Project (CEP)/Field Project (FP)	**02**	**03**	**2**
13	Project	**03**	**05**	**3**
14	Internship/ OJT	**01**	**06**	-
15	Massive Open Online Courses (MOOC)	**03**	**03**	-
	Total	**72**	**162**	-

CREDIT DISTRIBUTION: SEMESTER WISE

Sr. No.	Type of course	No. of Credits/Semester								Total
		1	2	3	4	5	6	7	8	
1	Basic Science Course (BSC)	08	08							**16**
2	Engineering Science Course (ESC)	07	07							**14**
3	Programme Core Course (PCC)	03	03	14	11	13	10	4	4	**62**
4	Programme Elective Course (PEC)					5	8	4	8	**25**
5	Multidisciplinary Minor (MD M)				02	3	2	2	2	**11**
6	Open Elective (OE) Other than a particular program			04	04					**08**
7	"Vocational and Skill Enhancement Course (VSEC)"	01	01		01					**03**
8	Ability Enhancement Course (AEC -01, AEC-02)	02	02							**04**
9	Entrepreneurship/Economics/ Management Courses									
10	Indian Knowledge System (IKS)									
11	Value Education Course (VEC)									
12	Research Methodology								2	**02**
13	Comm. Engg. Project (CEP)/Field Project (FP)			02	01					**03**
14	Project					01		2	2	**05**
15	Internship/ OJT							6		**06**
16	Co-curricular Courses (CC)									
17	Massive Open Online Courses (MOOC)						01	01	01	**03**
Total		21	21	20	19	22	21	19	19	162

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SCHOOL OF ENGINERRING & TECHNOLOGY

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

(ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)

As per Guidelines of NEP-2020 to be implemented

w.r.f. from Academic Year 2024-25

Choice Based Credit System (CBCS)

(2024 Pattern)

SEMESTER – III

Course Code	Course Type	Course Name	Teaching Scheme					Assessment Scheme			
			THY	PR	TUT	CREDITS	HRS.	CIA	ESA	PR /OR	Total
UBTCE201	PCC	Data Structures and Algorithms	3	-	-	3	3	40	60	-	100
UBTCE202	PCC	Data Structures and Algorithms Laboratory	-	1	-	1	2	25	-	25	50
UBTCE203	PCC	Python Programming	3	-	-	3	3	40	60	-	100
UBTCE204	PCC	Python Programming Laboratory	-	1	-	1	2	25	-	25	50
UBTCE205	OE	Open Elective-I	3	-	-	3	3	40	60	-	100
UBTCE206	OE	Open Elective-I Lab	-	1	-	1	2	25	-	25	50
UBTCE207	PCC	Discrete Mathematics	2	-	1	3	3	40	60	-	100
UBTCE208	PCC	Operating System	3	-	-	3	3	40	60	-	100
UBTML201	CEP	Community Engineering Project: AIML	-	2	-	2	4	25	-	25	50
UFL201	AEC	International Language I	2	-	-	-	2	50	-	-	50
ACUHV201/ ACCOI 201	AC	UHV II: Understanding Harmony/ Constitution of India	2	-	-	-	2	50	-	-	50
		Total	**18**	**5**	**1**	**20**	**29**	**400**	**300**	**100**	**800**

LIST OF OPEN ELECTIVES I: SEMESTER-III

Course Code	Elective-A	Course Code	Elective-B
UBTCE205 OE-Open Elective-I			
UBTCE205 A	Digital Electronics & Logic Design	UBTCE205 B	Signals and Systems
UBTCE206 OE-Open Elective-I Lab			
UBTCE206 A	Digital Electronics and Logic Design Laboratory	UBTCE206 B	Signals and Systems Lab

FOREIGN LANGUAGE -I

Course Code	International Language
UFL201 FL-I	
UFL201 A	Foreign Language-I : German
UFL201 B	Foreign Language-I : Japanese

SEMESTER - IV

Course Code	Course Type	Course Name	Teaching Scheme					Assessment Scheme			
			THY	PR	TUT	CREDITS	HRS.	CIA	ESA	PR /OR	Total
UBTCE210	PCC	Database Management System	3	-	-	3	3	40	60	-	100
UBTCE211	PCC	Database Management System Laboratory	-	1	-	1	2	25	-	25	50
UBTCE212	PCC	Core Java	2	-	-	2	2	20	30	-	50
UBTCE213	PCC	Computer Organisation	2	-	-	2	2	20	30	-	50
UBTCE214	PCC	Applied Mathematics	2	-	1	3	3	40	60	-	100
UBTCE215	OE	Open Elective-II	3	-	-	3	3	40	60	-	100
UBTCE216	OE	Open Elective-II Lab	-	1	-	1	2	25	-	25	50
UBTCE217	VSEC	Java Laboratory	-	1	-	1	2	25	-	25	50
UFL202	AEC	International Language: II	2	-	-	-	2	50	-	-	50
	MIN	Minor 1	2	-	-	2	2	20	30	-	50
ACUHV201 / ACCOI 201	AEC	UHV II: Understanding Harmony/ Constitution of India	2	-	-	-	2	50	-	-	50
UBTML202	CEP	Project Based on Digital and Technological Solutions: AIML	-	1	-	1	2	25	-	25	50
		Total	**18**	**4**	**1**	**19**	**27**	**380**	**270**	**100**	**750**

LIST OF OPEN ELECTIVES II: SEMESTER-IV

Course Code	Elective-A	Course Code	Elective-B
UBTCE205 OE-OPEN ELECTIVE-II			
UBTCE215 A	Communication System	UBTCE215 B	Digital Signal Processing
UBTCE206 OE-OPEN ELECTIVE-II LAB			
UBTCE216 A	Communication System Laboratory	UBTCE216 B	Digital Signal Processing Lab

FOREIGN LANGUAGES - II

Course Code	International Language II
UFL201 FL-I	
UFL202 A	Foreign Language-II: German
UFL202 B	Foreign Language-II: Japanese

SEMESTER - V

Course Code	Course Type	Course Name	HOURS / WEEK					Evaluation Scheme			
			THY	PR	TU	CREDITS	HRS.	CIA	ESA	PR /OR	TOTAL
UBTCE301	PCC	Theory of Computation	2	-	1	3	3	40	60	-	100
UBTCE310	PCC	Computer Network	3	-	-	3	3	40	60	-	100
UBTCE311	PCC	Computer Network Lab	-	1	-	1	2	25	-	25	50
UBTML301	PCC	Artificial Intelligence	3		-	3	3	40	60	-	100
UBTML302	PCC	Artificial Intelligence Lab	-	1	-	1	2	25	-	25	50
UBTML303 / UBTDS 303	PEC	Programme Elective-I	3	-	-	3	3	40	60	-	100
UBTML304 / UBTDS 304	PEC	Programme Elective-I Lab	-	1	-	1	2	25	-	25	50
	MIN	Minor-2	2	-	-	2	2	20	30	-	50
UBTCE308	PCC	Applied Statistical Techniques	2	-	-	2	2	20	30	-	50
UBTML305	PROJ	Technical Seminar: AIML	-	-	1	1	1	25	-	25	50
UFL301	VSEC	International Language - III	2	-	-	-	-	50	-	-	50
ACALR301 /ACCEVS301	AC	Aptitude and logical Reasoning /Environmental Studies	2	-	-	-	2	50	-	-	50
		Total	**19**	**3**	**2**	**20**	**27**	**400**	**300**	**100**	**800**

LIST OF PROGRAM ELECTIVE COURSE I: SEMESTER-V

Course Code	Programme Elective Courses	Course Code	Programme Elective Courses
Program Elective Course I: Theory			
UBTML303 A	Advanced Web Programming	UBTDS 303 B	Applied Data Science with Python
Program Elective Course I: Lab			
UBTML304 A	Advanced Web Programming Lab	UBTDS 304 B	Applied Data Science with Python Lab

FOREIGN LANGUAGES III-SEMESTER V

Course Code	International Language III
UFL201 FL-I	
UFL301 A	Foreign Language-III: German
UFL301 B	Foreign Language-III: Japanese

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SEMESTER – VI

Course Code	Course Type	Course Name	HOURS / WEEK				HRS.		Evaluation Scheme			
			THY	PR	TU	CREDITS			CIA	ESA	PR /OR	TOTAL
UBTML305	PCC	Machine Learning	3	-	-	3	3		40	60	-	100
UBTML306	PCC	Machine Learning Lab	-	1	-	1	2		25	-	25	50
UBTCE312	PCC	Software Engineering and Project Management	2	-	-	2	2		20	30	-	50
UBTCE313	PCC	Design and Analysis of Algorithms	3	-	-	3	3		40	60	-	100
UBTCE314	PCC	Design and Analysis of Algorithms Lab	-	1	-	1	2		25	-	25	50
UBTML307/ UBTML309	PEC	Program Elective Course -II	3	-	-	3	3		40	60	-	100
UBTML308 A	PEC	Program Elective Course -II Lab	-	1	-	1	2		25	-	25	50
UBTDS309	PEC	Program Elective Course -III	3	-	-	3	3		40	60	-	100
UBTDS310	PEC	Program Elective Course -III Lab	-	1	-	1	2		25	-	25	50
	MIN	Minor 3	2	-	-	2	2		20	30	-	50
VSE302	VSEC	International Language -IV	2	-		-	-		50	-	-	50
MOOCML 301	MOOC	MOOC II (Data Visualization using R programming/Advanced Full stack development/PHP)	-	-	1	1	2		25	-	-	25
ACALR301/ ACCEVS301	AC	Aptitude and logical Reasoning /Environmental Studies	2	-	-	-	2		50	-	-	50
		Total	**20**	**4**	**1**	**21**	**30**		**425**	**300**	100	**825**

LIST OF PROGRAM ELECTIVE COURSES II & III: SEMESTER-VI

Course Code	Programme Elective Courses	Course Code	Programme Elective Courses
Program Elective Course-II: PEC Theory			
UBTML307 A	Pattern Recognition and Optimization	UBTML307 B	Image Processing
UBTML308 A	Pattern Recognition and Optimization Laboratory	UBTML308 B	Image Processing Lab
Program Elective Course-III : PEC Theory			
UBTDS309 A	Data Visualization Techniques	UBTDS309 B	Financial Analytics
UBTDS310 A	Data Visualization Techniques Laboratory	UBTDS310 B	Financial Analytics Laboratory

FOREIGN LANGUAGE IV- SEMESTER V

Course Code	International Language -IV
UFL201 FL-I	
UFL302 A	Foreign Language-IV: German
UFL302 B	Foreign Language-IV: Japanese

SEMESTER - VII

Course Code	Course Type	Course Name	HOURS / WEEK				HRS.		Evaluation Scheme			
			THY	PR	TU	CREDITS			CIA	ESA	PR /OR	TOTAL
UBTML401	PCC	Deep Learning	3	-	-	3	3		40	60	-	100
UBTML402	PCC	Deep Learning Lab	-	1	-	1	2		25	-	25	50
UBTML403 UBTML405	PEC	Program Elective Course IV	3	-	-	3	3		20	30	-	50
UBTML404 UBTML406	PEC	Program Elective Course IV Lab	-	1	-	1	2		25	-	25	50
	MIN	Minor 4	2	-	-	2	2		20	30	-	50
UBTML407	INT/OJT	Industry/International/Research INTERNSHIP	-	6	-	6	12		100	-	150	250
UBTML408	PROJ	Major Project – I: AIML	-	2	-	2	4		25	-	100	125
MOOCML401	MOOC	MOOC III(Networking and Cyber Security/ARVR Certification)	-	-	1	1	2		25	-	-	25
		Total	**8**	**10**	**1**	**19**	**30**		**280**	**120**	**300**	**700**

LIST OF PROGRAM ELECTIVE COURSE IV: SEMESTER-VII

Course Code	Programme Elective Courses	Course Code	Programme Elective Courses
PROGRAM ELECTIVE COURSE-IV: PEC THEORY			
UBTML403 A	AI for Robotics	UBTML405 B	Generative AI
PROGRAM ELECTIVE COURSE-IV: PEC LAB			
UBTML404 A	AI for Robotics Laboratory	UBTML406 B	Generative AI Lab

SEMESTER - VIII

Course Code	Course Type	Course Name	HOURS / WEEK				HRS.		Evaluation Scheme			
			THY	PR	TU	CREDITS			CIA	ESA	PR /OR	TOTAL
UBTML407	PCC	Computer Vision	3		-	3	3		40	60	-	100
UBTML408	PCC	Computer Vision Lab	-	1	-	1	2		25	-	25	50
UBTML409/ UBTML410	PEC	Programme Elective Course-V	3	-	-	3	3		40	60	-	100
UBTML411/ UBTDS305	PEC	Programme Elective Course-VI	3	-	-	3	3		40	60	-	100
UBTCE409	PEC	Programme Elective Course-VII	2	-	-	2	2		20	30	-	50
UBTCE410	RM	Research Methodology & IPR	2	-	-	2	2		20	30	-	50
	MIN	Minor 5	2	-	-	2	2		20	30	-	50
UBTML412	PROJ	Major Project – II: AIML	-	2	-	2	4		100	-	125	225
MOOCML 402	MOOC	MOOC 3 Virtual Reality/ Data Mining/ UAV	-	-	1	1	2		25	-	-	25
		Total	**15**	**3**	**1**	**19**	**23**		**255**	**240**	**150**	**750**

LIST OF PROGRAMME ELECTIVES COURSES V & VI: SEMESTER-VII

Course Code	Programme Elective Courses	Course Code	Programme Elective Courses
PROGRAM ELECTIVE COURSE-V: PEC THEORY			
UBTML409 A	Time Series Forecasting	UBTML411 B	Reinforcement Learning
PROGRAM ELECTIVE COURSE-VI: PEC THEORY			
UBTML410 A	Business Analytics	UBTDS305 B	Data Analytics
PROGRAM ELECTIVE COURSE-VII: PEC ADVANCES IN COMPUTER ENGINEERING THEORY			
UBTCE413 A	Prompt Engineering	UBTCE413 B	Game Programming

INTERNSHIP SCHEMES

	Scheme A	Scheme B	Scheme C
Semester	6 Sem Summer	7 Sem	8 Sem
Mode	Offline	Online /Offline	Online /Offline
Duration	3-4 Months	3-4 Months	3-4 Months
Outcome	Project	Project	Project
Online Course	Not Required	50% Online MOOC Courses and remaining courses to be completed offline	50% Online MOOC Courses and remaining courses to be completed offline

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Established under Govt. of Maharashtra Act No. V of 2023
Sate, Maval (PMRDA) Dist - Pune, Maharashtra - 412 106.
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Evaluation Scheme for S. Y. B. Tech.

For the courses having End semester examination:

- Internal Evaluation: 40 Marks
- End Semester Exam: 60 Marks

Total: 100 Marks

Internal Evaluation: 40 Marks

- Mid Term Exam: 10 Marks
- Activity Performance / Tutorial /Assignments: 15 Marks
- Attendance: 05 Marks
- Online Course /Certificate:10 Marks

Total: 40 Marks

Term Work: 25 Marks

- Practical Assessment /Activity: 10 Marks
- Presentations/ Reports/ viva/ Mini Projects: 10 Marks
- Attendance: 05 Marks

Total: 25 Marks

Practical Exam: 25 Marks

MINOR COURSES

Minor Course Curriculum

Preamble:

The Minor Courses offered at Pimpri Chinchwad University are designed to equip students with practical skills and diverse perspectives to thrive in the modern world. Through minors focused on data analysis, environmental sustainability, digital media, and cyber-security, students gain experience and interdisciplinary knowledge. These minors encourage versatility, adaptability, and the ability to leverage technology to solve complex problems. Students explore subjects outside their primary focus, develop complementary abilities, and gain a deeper appreciation for diverse cultures and perspectives.

Vision:

To be a leading university inspiring academic and personal growth and transforming lives

Mission:

- To foster academic excellence, innovation and social responsibility by providing a holistic and inclusive learning ecosystem.
- To prepare students to be responsible ethical global citizens and leaders through industry-relevant curriculum, international exposure and skill development.
- To imbibe research and entrepreneurship aptitude among students
- To help and facilitate the students Learn, Grow, and achieve their full potential.

Program Outcomes

Programme Outcomes (POs):
PO 1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Course Structure

List of Minor Courses

Web Development (WD)

Offering School: School of Engineering & Technology (ET)

Course Code	Name of Course	Teaching Scheme			Evaluation Scheme	
		Sem	Credits	Hours	CIA	ESA
UETWD101	WD Minor1: Introduction of HTML	# II/ *IV	2	2	20	30
UETWD102	WD Minor2: Getting started with JavaScript	# III/ *V	2	2	20	30
UETWD103	WD Minor3: Server-side Programming with Node.js	# IV/*VI	2	2	20	30
UETWD104	WD Minor4: Front-end Development with React & Type Script	# V/*VII	2	2	20	30
UETWD105	WD Minor5: back-end frameworks - Django, Ruby on Rails,	# VI/*VIII	2	2	20	30

Robotics Process Automation (RP)

Offering School: School of Engineering & Technology (ET)

Course Code	Name of Course	Teaching Scheme			Evaluation Scheme	
		Sem	Credits	Hours	CIA	ESA
UETRP101	RP Minor1: Basics of Robotics Process Automation	# II/ *IV	2	2	20	30
UETRP102	RP Minor2: Fundamentals of RPA Business Analysis	# III/ *V	2	2	20	30
UETRP103	RP Minor3: Automation Techniques in RPA	# IV/*VI	2	2	20	30
UETRP104	RP Minor4: Future of RPA with Business Automation	# V/*VII	2	2	20	30
UETRP105	RP Minor5: RPA Tool	# VI/*VIII	2	2	20	30

Artificial intelligence & Machine Learning (ML)

Offering School: School of Engineering & Technology (ET)

Sr.no	Name of Course	Teaching Scheme			Evaluation Scheme	
		Sem	Credits	Hours	CIA	ESA
UETML101	ML Minor1: Artificial Intelligence	# II/ *IV	2	2	20	30
UETML102	ML Minor2: Machine Learning	# III/ *V	2	2	20	30
UETML103	ML Minor3: Natural Language Processing	# IV/*VI	2	2	20	30
UETML104	ML Minor4: Optimization Techniques	# V/*VII	2	2	20	30
UETML105	ML Minor5: Deep Learning For Computer Vision	# VI/*VIII	2	2	20	30

Data Science (DS)

Offering School: School of Engineering & Technology (ET)

Sr.no	Name of Course	Teaching Scheme			Evaluation Scheme	
		Sem	Credits	Hours	CIA	ESA
UETDS101	DS Minor1: Applied Data Science With Python	# II/ *IV	2	2	20	30
UETDS102	DS Minor2: Data Visualization With Tableau	# III/ *V	2	2	20	30
UETDS103	DS Minor3: Business Analytics	# IV/*VI	2	2	20	30
UETDS104	DS Minor4: Data Analytics	# V/*VII	2	2	20	30
UETDS105	DS Minor5: Generative AI	# VI/*VIII	2	2	20	30
	List of Minor Courses					

Media Communications

Offering School: School of media and communications studies

Course Code	Name of Course	Teaching Scheme			Evaluation Scheme	
		Sem	Credits	Hours	CIA	ESA
UMSMM101	MM Minor1: Literary Study	# II/ *IV	2	2	20	30
UMSMM102	MM Minor2: Digital Media Production	# III/ *V	2	2	20	30

UMSMM103	MM Minor3: Photography	# IV/*VI	2	2	20	30
UMSMM104	MM Minor4: Performing Arts - Theater	# V/*VII	2	2	20	30
UMSMM105	MM Minor5: Film Studies	# VI/*VIII	2	2	20	30

Psychology (PSY)

Offering School: School of science

Course Code	Name of Course	Teaching Scheme			Evaluation Scheme	
		Sem	Credits	Hours	CIA	ESA
USCPSY101	PSY Minor1: Introductory Psychology	# II/ *IV	2	2	20	30
USCPSY102	PSY Minor2: Foundations of Social Psychology	# III/ *V	2	2	20	30
USCPSY103	PSY Minor3: Theories of Personality Development	# IV/*VI	2	2	20	30
USCPSY104	PSY Minor4: Industrial Psychology	# V/*VII	2	2	20	30
USCPSY105	PSY Minor5: Mindfulness and Mental Health	# VI/*VIII	2	2	20	30

Nutrition (NUT)

Offering School: School of science

Course Code	Name of Course	Teaching Scheme			Evaluation Scheme	
		Sem	Credits	Hours	CIA	ESA
USCNUT101	NUT Minor1: Human Nutrition	# II/ *IV	2	2	20	30
USCNUT102	NUT Minor2: Lifestyle Management	# III/ *V	2	2	20	30
USCNUT103	NUT Minor3: Introduction to Weight Management	# IV/*VI	2	2	20	30
USCNUT104	NUT Minor4: Food Quality and Management	# V/*VII	2	2	20	30
USCNUT105	NUT Minor5: Novel Foods and Application	# VI/*VIII	2	2	20	30

Design Thinking and Methodologies (DM)

Offering School: Pune Design School (SD)

Course Code	Name of Course	Teaching Scheme			Evaluation Scheme	
		Sem	Credits	Hours	CIA	ESA
USDDM101	DM Minor1: Design Thinking	# II/ *IV	2	2	20	30
USDDM102	DM Minor2: Brand Identity Design	# III/ *V	2	2	20	30
USDDM103	DM Minor3: Digital tools for 2D design	# IV/*VI	2	2	20	30

USDDM104	DM Minor4: Physical model making/ Prototyping	# V/*VII	2	2	20	30
USDDM105	DM Minor5: Digital Tools for 3D design	# VI/*VIII	2	2	20	30

Economics & Finance (FE)

Offering School: School of Management (SM)

Course Code	Name of Course	Teaching Scheme			Evaluation Scheme	
		Sem	Credits	Hours	CIA	ESA
USMFE101	FE Minor1: Micro-economics	# II/ *IV	2	2	20	30
USMFE102	FE Minor2: Fundamentals of Accounting	# III/ *V	2	2	20	30
USMFE103	FE Minor3: Principles of Finance	# IV/*VI	2	2	20	30
USMFE104	FE Minor4: Cost anfd Management Accounting	# V/*VII	2	2	20	30
USMFE105	FE Minor5: Macro economics	# VI/*VIII	2	2	20	30

Entrepreneurship and Innovations (EI)

Offering School: School of Management (SM)

Course Code	Name of Course	Teaching Scheme			Evaluation Scheme	
		Sem	Credits	Hours	CIA	ESA
USMEI101	EI Minor1: Entrepreneurship-New venture Development	# II/ *IV	2	2	20	30
USMEI102	EI Minor2: Rural Entrepreneurship	# III/ *V	2	2	20	30
USMEI103	EI Minor3: Design Thinking	# IV/*VI	2	2	20	30
USMEI104	EI Minor4: Institutional and Legal framework for Startups and small Businesses	# V/*VII	2	2	20	30
USMEI105	EI Minor5: Managing creativity and learning organizations	# VI/*VIII	2	2	20	30

Drugs & Healthcare (DH)

Offering School: School of Pharmacy (SP)

Course Code	Name of Course	Teaching Scheme			Evaluation Scheme	
		Sem	Credits	Hours	CIA	ESA
USPDH101	DH Minor1: Health and hygiene	# II/ *IV	2	2	20	30
USPDH102	DH Minor2: Know your drugs	# III/ *V	2	2	20	30

USPDH103	DH Minor3: Complementary and alternative medicine	# IV/*VI	2	2	20	30
USPDH104	DH Minor4: Drug Discovery	# V/*VII	2	2	20	30
USPDH105	DH Minor5: Forensic Science	# VI/*VIII	2	2	20	30

Software Application Design and Development (AD)

Offering School: School of Engineering and Technology (Computer Applications)

Course Code	Name of Course	Teaching Scheme			Evaluation Scheme	
		Sem	Credits	Hours	CIA	ESA
UETAD101	AD Minor1: System Analysis and Design	# II/ *IV	2	2	20	30
UETAD102	AD Minor2: User Experience and Design	# III/ *V	2	2	20	30
UETAD103	AD Minor3: Introduction to GitHub.	# IV/*VI	2	2	20	30
UETAD104	AD Minor4: Introduction to Gaming Applications.	# V/*VII	2	2	20	30
UETAD105	AD Minor5: Mobile Application Development	# VI/*VIII	2	2	20	30

Cyber Security (CS)

Offering School: School of Engineering and Technology (Computer Applications)

Course Code	Name of Course	Teaching Scheme			Evaluation Scheme	
		Sem	Credits	Hours	CIA	ESA
UETCS101	CS Minor1: Cyber Ethics, Cyber Law and Cyber Policy	# II/ *IV	2	2	20	30
UETCS102	CS Minor2: Introduction to Cryptography	# III/ *V	2	2	20	30
UETCS103	CS Minor3: Social Media Security.	# IV/*VI	2	2	20	30
UETCS104	CS Minor4: Introduction to Block Chain.	# V/*VII	2	2	20	30
UETCS105	CS Minor5: Data Security & Privacy.	# VI/*VIII	2	2	20	30

English Literature (E)

Offering School: School of Liberal Arts (SL)

Course Code	Name of Course	Teaching Scheme			Evaluation Scheme	
		Sem	Credits	Hours	CIA	ESA
USLAE101	E Minor1: English for Competitive Examinations-I	# II/ *IV	2	2	20	30

USLAE102	E Minor2: English for Competitive Examinations-II	# III/ *V	2	2	20	30
USLAE103	E Minor3: English for Competitive Examinations-III	# IV/*VI	2	2	20	30
USLAE104	E Minor4: English for Competitive Examinations-IV	# V/*VII	2	2	20	30
USLAE105	E Minor5: English for Competitive Examinations-V	# VI/*VIII	2	2	20	30

English (E) Offering School: School of Liberal Arts (SL)						
Course Code	**Name of Course**	**Teaching Scheme**			**Evaluation Scheme**	
		Sem	Credits	Hours	CIA	ESA
USLAM101	Learning English With Shakespeare-Romeo and Juliet (Minor-I)	# II/ *IV	2	2	40	30
USLAM102	Learning English With Shakespeare-Hamlet (Minor-II)	# III/ *V	2	2	40	30

*** : Courses offered for B Tech, B Design**

#: Courses offered for B Sc, BBA, Media, and Management & Liberal Arts

Course Nomenclature

Course Title	Course Code	Name of Course
Web Development (WD)	UETWD101	WD Minor1: Introduction of HTML
	UETWD102	WD Minor2: Getting started with JavaScript
Robotics Process Automation (RP)	UETRP101	RP Minor1: Basics of Robotics Process Automation
	UETRP102	RP Minor2: Fundamentals of RPA Business Analysis
Artificial Intelligence & Machine Learning (AIML)	UETML101	ML Minor1: Artificial Intelligence
	UETML102	ML Minor2: Machine Learning
Data Science (DS)	UETDS101	DS Minor1: Applied Data Science With Python
	UETDS102	DS Minor2: Data Visualization With Tableau
Media Communications (MM)	UMSMM101	MM Minor1: Literary Study
	UMSMM102	MM Minor2: Digital Media Production
Psychology (PSY)	USCPSY101	PSY Minor1: Introductory Psychology
	USCPSY102	PSY Minor2: Foundations of Social Psychology
Nutrition (NUT)	USCNUT101	NUT Minor1: Human Nutrition
	USCNUT102	NUT Minor2: Lifestyle Management
Design Thinking Methodologies (DM)	USDDM101	DM Minor1: Design Thinking
	USDDM102	DM Minor2: Brand Identity Design
Economics and Finance (FE)	USMFE101	FE Minor1: Micro-economics
	USMFE102	FE Minor2: Fundamentals of Accounting
Entrepreneurship and Innovations (EI)	USMEI101	EI Minor1: Entrepreneurship-New venture Development
	USMEI102	EI Minor2: Rural Entrepreneurship
Drugs and Healthcare (DH)	USPDH101	DH Minor1: Health and hygiene
	USPDH102	DH Minor2: Know your drugs
Software Application Design and Development (AD)	UETAD101	AD Minor1: System Analysis and Design
	UETAD102	AD Minor2: User Experience and Design

Cyber Security (CS)	UETCS101	CS Minor1: Cyber Ethics, Cyber Law and Cyber Policy
	UETCS102	CS Minor2: Introduction to Cryptography
English Literature (EL)	USLAE101	E Minor1: English for Competitive Examinations-I
	USLAE102	E Minor2: English for Competitive Examinations-II
English (E)	USLAM101	E Minor 1: Learning English With Shakespeare-Romeo and Juliet
	USLAM102	E Minor2Learning English With Shakespeare-Hamlet (Minor-II)

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SEMESTER III

Name of the Program:	BTECH CSE	Semester: III	Level: UG
Course Name	Data Structures And Algorithms	Course Code/Course Type	UBTCE201/PCC
Course Pattern	2024	Version	1.0

Teaching Scheme					Assessment Scheme			
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Pr/ Oral	Total
3	-	-	3	3	40	60	-	100

Pre-Requisite: Knowledge of C Programming

Course Objectives (CO):	The objectives of Data Structures and Algorithms are: 1. To gain the knowledge about the concept of stack, queue and linked list. 2. To categorize the use of searching and sorting techniques. 3. Learn programming methodology for capability building. 4. Apply programming concepts to solve real life problem. 5. Implement Non-Linear Data Structures like Trees and graphs using programming language.
Course Learning Outcomes (CLO):	Students would be able to: **1.** Apply and analyse use of stacks, queues and linked lists with their applications. **2.** Apply and analyse use of searching and sorting techniques with their applications 3. Handle operations like searching, insertion, deletion, traversing mechanism etc. on various data structures. 4. Apply advanced data structure strategies to solve real world problems. 5. Apply concepts learned in various domains like DBMS, compiler

Descriptors/Topics	CLO	Hours
UNIT I		
Introduction to data structures, representing stacks and queues in C using arrays, linked lists: operations Stack and Queue implementation using Linked list, infix to post fix conversion, postfix expression evaluation, doubly linked lists, circular lists, polynomial representation & operations.	**CLO 1**	**9**
UNIT II		
Linear and binary search methods, sorting – Bubble sort, Selection sort, Insertion sort, Quick sort and Merge Sort. Input and output – concept of a file, text files and binary files, streams, standard I/O, Formatted I/O, file I/O operations.	**CLO 2**	**9**
UNIT III		
Linear Data Structure Array: Representation of arrays, Applications of arrays, sparse matrix and its representation., Stack: Stack-Definitions & Concepts, Operations On Stacks, Applications of Stacks, Polish Expression, Reverse Polish Expression And Their Compilation, Recursion, Tower of Hanoi, Queue: Representation Of Queue, Operations On Queue, Circular Queue, Priority Queue, Array representation of Priority Queue, Double Ended Queue, Applications of Queue, Linked List: Singly Linked List, Doubly Linked list, Circular linked list ,Linked implementation of Stack, Linked implementation of Queue, Applications of linked list.	**CLO 3**	**9**
UNIT IV		
Nonlinear Data Structure: Tree-Definitions and Concepts, Representation of binary tree, Binary tree traversal (Inorder, postorder, preorder), Threaded binary tree, Binary search trees, Conversion of General Trees to Binary Trees, Applications Of Trees- Some balanced tree mechanism, e.g. AVL trees, 2-3 trees, Height Balanced, Weight Balance, Graph-Matrix Representation of Graphs, Elementary Graph operations, (Breadth First Search, Depth First Search, Spanning Trees, Shortest path, Minimal spanning tree).	**CLO 4**	**9**
UNITV		
Hashing And File Structures: Hashing: The symbol table, Hashing Functions, Collision-Resolution Techniques, File Structure: Concepts of fields, records and files, Sequential, Indexed and Relative/Random File Organization, Indexing structure for index files, hashing for direct files, Multi-Key file organization and access methods.	**CLO 5**	**9**
Total		**45**

Learning resources

Text Books:

1. Herbert Schildt, "C++: The Complete Reference", McGraw Hill Education, 2003.
2. John R. Hubbard, "Data Structures with C++", Schaum's Outlines, Tata McGraw Hill Education, 2000.

Reference Books:

1. Michael T. Goodrich, Roberto Tamassia, David Mount, "Data Structures and Algorithms in C++", Wiley India Pvt. Ltd., 2004.
2. Seymour Lipschutz, "Data Structures", Schaum's Outlines, Tata McGraw Hill Education, 2006

Online Resource:

1. https://nptel.ac.in/courses/106102064
2. https://nptel.ac.in/courses/106103069

Name of the Program:	BTECH CSE-AIML	Semester: III	Level: UG
Course Name	Data Structures and Algorithms Lab	Course Code/Course Type	UBTCE202/PCC
Course Pattern	2024	Version	1.0

Teaching Scheme					Assessment Scheme			
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Pr/ Oral	Total
-	1	-	1	2	25	-	25	50

Pre-Requisite: Knowledge of C Programming

Course Objectives (CO)	The objectives of Data Structures and Algorithms lab are: 1. To gain the knowledge about the concept of stack, queue and linked list. 2. To categorize the use of searching and sorting techniques. 3. Learn programming methodology for capability building. 4. Apply programming concepts to solve real life problem. 5. Implement Non-Linear Data Structures like Trees and graphs using programming language.
Course Learning Outcomes (CLO):	Students would be able to: 1. Apply and analyse use of stacks, queues and linked lists with their applications. 2. Apply and analyse use of searching and sorting techniques with their applications 3. handle operations like searching, insertion, deletion, traversing mechanism etc. on various data structures. 4. Apply advanced data structure strategies to solve real world problems. 5. Apply concepts learned in various domains like DBMS, compiler

Assignment/ Practical/Activity Number	Assignment/Practical/Activity Title	Week Number/Turn	Details	CLO	Hours
1.	Practical 1: 1.WAP to demonstrate push, pop, traverse operations performed on stack.	Week 1		CLO1	2
2.	Practical 2: WAP to implement linear / circular queue using array.	Week 2		CLO1	2
3.	Practical 3: WAP to perform insertion and deletion in a single and double linked list	Week 3		CLO2	2
4.	Practical 4: WAP to sort an array of N elements using Selection sort.	Week 4		CLO 2	4
5.	Practical 4: WAP to sort an array of N elements using Selection sort.	Week 5			
6.	Practical 5: WAP to sort an array of N elements using Insertion sort	Week 6		CLO3	2
7.	Practical 6: WAP to sort an array of N elements using Quick sort	Week 7		CLO3	2

8.	Practical 7: WAP to sort an array of N elements using Merge sort.	Week 8		CLO4	2
9.	Practical 8: Write a program that uses both recursive and non-recursive functions to perform the following searching operations for a Key value in a given list of integers: i. Linear search ii. Binary search	Week 9		CLO4	2
10.	Practical 9: Write a program to perform the following operations: 1.Insert an element into a binary search tree. 2.Delete an element from a binary search tree. 3.Search for a key element in a binary search tree.	Week 10		CLO5	2
11.	Practical 10: To implement Depth First Search / Breadth First Search Algorithm	Week 11		CLO5	2
12.	Mini Project /Task	Week 12		CLO1/2/3/4/5	2
13.	Mini Project /Task	Week 13		CLO1/2/3/4/5	2
14.	Mini Project /Task	Week 14		CLO1/2/3/4/5	2
Total Hours					**30**

Learning resources

Text Books:

1. Herbert Schildt, "C++: The Complete Reference", McGraw Hill Education, 2003.
2. John R. Hubbard, "Data Structures with C++", Schaum's Outlines, Tata McGraw Hill Education, 2000.

Reference Book:

1. Michael T. Goodrich, Roberto Tamassia, David Mount, "Data Structures and Algorithms in C++", Wiley India Pvt. Ltd., 2004.
2. Seymour Lipschutz, "Data Structures", Schaum's Outlines, Tata McGraw Hill Education, 2006

Online Resource:

1. https://nptel.ac.in/courses/106102064
2. https://onlinecourses.swayam2.ac.in/cec19_cs04/preview

Name of the Program:		BTECH CSE			Semester: III	Level: UG	
Course Name		Python Programming			Course Code/ Course Type	UBTCE203/PCC	
Course Pattern		2024			Version	1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Pra/ Oral
3	-	-	3	3	40	60	-

Pre-Requisite:

1. Basic knowledge of Programming in C

Course Objectives (CO):	The objectives of Python Programming are: 1. To learn the fundamentals of the Python programming language. 2. To create Python lists, tuples to represent compound data. 3. To write and execute simple as well as complex Python programs. 4. To analyze the concepts of procedural as well as object-oriented Python programs. 5. To perform files handling operations and handle exceptions using Python.
Course Learning Outcomes (CLO):	Students would be able to: 1. Elaborate the features of Python programming language. 2. Apply the conditional and looping constructs using python. 3. Use the multidimensional array and string operations using python. 4. Analyze and apply the object-oriented concepts using python programming. 5. Apply the file handling and exception handling using python programming.

1.

Descriptors/Topics	CLO	Hours
UNIT I		
Introduction to Python: Python Introduction- Features, Identifiers, Reserved words, Indentation, Comments, Built-in Data types and their Methods: Strings, List, Tuples, Dictionary, and Set - Type Conversion- Operators. Execution of a Python, Program, Writing Our First Python Program, Statements Precedence of Operators.	**CLO 1**	**9**
UNIT II		
Decision Making and looping: Conditional (if), Alternative (if-else), Chained Conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Math and Random number functions.	**CLO 2**	**9**
UNIT III		
Array and String :	**CLO 3**	**9**

Arrays in Python, Strings and Characters. Strings: String Slices, Immutability, String Functions and Methods, String Module; Lists as Arrays, Sum an Array of Numbers, Linear Search, Binary Search.		
UNIT IV		
Function and OOPs concept: User defined functions - function arguments & its types, OOPs Concepts -Class and Objects, Constructors – Data hiding- Data Abstraction- Inheritance.	**CLO 4**	**9**
UNIT V		
Files and Exception: Text Files, Reading and Writing Files, Format Operator; Command Line Arguments, Errors and Exceptions, Handling Exceptions, Modules, Packages; Illustrative Programs: Word Count, Copy File.	**CLO 5**	**9**
Total Hours		**45**

Learning resources:

Textbooks:

1. Y. Daniel Liang, "Introduction to Programming using Python", Pearson, 2012.
2. Wes McKinney, "Python for Data Analysis: Data Wrangling with Pandas, NumPy, and Python", O'Reilly, 2nd Edition, 2018.

Reference Books:

1. Wesley J. Chun, "Core Python Programming", Prentice Hall, 2006
2. Mark Lutz, "Learning Python", O'Reilly, 4th Edition, 2009

Online Resources:

1. https://www.w3schools.com/python/
2. https://www.learnpython.org /
3. https://www.udemy.com/course/complete-python-bootcamp/?couponCode=ST8MT40924/
4. https://onlinecourses.swayam2.ac.in/cec22_cs20/preview

Name of the Program:		BTECH CSE			Semester: III	Level: UG	
Course Name		Python Programming Laboratory			Course Code/ Course Type	UBTCE204/PCC	
Course Pattern		2024			Version	1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/ Oral
-	1	-	1	2	25	-	25

Pre-Requisite:

1. Basic knowledge of Programming in C

Course Objectives (CO):	The objectives of Python Programming are: 1. To learn the python graphical user interface and editors to implement Python programming language. 2. To create Python lists, tuples to represent compound data. 3. To write simple as well as complex Python programs. 4. To analyze the concepts of procedural as well as object-oriented Python programs. 5. To perform files handling operations and handle exceptions using Python.
Course Learning Outcomes (CLO):	Students would be able to: 1. Create data structures using Python programming language. 2. Apply the conditional and looping constructs using python. 3. Use the multidimensional array and string operations using python. 4. Analyse and apply the object-oriented concepts using python programming. 5. Apply the file handling and exception handling using python programming.

Assignment/ Practical/Activity Number	Assignment/Practical/Activity Title	Week Number/ Turn	Details	CLO	Hours
1.	Practical 1: Command Line Argument	Week 1/Turn 1	To write a python program that takes in command line arguments as input and print the number of arguments.	CLO1	2
2.	Practical 2: Data structure	Week 2/ /Turn 1	To write a python program to perform Creation, indexing, slicing, concatenation and repetition operations on Python built-in data types: Strings, List, Tuples, Dictionary, and Set.	CLO1	2
3.	Practical 2: Data structure	Week 3/ Turn 1	To write a python program to perform Creation, indexing, slicing, concatenation and repetition operations on Python built-in data types: Strings, List, Tuples, Dictionary, and Set.	CLO2	2
4.	Practical 2: Data structure	Week 4/ Turn 1	To write a python program to perform Creation, indexing, slicing, concatenation	CLO2	2

			and repetition operations on Python built-in data types: Strings, List, Tuples, Dictionary, and Set.		
5.	Practical 3: Control Statements	Week 5/Turn 1	To write a python program to Solve problems using decision and looping statements.	CLO2	2
6.	Practical 3: Control Statements	Week 6/Turn 1	To write a python program to Solve problems using decision and looping statements.	CLO2	2
7.	Practical 4: Linear Search	Week 7/Turn 1	To write a python program to perform linear search.	CLO2	2
8.	Practical 5: Binary Search	Week 8/Turn 1	To write a python program to perform Binary search using strings.	CLO3	2
9.	Practical 6: Numerical Operations	Week 9/Turn 1	To write a python program to handle numerical operations using math and random number functions.	CLO3	2
10.	Practical 7: User Defined Functions	Week 10 /Turn 1,	To write a python program to Create user-defined functions with different types of function arguments.	CLO4	2
11.	Practical 7: User Defined Functions	Week 11 /Turn 1	To write a python program to Create user-defined functions with different types of function arguments.	CLO4	2
12.	Practical 8: Packages and Modules	Week 12 /Turn 1	To write a python program to Create packages and import modules from packages.	CLO4	2
13.	Practical 9: File Handling Operations	Week 13 /Turn 1	To write a python program to perform File manipulations- open, close, read, write, append and copy from one file to another.	CLO5	2
14.	Practical 10: Exception Handling Operations	Week 14 /Turn 1	To write a python program to handle Exceptions using Python Built-in Exceptions.	CLO5	2
15.	Practical 10: Exception Handling Operations	Week 15 /Turn 1	To write a python program to handle Exceptions using Python Built-in Exceptions.	CLO5	2
	Total				**30 Hrs**

Learning resources

Textbooks:

1. Y. Daniel Liang, "Introduction to Programming using Python", Pearson, 2012.
2. Wes McKinney, "Python for Data Analysis: Data Wrangling with Pandas, NumPy, and Python", O'Reilly, 2nd Edition, 2018.

Reference Books:

1. Wesley J. Chun, "Core Python Programming", Prentice Hall, 2006
2. Mark Lutz, "Learning Python", O'Reilly, 4th Edition, 2009

Online Resources:

1. https://www.w3schools.com/python/
2. https://www.learnpython.org/
3. https://www.udemy.com/course/complete-python-bootcamp/?couponCode=ST8MT40924
4. https://onlinecourses.swayam2.ac.in/cec22_cs20/preview

Name of the Program:		BTECH CSE			Semester: III	Level: UG		
Course Name		Digital Electronics & Logic Design			Course Code/Course Type	UBTCE205A/OE1		
Course Pattern		2024			Version	1.0		
Teaching Scheme					Assessment Scheme			
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Pra/ Oral	Total
3	-	-	3	3	40	60	-	100

Pre-Requisite:

1. Fundamentals of Computers

Course Objectives (CO):	The objective of Digital Electronics & Logic Design is: 1. To understand the basics of Digital fundamentals, Boolean algebra, its applications and combinational logic circuits in digital systems. 2. To Study, analysis and design of clocked sequential circuits. 3. To get acquaint students with the asynchronous Sequential Circuits and Design of Hazard free circuits. 4. To Design Race free and Hazard free sequential Circuit. 5. To demonstrate logic families, Basic memory structure, design and implementation of combinational logic circuits using PLA.
Course Learning Outcomes (CLO):	At the end of the course: 1. Design various combinational digital circuits using logic gates. 2. Do the analysis and design procedures for synchronous and asynchronous sequential circuits. 3. Use the semiconductor memories and related technology. 4. Comprehend the ROM, PLA and PAL 5. Design and implementation of digital circuits.

Descriptors/Topics	CLO	Hours
UNIT I		
Digital Fundamentals: Number Systems –Decimal, Binary, Octal, Hexadecimal, 1's and 2's complements, Codes –Binary, BCD, Excess 3, Gray, Alphanumeric codes, Boolean theorems, Logic gates, Universal gates, Sum of products and product of sums, Midterms and Maxterms, Karnaugh map Minimization and Quine.	**CLO 1**	**9**
UNIT II		
Combinational Circuit Design Design of Half and Full Adders, Half and Full Subtractors, Binary Parallel Adder Carry look ahead Adder, BCD Adder, Multiplexer, Demultiplexer, Magnitude Comparator, Decoder, Encoder, Priority Encoder.	**CLO 2**	**9**
UNIT III		
Synchronous Sequential Circuits: Flip flops –SR, JK, T, D, Master/Slave FF – operation and excitation tables, Triggering of FF, Analysis and design of clocked sequential circuits –Design –Moore/Mealy models, state minimization, state assignment, circuit implementation –Design of Counters-Ripple Counters, Ring Counters, Shift registers, Universal Shift Register	**CLO 3**	**10**
UNIT IV		
Asynchronous Sequential Circuits: Stable and Unstable states, output specifications, cycles and races, state reduction, race free assignments, Hazards, Essential Hazards, Pulse mode sequential circuits, Design of Hazard free circuits.	**CLO 4**	**8**
UNIT V		
Memory Devices and Digital Integrated Circuits: Digital integrated circuits: Logic levels, propagation delay, power dissipation, fan-out and fan-in, noise margin, logic families and their characteristics-RTL, TTL, ECL, CMOS Basic memory structure –ROM -PROM –EPROM –EEPROM –EAPROM, RAM –Static and dynamic RAM –Programmable Logic Devices –Programmable Logic Array (PLA) –Programmable Array Logic (PAL) –Field Programmable Gate Arrays (FPGA) –Implementation of combinational logic circuits using PLA, PAL.	**CLO 5**	**8**
Total Hours		**45**

Learning Resources:

Text Books:

1. Digital Logic and Computer Design by M. Morris Mano (2nd Edition), PHI
2. Modern Digital Electronics byR.P. Jain, Mc Graw Hill
3. Digital Electronics by Malvino Leach, Mc Graw Hill

Reference Books:

1. Thomas. L. Floyd,"Digital Fundamentals" , Pearson ,11th Edition.
2. Digital Systems: Principles and Applications, Book by Ronald J Toc

Online Resources:

1. https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials/
2. https://www.youtube.com/watch?v=lumpHzyakVs
3. https://www.classcentral.com/course/youtube-digital-electronics-48205

Name of the Program:		BTECH CSE			Semester: III	Level: UG		
Course Name		Digital Electronics & Logic Design Laboratory			Course Code/Course Type	UBTCE206A/OE1		
Course Pattern		2024			Version	1.0		
Teaching Scheme					Assessment Scheme			
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical / Oral	Total
-	1	-	1	2	25	-	25	50
Pre-Requisite: XIIth Science /Diploma (Engineering								
Course Objectives (CO):		The objective of Digital Electronics & Logic Design is: 1. To understand the basics of Digital fundamentals, Boolean algebra, its applications and combinational logic circuits in digital systems. 2. To Study, analysis and design of clocked sequential circuits. 3. To get acquaint students with the asynchronous Sequential Circuits and Design of Hazard free circuits. 4. To Design Race free and Hazard free sequential Circuit. 5. To demonstrate logic families, Basic memory structure, design and implementation of combinational logic circuits using PLA..						
Course Learning Outcomes (CLO):		At the end of the course, students will be able to: 1. Design various combinational digital circuits using logic gates. 2. Do the analysis and design procedures for synchronous and asynchronous sequential circuits. 3. Use the semiconductor memories and related technology. 4. Comprehend the ROM, PLA and PAL 5. Design and implementation of digital circuits.						

Assignment/Practical/Activity Number	Assignment /Practical/Activity Title	Week Number/Turn	Details	CLO	Hours
1.	Practical 1:	Week 1	Practical 1: Introduction: Study of logic gates.	CLO1	2
2.	Practical2:	Week 2	Practical2: Simplification, Realization of Boolean expressions using Logic gates / Universal gates. 1.Realization of half/full adder using logic gates	CLO1	2
3.	Practical2:	Week 3	Practical2: Simplification, Realization of Boolean expressions using Logic gates / Universal gates. 2. Realization of half/full Subtractor using logic gates	CLO1	2
4.	Practical 3:	Week 4	Practical 3: 1.Realization of parallel adder /Subtractor using 7483 chip	CLO2	2

5.	Practical 3:	Week 5	Practical 3: 2.BCD to Ex-3 code conversion and vice versa. Realization of parallel adder /Subtractor using 7483 chip .BCD to Ex-3 code conversion and vice versa	CLO2	2
6.	Practical 4:	Week 6	Practical 4: Realization of Binary to Gray code converter & vice versa	CLO 2	2
7.	Practical 5:	Week 7	Practical 5: Design MUX using 74153 for Arithmetic circuits	CLO2	2
8.	Practical 5:	Week 8	Practical 5: Design DEMUX using 74139 for code converter	CLO2	2
9.	Practical 6:	Week 9	Practical 6: Realization of one/two-bit comparator & study of 7485 magnitude Comparator.	CLO3	2
10.	Practical 6:	Week 10	Practical 6: Realization of one/two-bit comparator & study of 7485 magnitude Comparator.	CLO3	2
11.	Practical 7:	Week 11	Practical 7: Use of decoder chip to drive LED/LCD display	CLO3	2
12.	Practical 7:	Week 12	Practical 7: 1.Use of decoder chip to drive LED/LCD display 2.Priority Encoder	CLO3	2
13.	Practical 8:	Week 13	Practical 8: Truth table verification of flip-flops 1.JK master slave 2.T-type 3. D type	CLO4	2
14.	Practical 9:	Week 14	Practical 9: a. Realization of 3-bit counters as a sequential circuit using 7476 b. Design of mod N counter using 7490 c. Realization of counters as a sequential circuit & mod N counter Design using74192/74193	CLO4	2
15.	Practical 10:	Week 15	Practical 10: Shift left, shift right, SIPO, SISO, PISO, PIPO operations using 74S95	CLO5	2
Total Hours					**30**

Learning Resources

Text Books:

1. Digital Logic And Computer Design By M. Morris Mano (2nd Edition), PHI
2. Modern Digital Electronics By R.P. Jain, Mc Graw Hill
3. Digital Electronics By Malvino Leach, Mc Graw Hill

Reference Books:

1. Thomas. L. Floyd ,"Digital Fundamentals" , Pearson ,11th Edition.
2. Digital Systems: Principles and Applications, Book by Ronald J Tocci

Online Resources:

1. https://www.youtube.com/watch?v=cdMJvFT-Afc
2. https://www.youtube.com/watch?v=xrgxDccit8A
3. https://www.classcentral.com/course/youtube-digital-electronics-48205

Name of the Program:		BTECH CSE		Semester: III		Level: UG	
Course Name		Signals and Systems		Course Code/ Course Type		UBTCE205B/OE1	
Course Pattern		2024		Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/ Oral
3	-	-	3	3	40	60	-

Pre-Requisite: Signal theory, Maths

Course Objectives (CO):	The objectives of Signals and Systems are: 1. To recall the basic knowledge about the different type of signals 2. To recognize the system analysis in frequency domain. 3. To apply the knowledge of Fourier and Laplace transform. 4. To analyze correlation and spectral density. 5. To evaluate probability, random variables & signals.
Course Learning Outcomes (CLO):	Students would be able to: 1. Enumerate different type of signals. 2. Elaborate the system analysis in frequency domain. 3. Apply knowledge of Fourier and Laplace transform. 4. Analyze correlation and spectral density 5. Evaluate the probability, random variables & signals.

Descriptors/Topics	CLO	Hours
UNIT I		
Introduction to Signals and Systems: Definition of signals and systems, communication and control systems as examples, Classification of signals: Continuous time and discrete time, even, odd, periodic and non-periodic, deterministic and non-deterministic, energy and power. Operations on signals: Amplitude scaling, addition, multiplication, differentiation, integration (accumulator for DT), time scaling, time shifting and folding, precedence rule. Elementary signals: exponential, sine, step, impulse and its properties, ramp, rectangular, triangular, signum, sinc. Systems: Definition, Classification: linear and nonlinear, time variant and invariant, causal and non-causal, static and dynamic, stable and unstable, invertible.	**CLO 1**	**9**
UNIT II		
System Analysis: System modeling: Input output relation, impulse response, block diagram, integro-differential equation and state-space representation. Definition of impulse response, convolution integral, convolution sum, computation of convolution integral using graphical method for unit step to unit step, unit step to exponential, exponential to exponential and unit step to rectangular, rectangular to rectangular only. Computation of convolution sum by all methods. Properties of convolution, system interconnection, system properties in terms of impulse response, step response in terms of impulse response.	**CLO 2**	**9**
UNIT III		
System Analysis in Frequency Domain using Fourier Transform & Laplace Transform: Definition and necessity of CT and DT Fourier series and Fourier	**CLO 3**	**10**

transforms. Analogy between CTFS, DTFS and CTFT, DTFT. CT Fourier series, CT Fourier transform and its properties, problem solving using properties, amplitude spectrum, phase spectrum of the signal and system. Interplay between time and frequency domain using sinc and rectangular signals. Limitations of FT and need of LT and ZT, , ROC and pole zero concept. Application of Laplace transforms to the LTI system analysis. Inversion using duality, numerical based on properties. Signal analysis using LT.		
UNIT IV		
Correlation and Spectral Density: Definition of Correlation and Spectral Density, correlogrm, analogy between correlation, covariance and convolution, conceptual basis, auto-correlation, cross correlation, energy/power spectral density, properties of correlation and spectral density, inter relation between correlation and spectral density.	**CLO 4**	**9**
UNIT V		
Probability, Random Variables and Random Signals: Experiment, sample space, event, probability, conditional probability and statistical independence. Random variables: Continuous and Discrete random variables, cumulative distributive function, Probability density function, properties of CDF and PDF. Statistical averages, mean, moments and expectations, standard deviation and variance. Probability models: Uniform, Gaussian, Binomial. Evolution and definition of random signal through probability via random variable.	**CLO 5**	**8**
Total Hours		**45**

Learning resources

Textbooks:

1. Simon Haykins and Barry Van Veen, “Signals and Systems”, 2nd Edition, Wiley India.
2. Simon Haykins, “Introduction to Analog and Digital Communications”, Wiley India.

Reference Books:

1. B.P. Lathi, “Linear Systems and Signals”, 2nd Edition, Oxford University Press, 2004.
2. Charles Phillips, “Signals , Systems and Transforms” , 3rd Edition, Pearson Education.
3. Peyton Peebles, “Probability, Random Variable, Random Processes”, 4th Edition, Tata Mc Graw Hill.

Online Resources

1. https://onlinecourses.nptel.ac.in/noc21_ee28/previe
2. https://onlinecourses.nptel.ac.in/noc21_ee28/preview

Practical Plan

Name of the Program:	BTECH CSE	Semester: III	Level: UG
Course Name	Signals and Systems Laboratory	Course Code/ Course Type	UBTCE206 B/OE1
Course Pattern	2024	Version	1.0

Teaching Scheme

Assessment Scheme

Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical /Oral
-	1	-	1	2	25	-	25

Pre-Requisite: Fourier transform & Laplace transform.

Course Objectives (CO):	The objectives of Signals and Systems Laboratory are: 1. To recall the basic knowledge about the different type of signals 2. To recognize the system analysis in frequency domain. 3. To apply the knowledge of Fourier and Laplace transform. 4. To analyze correlation and spectral density. 5. To evaluate probability, random variables & signals.
Course Learning Outcomes (CLO):	Students would be able to: 1. Identify different type of signals. 2. Elaborate the system analysis in frequency domain. 3. Apply knowledge of Fourier and Laplace transform. 4. Analyze correlation and spectral density 5. Evaluate the probability, random variables & signals.

Assignment/Practical/Activity Number	Assignment /Practical/Activity Title	Week Number/ Turn	Details	CLO	Hours
1.	Practical 1: Sketch and write defining mathematical expression for the following signals in CT and DT	Week 1	Sketch and write defining mathematical expression for the followingsignals in CT and DT using MATLAB- Unit step, rectangular, exponential, signum, sine, sinc, triangular, unit impulse, unit ramp.	CLO1	2
2.	Practical 2:	Week 2	Take any two CT and DT signals and perform the following operation Amplitude scaling, addition, multiplication, differentiation, integration (accumulator for DT), time scaling, time shifting and folding	CLO1	2
3.	Practical 3:	Week 3	Express any two system mathematical expressions in input output relation form and determine whether each one of them is, Memory less, Causal, Linear, Stable, Time in variant, Invertible	CLO3	2
4.	Practical 4:	Week 4	Express any two system mathematical expressions in impulse response form and determine whether each one of them is, Memory less, Causal, Linear, Stable, Time in variant, Invertible	CLO 3	2

5.	Practical 5:	Week 5	Express any two system mathematical expressions in impulse response form and determine whether each one of them is, Memory less, Causal, Linear, Stable, Time in variant, Invertible	CLO 3	2
6.	Practical 6:	Week 6	State and prove the properties of Fourier Transform. Take rectangular and sinc signal as examples and demonstrate the applications of CTFT properties. And also demonstrate the interplay between the time and frequency domain.	CLO 4	2
7.	Practical 7:	Week 7	State and prove the properties of Fourier Transform. Take rectangular and Sinc signal as examples and demonstrate the applications of CTFT properties. And also demonstrate the interplay between the time and frequency domain.	CLO 4	2
8.	Practical 8:	Week 8	State and prove the properties of Laplace Transform. Take any example of a system in time domain and demonstrate the application of LT in system analysis	CLO 4	1
9.	Practical 9:	Week 9	State and prove the properties of Laplace Transform. Take any example of a system in time domain and demonstrate the application of LT in system analysis	CLO 4	1
10.	Practical 10:	Week 10	State and prove the properties of Laplace Transform. Take any example of a system in time domain and demonstrate the application of LT in system analysis	CLO 4	1
11.	Practical 11:	Week 11	State and prove the properties of Laplace Transform. Take any example of a system in time domain and demonstrate the application of LT in system analysis	CLO 4	1
12.	Practical 12:	Week 12	Find the following for the given energy signal- Autocorrelation, Energy from Autocorrelation, Energy from definition, Energy Spectral Density directly	CLO 5	2
13.	Practical 13:	Week 13	Find the following for the given energy signal- Autocorrelation, Energy from Autocorrelation, Energy from definition, Energy Spectral Density directly	CLO 5	2
14.	Practical 14:	Week 14	List and explain the properties of CDF & PDF, Suppose a certain random variable has the CDF	CLO 5	2
15.	Practical 15:	Week 15	List and explain the properties of CDF & PDF, suppose a certain random variable has the CDF	CLO 5	2
	Total Hrs				**30**

Learning resources:

Textbooks:

1. Simon Haykins and Barry Van Veen, "Signals and Systems", 2nd Edition, Wiley India.
2. Simon Haykins, "Introduction to Analog and Digital Communications", Wiley India.

Reference Books:

1. B.P. Lathi, "Linear Systems and Signals", 2nd Edition, Oxford University Press, 2004.
2. Charles Phillips, "Signals , Systems and Transforms" , 3rd Edition, Pearson Education.
3. Peyton Peebles, "Probability, Random Variable, Random Processes", 4th Edition, Tata Mc Graw Hill.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc21_ee28/preview
2. https://onlinecourses.nptel.ac.in/noc21_ee28/preview

Name of the Program:	B. Tech	Semester: 3	Level: UG
Course Name	Discrete Mathematics	Course Code/ Course Type	UBTCE207
Course Pattern	2024	Version	1.0

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/ Oral
2	0	1	3	3	45	60	-

Prerequisite: Determinants, Matrices, Limits, continuity, Differentiation

Course Objectives (CO):	The objectives of (Discrete Mathematics) are: 1. To familiarize the students with the concepts and techniques of logics & sets. 2. To recognize relations and its real-life application. 3. To understand Algebraic structure and its application. 4. To acquire the knowledge of graph theory 5. To acquire the knowledge trees to understand the concepts of different types of algorithms and its applications that would enhance analytical thinking power.
Course Learning Outcomes (CLO):	Students would be able to: 1. Elaborate the logic, normal forms and its application. 2. Comprehend the relations & functions. 3. Comprehend the algebraic structures. 4. Comprehend & apply the knowledge of graph theory in data structure and other core subjects. 5. Solve traversing problems, searching by using the concept of Trees.

Descriptors/Topics	CLO	Hours
UNIT I		
Propositions and Connectives, Truth table, laws of Propositions, Logical Equivalence, Normal Forms: DNF, CNF, PCNF &, PDNF Logical implication, Rules of Inference, Validity and satisfiability, Compactness and resolution, Quantifiers, Application of Propositional logic.	**CLO 1**	**9**
UNIT II		
Relation and Functions: - Relation, representation of relation, types, n- array relation and their application, Equivalence relation, Equivalence class, Partitions, Partial ordering relation, Hasse diagram, Lattice, chain and antichain, Function and types of Functions.	**CLO 2**	**9**
UNIT III	**CLO 3**	
Algebraic structures, Semi group, Monod, Group, abelian group, cyclic group, Coding Theory.		**9**

UNIT IV		9
Introduction, Graph models, Hand shaking lemma, Types of graphs, Matrix representation of Graphs, adjacency and incidence Matrix, Isomorphism, Connectivity, Eulerian and Hamiltonian Graphs, Shortest path, Travelling Salesman Problem, Dijkstra's algorithm, Planar graph and Euler formula, coloring of graph, Chromatic number –Dual of Graph, Clique number	**CLO 4**	**9**
UNIT V		**9**
Introduction, properties, Rooted tree, Tree Traversal, path length, weighted tree, prefix code, Huffman coding, Binary search tree, spanning tree, Minimal spanning tree, Kruskal algorithm, prims algorithm, cut-set, The Max flow- Min cut Theorem (Transport Network) Application of tree	**CLO 5**	**9**
Total Hours	**…**	**45**

Learning Resource:

Text Books:

1. C. L. Liu, "Elements of Discrete Mathematics", Tata McGraw-Hill, 4th Edition, 2017, ISBN 978- 1259006395.
2. Ron Larson and David C. Falvo. "Elementary Linear Algebra", HOUGHTON MIFFLIN HARCOURT PUBLISHING COMPANY. Boston New York.
3. Higher Engineering Mathematics - B. V. Ramana (Tata McGraw-Hill).
4. Advanced Engineering Mathematics - Erwin Kreyszig (Wiley Eastern Ltd.)

Reference Books:

1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", Tata McGraw-Hill, 8th Edition, 2018, ISBN 978- 1259676512.
2. Dr. K. D. Joshi, "Foundations of Discrete Mathematics", New Age International Limited Publishers, 2nd Edition, January 2014, ISBN-13: 978-8122435

Online Resources:

1. https://maa.org/press/ebooks/resources-for-teaching-discrete-mathematics
2. https://www.sciencedirect.com/journal/discrete-mathematic

Name of the Program:		BTECH CSE			Semester: III	Level: UG	
Course Name		Operating System			Course Code/Course Type	UBTCE208/PCC	
Course Pattern		2024			Version	1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
3	-	-	3	3	40	60	-

Pre-Requisite:
1. Computer Organization and Architecture
2. Fundamentals of Data Structures

Course Objectives (CO):	This course will enable the students to: 1. To introduce basic concepts and functions of modern operating systems. 2. To understand the concept of process, thread management an scheduling. 3. To learn the concept of concurrency control. 4. To study various Memory Management techniques. 5. To know the concept of I/O and File management
Course Learning Outcomes (CLO):	Students would be able to: 1. Comprehend the role of Modern Operating Systems. 2. Apply the concepts of process and thread scheduling. 3. Apply the concept of process synchronization, mutual exclusion and the deadlock. 4. Comprehend and apply the concepts of various memory management techniques. 5. Make use of concept of I/O management and File system.

Descriptors/Topics	CLO	Hours
UNIT I		
OVERVIEW OF OPERATING SYSTEM Operating System Objectives and Functions, The Evolution of Operating Systems, Developments Leading to Modern Operating Systems, Virtual Machines, Introduction to Linux OS, BASH Shell scripting: Basic shell commands.	**CLO 1**	**9**
UNIT II		
PROCESS MANAGEMENT: Process: Concept of a Process, Process States, Process Description, Process Control Threads: Processes and Threads, Concept of Multithreading, Types of Threads, Thread programming Using Pthreads. Scheduling: Types of Scheduling, Scheduling Algorithms, First Come First Served, Shortest Job First, Priority, Round Robin	**CLO 2**	**9**
UNIT III		

CONCURRENCY CONTROL: Process/thread Synchronization and Mutual Exclusion: Principles of Concurrency, Requirements for Mutual Exclusion, Mutual Exclusion: Operating System Support (Semaphores and Mutex). Classical synchronization problems: Readers/Writers Problem, Producer and Consumer problem, Inter-process communication (Pipes, Shared Memory). Deadlock: Principles of Deadlock, Deadlock Modelling, and Strategies to deal with deadlock: Prevention, Avoidance, Detection and Recovery. Example: Dining Philosophers Problem / Banker's Algorithm.	**CLO 3**	**9**
UNIT IV		
MEMORY MANAGEMENT: Memory Management: Memory Management Requirements, Memory Partitioning: Fixed Partitioning, Dynamic Partitioning, Buddy System, Relocation, Paging, Page table structure, Segmentation Virtual Memory: Background, Demand Paging, Page Replacement (FIFO, LRU, Optimal), Allocation of frames, Thrashing	**CLO 4**	**9**
UNIT V		
INPUT/OUTPUT AND FILE MANAGEMENT: I/O Management and Disk Scheduling: I/O Devices, Organization of the I/O Function, I/O Buffering, Disk Scheduling (FIFO, SSTF, SCAN, C-SCAN, LOOK, C-LOOK). File Management: Overview-Files and File Systems, File structure. File Organization and Access, File Directories, File Sharing, Record Blocking, Secondary Storage Management.	**CLO 5**	**9**
Total Hours		**45**

Earning Resources:

Text Books:

1. William Stallings, Operating System: Internals and Design Principles, Prentice Hall, 8th Edition,2014, ISBN-10: 0133805913 • ISBN-13: 9780133805918
2. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, Operating System Concepts,John Wiley & Sons, Inc., 9th Edition,2012, ISBN 978-1-118-06333-0
3. Das, Sumit Abha, UNIX Concepts and Applications, TMH, ISBN-10: 0070635463, ISBN-13: 978- 0070635463, 4th Edition.

Reference Books:

1. Tom Adelstein and Bill Lubanovic, Linux System Administration, O'Reilly Media, ISBN- 10: 0596009526, ISBN-13: 978-0596009526
2. Andrew S. Tanenbaum & Herbert Bos, Modern Operating System, Pearson, ISBN-13: 9780133592221, 4th Edition.

Online Resources:

1. https://www.edx.org/learn/operating-systems
2. https://pages.cs.wisc.edu/~remzi/OSTEP/
3. https://www.coursera.org/courses?query=operating%20system

Course Name		Community Engineering Project			Course Code/Course Type	UBTCE209/ CEP	
Course Pattern		2024			Version	1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
-	2	-	2	4	25	60	25

Pre-Requisite:

1. Basic knowledge of English

Course Objectives (CO):	This course will enable the students to: 1. Develop an understanding of the role of engineering in addressing community needs and promoting sustainable development. 2. Apply engineering design processes and methodologies to identify, analyse, and prioritize community challenges. 3. Collaborate with community stakeholders to co-create solutions that are culturally sensitive, socially equitable, and environmentally sustainable. 4. Gain practical experience in project management, budgeting, and resource allocation for community engineering projects. 5. Communicate effectively with diverse audiences through written reports, oral presentations, and multimedia platforms.
Course Learning Outcomes (CLO):	Students would be able to: 1. Develop an understanding of the role of engineering in addressing community needs and promoting sustainable development. 2. Apply engineering design processes and methodologies to identify, analyse, and prioritize community challenges. 3. Collaborate with community stakeholders to co-create solutions that are culturally sensitive, socially equitable, and environmentally sustainable. 4. Gain practical experience in project management, budgeting, and resource allocation for community engineering projects. 5. Communicate effectively with diverse audiences through written reports, oral presentations, and multimedia platforms.

Descriptors/Topics	CLO	Hours
1. Introduction to Community Engineering • Overview of course objectives, expectations, and project guidelines • Introduction to community-based participatory research and design principles • Case studies of successful community engineering projects 2. Needs Assessment and Stakeholder Engagement • Methods for conducting community needs assessments and asset mapping • Techniques for engaging diverse stakeholders in the design process • Ethical considerations in working with communities 3. Project Planning and Design • Project scoping, goal setting, and defining success criteria • Engineering design processes and methodologies • Incorporating sustainability principles into project design 4. Implementation and Collaboration • Project management techniques, including scheduling, budgeting, and resource allocation • Interdisciplinary collaboration and team dynamics • Effective communication with community partners and project stakeholders 5. Project Execution and Monitoring • Prototyping and testing of project solutions • Monitoring project progress and making adjustments as needed • Documentation and record-keeping for project evaluation 6. Impact Evaluation and Reflection • Methods for assessing the social, economic, and environmental impact of community engineering projects • Reflective practices and peer feedback	**CLO1 to CLO5**	**60**

Assessment:

1. Project Proposal: Written proposal outlining the project scope, objectives, and methodology (20%)
2. Project Implementation: Development and implementation of the digital solution, including documentation and code repository (30%)
3. Final Report: Written report summarizing the project process, outcomes, and impact assessment (30%)
4. Presentation: Oral presentation of project findings and demonstration of the digital solution (20%)

Learning resources:

Name of the Program:	Foreign Language		Semester: 3		Level: UG/PG	
Course Name	German A1.1		Course Code/ Course Type		UFL201A/AEC	
Course Pattern	2024		Version		1.0	
Teaching Scheme				Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/ Oral
2	-	-	-	2	20	30	-
Pre-Requisite:							

Course Objectives (CO):	The objectives of (German A1.1) are: 1. To remember new words and their spellings. 2. To understand the new concepts. 3. To apply the basic vocab and grammar concepts. 4. To understand the German text. 5. To create basic sentences in German.
Course Learning Outcomes (CLO):	Students would be able to: **1.** Spell simple words in German 2. Can comprehend everyday expressions. 3. Able to frame simple sentences in German language. 4. Can introduce themselves and others. 5. Can answer questions about themselves.

Descriptors/Topics	CLO	Hours
UNIT I		
Guten Tag Speak about yourself and others, Speak about Countries and Languages Grammar – Sentence formation and verbs usage	**CLO 1**	**6**
UNIT II		
Freunde, Kollegen und Ich Speak about your Hobbys, To fix a meeting, Speak about work and Profession, To creat a profile on Internet Grammar – How to use 'The' in german, Singular and plural forms of Nouns	**CLO 2**	**6**
UNIT III		
In der Stadt To get to know about Cities and Places, how to find way and understand directions, learn international words Grammar – Negations (how to use NO in German), Definite articles, indefinite articles.	**CLO3**	**6**
UNIT IV		
Guten Appetit To speak about food and food habits, to have a discussion about shopping Grammar – introduction of cases	**CLO4**	**6**
UNIT V		
Tag für Tag & Zeit mit Freunden Clock timings, To speak about family and friends, Daily routine To speak about free time activity, to understand the specific information from the text, to order and to pay in a restaurant Grammar – Possessivarticle, Modal verbs, use of on, at, from…till, Separable verbs and past tense	**CLO5**	**6**
Total Hours		**30**

Textbooks:

1. Netzwerk A1, Ernst klett Verlag & Goyal Publishers & Distributors Pvt. Ltd.
2. Studio d A1, Cornelesen Verlag & Goyal Publishers & Distributors Pvt. Ltd.
3. Netzwerk Neu A1, Ernst klett Verlag & Goyal Publishers & Distributors Pvt. Ltd

Reference Books:

1. Hallo Deutsch A1,Ernst Klett Verlag, Goyal Publishers & Distributors Pvt. Ltd
2. Themen Aktuell 1, Hueber verlag
3. Maximal Ernst klett Verlag & Goyal Publishers & Distributors Pvt. Ltd.

Online Resources/E-Learning Resources:

1. https://youtube.com/@LearnGermanwithAnja?si=BkJYDPi7TS0fT4lr
2. https://youtube.com/@deutschlernenmitheidi?si=TkICIabzioaU0roZ
   instagram.com/learngermanwithanja

Name of the Program:	B.Tech/B.B.A/B.C.A/B.Sc./B.Pham	Semester: 3	Level: UG/PG
Course Name	Basic Japanese language skill	Course Code/Course Type	UFL201B/AEC
Course Pattern	2024	Version	1.0

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/ Oral
2	--	--	2	30	50	--	--

Pre-Requisite: Desire to get acquainted with the Japanese language.

Course Objectives (CO):	The objectives of Basic Japanese language skill are: 1. To meet the needs of ever-growing industry, with respect to language support. 2. To get introduced to Japanese society and culture through language. 3. To acquire competitive edge in career choices. 4. To participate effectively & responsibly in a multi-cultural world. 5. To enable learners to communicate effectively in Japanese language.
Course Learning Outcomes (CLO):	After learning the course, the students will be able to: 1. Read and Write Hiragana script. 2. Write and Speak basic sentences. 3. Comprehend and speak about time, hobbies, likes and dislikes. 4. Write basic kanji. 5. Use the Hiragana script in discussion.

Descriptors/Topics	CLO	Hours
UNIT I		
Introduction to Japanese Language – Introduction of script, culture, History of script, Speaking: Self introduction, listening: short video skit on self-introduction	**CLO 1**	**6**
UNIT II		
Introduction of Hiragana Script -Writing: Hiragana script, Speak : Basic sentences, General vocabulary : Months , Days of the week ,Basic numbers, colours	**CLO 2**	**6**
UNIT III		
Basic Sentence formation - Basic sentence structure: Affirmative and Negative , General vocabulary: about family	**CLO 3**	**6**
UNIT IV		

Time and verbs – Speaking : Talking about routine, Writing: routine using verbs and time, reading : A clock	**CLO 4**	**6**
UNIT V		
Introduction of Katakana and basic kanji – Reading : English words, country names Writing : Basic Kanji	**CLO 5**	**6**
Total Hours		**30**

Learning resources

Textbook:

1. Minna no Nihongo, "Japanese for everyone", Elementary Main Textbook, Goyal Publishers & Distributors Pvt. Ltd.

Reference books:

1. Shyoho Volume 1.
2. Genki Japan
3. Haru Vol. 1 & 2

Online Resources/E-Learning Resources:

U Tube links

1. https://www.youtube.com/watch?v=shdlEapDsP4
2. https://youtu.be/K-nw5EUxDz0?feature=shared
3. https://youtu.be/o9sP-vaCEa0?si=l8yOvVKaItBQWXNu
4. https://youtu.be/JnoZE51WZg4?si=9uq68USOz5plBk2n
5. https://youtu.be/shdlEapDsP4?si=tC6RGaMtwDJgVu2d
6. https://youtu.be/9paXgC2U8L0?si=btS1G4mvrkG5C9zi

1. Apps

A) Learn Japanese - Hiragana APP available on Google play.
B) Hiragana Pro

Name of the Program:	B. Tech	Semester: 3/4	Level: UG
Course Name	UHV-II: Understanding Harmony	Course Code/ Course Type	ACUHV201/AC
Course Pattern	2024	Version	1.0

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
2	0	0	0	2	-	-	-

Pre-Requisite:	
Course Objectives (CO):	The objectives of Universal Human Value- Understanding Harmony are: 1. To train the student for Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence. 2. To understand (or develop clarity) the harmony in the human being, family, society and nature/existence 3. To strengthen self-reflection. 4. To infuse a sense of commitment and courage to act 5. To understand Holistic Understanding of Harmony on Professional Ethics
Course Learning Outcomes (CLO):	Students would be able to: 1. Analyze the most important requirement for any human being 2. Apply correct appraisal of Physical needs, meaning of Prosperity in detail 3. Analyze salient values in relationship, Friends and Foes, Empathy, False Prestige. 4. Develop holistic perception of harmony at all levels of existence 5. Apply the Holistic Understanding of Harmony on Professional Ethics

Descriptors/Topics	CLO	Hours
UNIT I		
Course Introduction - Need, Basic Guidelines, Content and Process for Value Education Purpose and motivation for the course, recapitulation from Universal Human Values-I Self-Exploration–what is it? - Its content and process; Personality Traits- Self Excellence, „Natural Acceptance" and Experiential Validation- as the process for self-exploration, Adaptability, Belief and Understanding- Self discipline Continuous Happiness and Prosperity- A look at basic Human Aspirations Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority	CLO 1	8

Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario Method to fulfil the above human aspirations: understanding and living in harmony at various levels.		
UNIT II		
Understanding Harmony in the Human Being - Harmony in Myself: Understanding human being as a co-existence of the sentient „I" and the material Body. Understanding the needs of Self („I") and „Body" - happiness and physical facility Understanding the Body as an instrument of „I" (I being the doer, seer and enjoyer)- Habits and Hobbies, SWOT Analysis (Activity) Understanding the characteristics and activities of „I" and harmony in „I" – Dalai Lamas" Tibetan Personality Test – Dr. Menninger's Psychometric Test. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail	**CLO 2**	**5**
UNIT III		
Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship: Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship Understanding the meaning of Trust; Difference between intention and competence Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship, Friends and Foes, Empathy, False Prestige.	**CLO 3**	**5**
UNIT IV		
Understanding Harmony in the Nature and Existence - Whole existence as Coexistence: Understanding the harmony in the Nature and its Equanimity, Respect for all, Nature as Teacher Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature Understanding Existence as Co-existence of mutually interacting units in all- pervasive space Holistic perception of harmony at all levels of existence.	**CLO 4**	**5**
UNIT V		
Implications of the above Holistic Understanding of Harmony on Professional Ethics: Natural acceptance of human values Definitiveness of Ethical Human Conduct Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order Vision for the Holistic alternatives, UHVs for entrepreneurship	**CLO 5**	**7**
Total Hours		**30**

Learning resources :

Textbooks:

1. _Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010
2. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
3. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

Reference Books:

1. The Story of Stuff (Book).
2. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
3. Small is Beautiful - E. F Schumacher
4. Slow is Beautiful - Cecile Andrews

Online Resources:

1. https://www.studocu.com/in/document/jss-science-and-technology-university/human-values/uhv-handout-2-harmony-in-the-human-being/
2. https://vvce.ac.in/wp-content/uploads/2021/04/Realising-Aspirations-of-NEP2020-UHV.pdf
3. https://vemu.org/uploads/lecture_notes/22_12_2022_1850871704.pdf

Name of the Program:		B. Tech		Semester: 3/4		Level: UG	
Course Name		Constitution of India		Course Code/ Course Type		ACCOI201/AC	
Course Pattern		2024		Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
2	0	0	0	2	50	-	-
Pre-Requisite:							
Course Objectives (CO):		The objectives of Constitution of India are: 1. To familiarize the students with the key elements of the Indian constitution. 2. To enable students to grasp the constitutional provisions and values. 3. To acquaint the students with the powers and functions of various constitutional offices and institutions. 4. To make students understand the basic premises of Indian politics. 5. To make students understand the role of constitution and citizen-oriented measures in a democracy					
Course Learning Outcomes (CLO):		Students would be able to: 1. Analyze the basic structure of Indian Constitution. 2. Remember their Fundamental Rights, DPSP's and Fundamental Duties (FD's) of our constitution. 3. know about our Union Government, political structure & codes, procedures. 4. Comprehend our State Executive & Elections system of India. 5. Access the Amendments and Emergency Provisions, other important provisions given by the constitution					

Descriptors/Topics	CLO	Hours
UNIT I		
Introduction to Indian Constitution: The Necessity of the Constitution, The Societies before and after the Constitution adoption. Introduction to the Indian constitution, The Making of the Constitution, The Role of the Constituent Assembly. The Preamble of Indian Constitution & Key concepts of the Preamble. Salient features of India Constitution.	CLO 1	8
UNIT II		
FR's, FD's and DPSP's: Fundamental Rights and its Restriction and limitations in different Complex Situations. Directive Principles of State Policy (DPSP) and its present relevance in our society with examples. Fundamental Duties and its Scope and significance in Nation building	CLO 2	5
UNIT III		
Governance and Constitution: Federalism in India - Features, Local Government -Panchayats –Powers and functions; 73rd and 74th amendments, Election Commission – Composition, Powers and Functions; Electoral Reforms, Citizen oriented measures – RTI and PIL – Provisions and significance.	CLO 3	5

UNIT IV		
Union Executive: Parliamentary System, Union Executive – President, Prime Minister, Union Cabinet, Parliament - LS and RS, Parliamentary Committees, Important Parliamentary Terminologies. Supreme Court of India, Judicial Reviews and Judicial Activism.	**CLO 4**	**5**
UNIT V		
State Executive & Elections, Amendments and Emergency Provisions: State Executive, Election Commission, Elections & Electoral Process. Amendment to Constitution (How and Why) and Important Constitutional Amendments till today. Emergency Provisions.	**CLO 5**	**7**
Total Hours		**30**

Learning resources

Text Books :

1. "Constitution of India" (for Competitive Exams) - Published by Naidhruva Edutech Learning Solutions, Bengaluru. – 2022.
2. "Engineering Ethics", M. Govindarajan, S. Natarajan, V.S. Senthilkumar, Prentice –Hall, 2004

Reference Books:

1. "SamvidhanaOdu" - for Students & Youths by Justice HN Nagamohan Dhas, Sahayana, kerekon.
2. "Constitution of India, Professional Ethics and Human Rights" by Shubham Singles, Charles E. Haries, and et al: published by Cengage Learning India, Latest Edition – 2019.
3. "Introduction to the Constitution of India", (Students Edition.) by Durga Das Basu (DD Basu):Prentice –Hall, 2008.
4. "The Constitution of India" by Merunandan K B: published by Merugu Publication, Second Edition, Bengaluru.

Online resources:

1. https://www.clearias.com/constitution-of-india/
2. https://www.youtube.com/channel/UCNyWoX6zYjFw593Zt8-5i2A

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COURSE SYLLABUS
SYBTECH
SEMESTER-IV

Name of the Program:		BTECH CSE		Semester : IV		Level: UG	
Course Name		Database Management System		Course Code/Course Type		UBTCE210/ PCC	
Course Pattern		2024		Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/ Oral
3	-	--	3	3	40	60	-

Pre-Requisite: Knowledge of C Programming **and** DSA

Course Objectives (CO):	The objectives of Database Management System are: 1. Develop understanding concepts of Relational Database design and query languages. 2. Demonstrate effective Query processing and Transaction Processing. 3. Apply normalization for the development of application software's 4. Ability to design entity relationship and convert entity relationship diagrams into RDBMS and formulate SQL queries on the respect data 5. Ability to identify the data models for relevant problems
Course Learning Outcomes (CLO):	Students would be able to: 1. An ability to design ER Model for any application 2. To Decompose any Schema by applying normal forms 3. To construct SQL queries for any requirement. 4. To Comprehend the Query Evaluation and Execution processes. 5. To write Trigger, Cursor, PL/SQL Programs and to design object oriented, extended relational schemas

Descriptors/Topics	CLO	Hours
UNIT I		
INTRODUCTION Data base System Applications, Purpose of Database Systems, View of Data – Data Abstraction –Instances and Schemas – data Models – the ER Model – Relational Model – Other Models –Database Languages – DDL – DML – database Access for applications Programs – data base Users and Administrator – Transaction Management – data base Architecture – Storage Manager – the Query Processor Data base design and ER diagrams – ER Model - Entities, Attributes and Entity sets – Relationships and Relationship sets – ER Design Issues – Concept Design – Conceptual Design for University Enterprise. Introduction to the Relational Model – Structure – Database Schema, Keys – Schema Diagrams	**CLO 1**	**9**
UNIT II		
Relational Query Languages, Relational Operations. Relational Algebra – Selection and projection set operations – renaming – Joins – Division – Examples of Algebra overviews – Relational calculus – Tuple relational Calculus – Domain relational calculus. Overview of the SQL Query Language – Basic Structure of SQL Queries, Set Operations, Aggregate Functions – GROUPBY – HAVING, Nested Sub queries, Views, Triggers.	**CLO 2**	**9**

UNIT III		
Normalization – Introduction, Non loss decomposition and functional dependencies, First, Second, and third normal forms – dependency preservation, Boyee/Codd normal form. Higher Normal Forms - Introduction, Multi-valued dependencies and Fourth normal form, Join dependencies and Fifth normal form	**CLO 3**	**9**
UNIT IV		
Transaction Concept- Transaction State- Implementation of Atomicity and Durability – Concurrent – Executions – Serializability- Recoverability – Implementation of Isolation – Testing for serializability- Lock –Based Protocols – Timestamp Based Protocols- Validation- Based Protocols – Multiple Granularity. Recovery and Atomicity – Log – Based Recovery – Recovery with Concurrent Transactions – Buffer Management – Failure with loss of non-volatile storage-Advance Recovery systems- Remote Backup systems.	**CLO 4**	**9**
UNITV		
File organization: – File organization – various kinds of indexes. Query Processing – Measures of query cost - Selection operation – Projection operation, - Join operation – set operation and aggregate operation – Relational Query Optimization – Transacting SQL queries – Estimating the cost – Equivalence Rules	**CLO 5**	**9**
Total Hours		**45**

Learning resources:

Text Books:

1. 1. Hector Garcia-Molina, Jeff Ullman, and Jennifer Widom, "Database Systems: The Complete Book" - Pearson Education, 2002.

Reference Books:

1. Silberschatz, H. Korth and S. Sudarshan, "Database System Concepts", 4rth Edition, McGraw-Hill International, 2002.
2. R. Elmasri and Shamakant B. Navathe, "Fundamentals of Database Systems", 3rd Edition, Addision Wesley , 2000.

Online resources:

1.http://www.cs.helsinki.fi/u/laine/tikape/k03/material03.html
2.http://infolab.stanford.edu/~ullman/dscb.html
3.http://cs.nyu.edu/courses/spring06/G22.2433-001/
4.https://www.scaler.com/topics/course/dbms/
5.https://onlinecourses.nptel.ac.in/noc22_cs91/preview

Name of the Program:		BTECH CSE		Semester: IV		Level: UG	
Course Name		Database Management System Laboratory		Course Code/Course Type		UBTCE211/PCC	
Course Pattern		2024		Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
-	1	-	1	2	25	-	25
Pre-Requisite: Knowledge of C Programming and DSA							
Course Objectives (CO):				The objectives of Database Management System Lab are: 1. Develop understanding concepts of Relational Database design and query languages. 2. Demonstrate effective Query processing and Transaction Processing. 3. Apply normalization for the development of application software's 4. Ability to design entity relationship and convert entity relationship diagrams into RDBMS and formulate SQL queries on the respect data 5. Ability to identify the data models for relevant problems		
Course Learning Outcomes (CLO):				Students would be able to: 1. An ability to design ER Model for any application 2. To Decompose any Schema by applying normal forms 3. To construct SQL queries for any requirement. 4. To Comprehend the Query Evaluation and Execution processes. 5. To write Trigger, Cursor, PL/SQL Programs and to design object oriented, extended relational schemas.		

Assignment/Practical/Activity Number	Assignment/ Practical/Activity Title	Week Number /Turn	Details	CLO	Hours
1	Practical 1:	Week 1	Practical 1: Analyze the problem and come with the entities in it. Identify what Data has to be persisted in the databases.	CLO1	2
2	Practical 2:	Week 2	Practical 2: Installation of MySQL and practicing DDL & DML commands.	CLO1	2
3	Practical3:	Week 3	Practical3: Practice queries using ANY, ALL, IN, EXISTS, UNION, INTERSECT Union: The union operator returns all distinct rows selected by two or more queries.	CLO2	2
4	Practical 4:	Week 4	Practical 4: Practice Queries using Aggregate functions, Group By, Having Clause and Order Clause.	CLO 2	2
5	Practical 4:	Week 5	Practice Queries using Aggregate functions, Group By, Having Clause and Order Clause.	CLO 2	2

6	Practical 5:	Week 6	Implement Indexes: An index is an ordered list of the contents of a column, (or a group of columns) of a table.	CLO3	2
7	Practical 6:	Week 7	Implement Exception handling	CLO3	2
8	Practical7:	Week 8	Practical 7: Implement Triggers	CLO4	2
9	Practical 8:	Week 9	Implement Cursors	CLO4	2
10	Practical 9:	Week 10	Implementing Operations on relations using PL / SQL.	CLO5	2
11	Practical 10:	Week 11	Implementing Operations on relations using PL / SQL.	CLO5	2
12	Practical 10:	Week 12	Implementing Operations on relations using PL / SQL.	CLO5	2
13	Mini Project /Task	Week 13	Mini Project /Task	CLO1/ 2/3/4/5	2
14	Mini Project /Task	Week 14	Mini Project /Task	CLO1/ 2/3/4/5	2
15	Mini Project /Task	Week 15	Mini Project /Task	CLO1/ 2/3/4/5	2
Total Hours					**30**

Learning resources:

Text Books:

1. Hector Garcia-Molina, Jeff Ullman, and Jennifer Widom, "Database Systems: The Complete Book" - Pearson Education, 2002.

Reference Books:

1. Silberschatz, H. Korth and S. Sudarshan, “Database System Concepts”, 4rth Edition, McGraw-Hill International, 2002.
2. R. Elmasri and Shamakant B. Navathe, “Fundamentals of Database Systems”, 3rd Edition, Addision Wesley , 2000.

Online resources:

1. http://www.cs.helsinki.fi/u/laine/tikape/k03/material03.html
2. http://infolab.stanford.edu/~ullman/dscb.html
3. http://cs.nyu.edu/courses/spring06/G22.2433-001/
4. https://www.scaler.com/topics/course/dbms/
5. https://onlinecourses.nptel.ac.in/noc22_cs91/preview

Name of the Program:	CSE				Semester : IV	Level: UG	
Course Name	Core Java				Course Code/ Course Type	UBTCE212/Major	
Course Pattern	2024				Version	1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/ Oral
2	-	-	2	2	20	30	-

Pre-Requisite:

1. Basic knowledge of Programming in C and C++

Course Objectives (CO):	The objectives of Java Programming are: 1. To learn the fundamentals of the Java programming language. 2. To learn object-oriented principles like abstraction, encapsulation, inheritance, and polymorphism and apply them in solving problems using java. 3. To apply the concepts of exception handling, multithreading and collection classes using java. 4. To develop software applications using JDBC connectivity. 5. To design the Graphical User Interface using applets and swing controls.
Course Learning Outcomes (CLO):	Students would be able to: 1. To grasp the fundamentals programming concepts of Java programming language. 2. To apply object-oriented principles like abstraction, encapsulation, inheritance, polymorphism in solving problems using java. 3. To perform exception handling, multithreading code using java. 4. To develop software applications using JDBC connectivity. 5. To design the Graphical User Interface using event handling.

Descriptors/Topics	CLO	Hours
UNIT I		
Introduction to Java Programming: Java Programming- History of Java, comments, Java Buzz words, Data types, Variables, Constants, Scope and Lifetime of variables, Operators, Type conversion and casting, Enumerated types, Control flow- block scope, conditional statements, loops, break and continue statements, arrays, simple java standalone programs, class, object, and its methods constructors, methods, static fields and methods, access control, this reference, overloading constructors, recursion, exploring string class, garbage collection.	**CLO 1**	**6**
UNIT II		
Inheritance: Inheritance – Inheritance types, super keyword, preventing inheritance: final classes and methods. Polymorphism – method overloading and method overriding, abstract	**CLO 2**	**6**

classes and methods. Interfaces- Interfaces Vs Abstract classes, defining an interface, implement interfaces, accessing implementations through interface references, extending interface, inner class. Packages- Defining, creating and accessing a package, importing packages.		
UNIT III		
Exception Handling and Multithreading: Exception handling-Benefits of exception handling, the classification of exceptions - exception hierarchy, checked exceptions and unchecked exceptions, usage of try, catch, throw, throws and finally, creating own exception subclasses. Multithreading – Differences between multiple processes and multiple threads, thread life cycle, creating threads, interrupting threads, thread priorities, synchronizing threads, inter-thread communication, producer consumer problem	**CLO 3**	**6**
UNIT IV		
Database Management: Collection Framework in Java – Introduction to java collections, Overview of java collection framework, commonly used collection classes- Array List, Vector, Hash table, Stack, Lambda Expressions. Files- Streams- Byte streams, Character streams, Text input/output, Binary input/output, File management using File class. Connecting to Database – JDBC Type 1 to 4 drivers, Connecting to a database, querying a database and processing the results, updating data with JDBC, Data Access Object (DAO).	**CLO 4**	**6**
UNIT V		
Event Handling: GUI Programming with Swing - The AWT class hierarchy, Introduction to Swing, Swing Vs AWT, Hierarchy for Swing components, Overview of some Swing components – Jbutton, JLabel, JTextField, JTextArea, simple Swing applications, Layout management – Layout manager types – border, grid and flow Event Handling- Events, Event sources, Event classes, Event	**CLO 5**	**6**
Total Hours		**30**

Learning resources:

Textbooks:

1. "Java Fundamentals a Comprehensive Introduction" HerbertSchildt and DaleSkrien,TMH
2. "Head First Java: Your Brain on Java - A Learner's Guide", 1st Edition, by Bert Bates, Kathy Sierra

Reference Books:

1. "Java: the complete reference" by Herbert Schildt and DaleSkrien,TMH
2. "Java For Dummies (For Dummies" (Computer/Tech)) 8th Edition by Barry Burd.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc20_cs58/preview Programming in Java By Prof. Debasis Samanta | IIT Kharagpur
2. https://onlinecourses.nptel.ac.in/noc

Name of the Program:	BTECH CSE	Semester: IV	Level: UG
Course Name	Computer Organisation	Course Code/ Course Type	UBTCE213/PCC
Course Pattern	2024	Version	1.0

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
2	-	-	2	2	20	30	-

Pre-Requisite:	
Course Objectives (CO):	The objectives of Computer Organisation are: 1. To recognize the components of Computer 2. To articulate the principles of computer organization and the basic architectural concepts. 3. To comprehend simple register transfer language to specify various computer operations. 4. To interpret and summarize the pipelining concept and multiprocessor systems 5. To design, and program a simple digital computer ALU operation.
Course Learning Outcomes (CLO):	Students would be able to: 1. Elaborate the concepts of computer organization for several engineering applications. 2. Develop the ability and confidence to use the fundamentals of computer organization as a tool in the engineering of digital systems. 3. Build an ability to identify, formulate, and solve hardware and software computer engineering problems using sound computer engineering principle 4. Impart the knowledge on micro programming 5. Comprehend the concepts of advanced pipelining techniques.

Descriptors/Topics	CLO	Hours
UNIT I		
FUNDAMENTALS OF COMPUTERS: Basic Functional units of Computers: Types and generation of computers, Functional units, basic Operational concepts, Bus structures. Software, Performance,Architecture:Von Neumann and Harvard architectureDataRepresentation: Signed number representation, fixed and floating point representations. Computer Arithmetic: Addition and subtraction, multiplication. Booth's Algorithm, Division Restoring Algorithm, Non Restoring algorithm	**CLO 1**	**8**
UNIT II		
THE MEMORY SYSTEM Basic concepts of semiconductor RAM memories, Memory Hierarchy; Primary memory, Secondary Memory: Magnetic Tape, Magnetic Disk, Optical disk,	**CLO 2**	**8**

magneto-optical disk; Concepts of auxiliary, Associative, Cache Cache coherence and Virtual Memory. Introduction to RAID and JBOD, DMA, DMA Transfer modes, sequential access, and direct access storage devices.		
UNIT III		
REGISTER TRANSFER LANGUAGE AND MICRO-OPERATIONS: Register Transfer Language and Micro Operations: RTL- Registers, Register transfers, Bus and memory transfers. Micro operations: Arithmetic, Logic, and Shift micro-operations, Arithmetic logic shift unit. **Instructions and Instruction types and Instruction Cycle** Computer instructions, Instruction cycle, Instruction codes, Timing and Control, Types of Instructions: Memory Reference Instructions, Input–Output and Interrupt.	**CLO3**	**8**
UNIT IV		
CENTRAL PROCESSING UNIT ORGANIZATION: General Register Organization, Stack organization, Addressing modes, Data Transfer and Manipulation, Program Control, CISC and RISC processors Control unit design: Design approaches, Control memory, Address sequencing, Micro Programmed Control.	**CLO4**	**6**
UNIT V		
MULTI-PROCESSOR ORGANIZATION Input –Output Organization: Peripheral devices, Input-output subsystems, I/O device interface, I/O Processor, I/O transfers–Program controlled, Interrupt driven, and DMA, Interrupts and exceptions. I/O device interfaces – SCII, USB **Pipelining and Vector Processing:** Basic concepts, Instruction level Parallelism Throughput and Speedup, Pipeline hazards. Time Space Diagram, Hazards instruction Pipelining, Arithmetic Pipelining	**CLO 5**	**6**
Total Hours		**30**

Learning resources:

Text Books:

1.Computer Organization – Carl Hamacher, Zvonks Vranesic, Safea Zaky, Vth Edition, McGraw Hill.
2. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI

Reference Books:

1. Computer Systems Architecture – M.Moris Mano, IIIrd Edition, Pearson/PHI
2. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition PHI/Pearson
3. Fundamentals or Computer Organization and Design, - Sivaraama Dandamudi Springer Int. Edition.
4. Computer Architecture a quantitative approach, John L. Hennessy and David A. Patterson, Fourth Edition Elsevier

Online Resources:

NPTEL & MOOC courses titled Computer organization

1.https://nptel.ac.in/courses/106105163 /
2.https://nptel.ac.in/courses/106103068/

Name of the Program:		BTECH CSE		Semester: IV		Level: UG	
Course Name		Applied Mathematics		Course Code/ Course Type		UBTCE214/PCC	
Course Pattern		2024		Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/ Oral
3	0	0	3	3	40	60	-

Pre-Requisite: Limits, continuity, differentiability, differential equations of first order and first degree

Course Objectives (CO):	The objectives of (Applied Mathematics) are: 1. To familiarize the students with concepts and techniques in Differential Equations, 2. Transform techniques and basic probability and statistical concepts. 3. To acquire techniques of advanced level mathematics and its applications that would enhance analytical thinking power. 4. To apply statistical techniques to analyse data. 5. To familiarize the students with probability and its distribution.
Course Learning Outcomes (CLO):	Students would be able to: 1. To familiarize the students with concepts and techniques in Differential Equations, 2. Transform techniques and basic probability and statistical concepts. 3. To acquire techniques of advanced level mathematics and its applications that would enhance analytical thinking power. 4. Comprehend statistical data and its analysis. 5. Comprehend the probability, its theorem & distribution.

Descriptors/Topics	CLO	Hours
UNIT I		
Higher order linear differential equations Introduction, LDE of nth order with constant coefficients, Complementary function, Particular integral, General method, Shortcut methods, Method of variation of parameters, Cauchy's & Legendre's DE.	**CLO 1**	**12**
UNIT II		
Fourier Transform and Z –Transform: Introduction, Complex exponential form of Fourier series, Fourier integral theorem, Fourier Sine & Cosine integrals, Fourier transform, Fourier Sine & Cosine transforms and their inverses. **Z –Transform:** - Introduction, Definition, Standard properties, Z Transform of standard sequences and their inverses. Solution of difference equations.	**CLO 2**	**12**
UNIT III		
Statistics: Introduction Measures of central tendency, Measures of dispersion, Coefficient of variation, Moments, Skewness and Kurtosis, Correlation and Regression, Multiple Correlation, Linear and Multiple egressions, Reliability of Regression Estimates.	**CLO 3**	**10**

UNIT IV		
Probability and Probability Distributions Probability, Theorems on Probability, Bayes theorem, Random variables, Probability mass function, Probability density function, Mathematical expectation, variance and its properties Probability distributions: - Binomial distribution, Poisson distribution, Normal distribution. Geometric, Uniform distribution, Exponential distribution.	**CLO 4**	**11**
Total Hours		**45**

Learning resources:

Text Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2014.
2. Hugh Neill, Trigonometry: A complete Introduction, John Murray Learning, 2018.
3. George B. Thomas, Jr and Ross L. Finney, Calculus and Analytical Geometry, 9th Edition, 1998

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44thEdition, 2010.
2. Ron Larson, Trigonometry, Brooks/Cole, 9th Edition, 2013.
3. Robert E, Moyer, Trigonometry, Mc. Graw Hill, Addision-Wesely, 4th Edition, 2009.

Online Resources:

1. https://www.appliedmathematics.ie/
2. https://www.youtube.com/watch?v=AVqBzf1wNr8

Name of the Program:	BTECH CSE	Semester: IV	Level: UG
Course Name	Communication System	Course Code/ Course Type	UBTCE215A/ OEII
Course Pattern	2024	Version	1.0

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
3	-	-	3	3	40	60	-

Pre-Requisite: Basic Electronics

Course Objectives (CO):	The objectives of Communication System are: 1. To describe the building blocks of communication systems. 2. To recognize mathematical background for communication signal analysis. 3. To analyse the signal flow in a digital communication system. 4. To explore the concept of Data Communication 5. To evaluate the error performance of a digital communication system in the presence of noise and other interferences multiple access techniques
Course Learning Outcomes (CLO):	Students would be able to: 1. Students will be able to identify Various types of Signals and its frequency response 2. Explain the Amplitude modulation and frequency modulation with its real-world applications 3. Explore the Pulse modulation digital modulation techniques and their S/N ratio to better understand for mobile environment. 4. Model various line coding methods for TDMA, CDMA etc 5. Evaluation of practical digital communication systems in terms of their performance and complexity.

Descriptors/Topics	CLO	Hours
UNIT I	**CLO 1**	**09**
Introduction to communication system: Introduction To Communication System (Block diagram). Analog and Digital Messages, History of Communications. Signal Transmission through a linear system, Signal distortion over a communication channel, Fourier Transform (in brief),Amplitude Modulation: Modulation and demodulation, Frequency modulation and its types: Modulation and demodulation.		
UNIT II	**CLO 2**	**9**
Sampling and pulse communication: Introduction To Communication System (Block diagram). Analog and Digital Messages, History of Communications. Signal Transmission through a linear system,		

Signal distortion over a communication channel, Fourier Transform (in brief) Amplitude Modulation: Modulation and demodulation Frequency modulation and its types: Modulation and demodulation		
UNIT III	**CLO 3**	**9**
Data communication: History of Data Communication Standards Organizations for Data Communication, Data Communication Circuits, Data Communication Codes –Data communication Hardware – serial and parallel interfaces. Multiple Access: TDMA, FDMA, CDMA and its comparison, Guided Media, Unguided Media, Transmission Impairments, Performance Shannon Capacity and Bandwidth.		
UNIT IV	**CLO 4**	**8**
Channel capacity, error detection and correction: Entropy, Mutual Information, Source Encoding Theorem, Shannon Fano Coding, Huffman Coding, Types of Errors, Detection, Parity Check, • Error Correction		
UNIT V	**CLO5**	**10**
Digital Transmission and Digital Modulation Techniques Components of digital communication system, line coding, Eye Diagram, DIGITAL CARRIER SYSTEMS Introduction to Digital Modulation-Demodulation Techniques, Modulation techniques for ASK, FSK, PSK, MSK, BPSK, QPSK		
Total Hours		**45**

Learning resources:

Text Books:

1. Digital and analog communication system by B.P.Lathi .
2. Communication Systems by Simon Haykins.
3. Principles of Communication Systems by Taub and Schilling

Reference Books:

1. Electronic Communications Systems by Wayne Tomasi.

Online Resources

1. https://archive.nptel.ac.in/courses/108/104/108104091/
2. https://onlinecourses.nptel.ac.in/noc22_ee05/preview

Name of the Program:	B Tech CSE	Semester : IV	Level: UG/PG
Course Name	Communication System Laboratory	Course Code/ Course Type	UBTCE216 A/ OEII
Course Pattern	2024	Version	1.0

Teaching Scheme				Assessment Scheme			
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
-	1	-	1	2	25	-	25

Pre-Requisite:	
Course Objectives (CO):	The objectives of (Name of course) are: 1. To describe the building blocks of communication systems. 2. To recognize mathematical background for communication signal analysis. 3. To analyse the signal flow in a digital communication system. 4. To explore the concept of Data Communication 5. To evaluate the error performance of a digital communication system in the presence of noise and other interferences multiple access techniques
Course Learning Outcomes (CLO):	Students would be able to: 1. Students will be able to identify Various types of Signals and its frequency response 2. Explain the Amplitude modulation and frequency modulation with its real-world applications 3. Explore the Pulse modulation digital modulation techniques and their S/N ratio to better understand for mobile environment. 4. Model various line coding methods for TDMA, CDMA etc 5. Evaluation of practical digital communication systems in terms of their performance and complexity.

Assignment /Practical/Activity Number	Assignment /Practical/Activity Title	Week Number/Turn	Details	CLO	Hours
1.	Practical 1:	Week 1/Turn 1	Write a SciLab Program for amplitude Modulation: Modulation and demodulation	CLO1, CLO1	2

2.	Practical 2:	Week 2/Turn 1	Write a SciLab Program for frequency modulation and its types: Modulation and demodulation	CLO2	2
3.	Practical 3:	Week 3/Turn 1	Write a SciLab Program for sampling and Sampling Theorem & Aliasing	CLO3	2
4.	Practical 4:	Week 4 /Turn 1	Write a SciLab Program for PAM, pulse modulation and demodulation	CLO 4	2
5.	Practical 4:	Week 5/Turn 1	Write a SciLab Program for PPM pulse modulation and demodulation	CLO 4	2
6.	Practical 4:	Week 6/Turn 1	Write a SciLab Program for PWM pulse modulation and demodulation	CLO 4	2
7.	Practical 5:	Week 7/Turn 1	Write a SciLab Program for PCM modulation and demodulation and calculation of S/Nq.	CLO4	2
8.	Practical 6:	Week8/Turn 1	Write a SciLab Program for DM, ADM, modulation and demodulation.	CLO 4	2
9.	Practical 6:	Week9/Turn 1	Write a SciLab Program for ADPCM modulation and demodulation.	CLO 4	2
10.	Practical 7:	Week 10/Turn 1	Write a SciLab Program for Multiple Access: TDMA, FDMA, CDMA and its comparison.	CLO4	2
11.	Practical 7:	Week 11/Turn 1	Write a SciLab Program for Multiple Access: TDMA, FDMA, CDMA and its comparison.	CLO4	2
12.	Practical 8:	Week 12/Turn 1	Data communication Hardware – serial and parallel interfaces.	CLO 4	2
13.	Practical 9:	Week 13/Turn 1	Write a SciLab Program for Line coding NRZ, RZ etc	CLO5	2
14.	Practical 10:	Week 14/Turn 1	Write a SciLab Program for Modulation techniques for ASK,FSK,PSK,	CLO5	2
15.	Practical 10:	Week 15/Turn 1	Write a SciLab Program for Modulation techniques for MSK,BPSK,QPSK,	CLO5	2

Learning resources:

Text Books:

1. Digital and analog communication system by B.P.Lathi .
2. Communication Systems by Simon Haykins.
3. Principles of Communication Systems by Taub and Schilling

Reference Books:

1. Electronic Communications Systems by Wayne Tomasi.

Online Resources:

1. https://archive.nptel.ac.in/courses/108/104/108104091/
2. https://onlinecourses.nptel.ac.in/noc22_ee05/preview

Name of the Program:		BTECH CSE		Semester : IV		Level: UG	
Course Name		Digital Signal Processing		Course Code/ Course Type		UBTCE215 B/OEII	
Course Pattern		2024		Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/ Oral
3	-	-	3	3	40	60	-
Pre-Requisite: Signal and system, Mathematics particularly linear algebra, calculus, and complex analysis.							
Course Objectives (CO):				The objectives of Signals and Systems are: 1. To recall the basic knowledge about the different type of signals 2. To recognize signals mathematically. 3. Understand how to perform mathematical operations on signals. 4. To provide knowledge of Digital filter. 5. To discuss word length issues, multi rate signal processing and application.			
Course Learning Outcomes (CLO):				Students would be able to: 1. To identify different type of signals. 2. Explain the signals mathematically. 3. Apply knowledge of mathematical operations on signals. 4. Analyze Digital filter. 5. Evaluate the multi rate signal processing and application.			

Descriptors/Topics	CLO	Hours
UNIT I		
Basic elements of digital signal Processing: Concept of frequency in continuous time and discrete time signals –Sampling theorem Discrete time signals. Discrete time systems –Analysis of Linear time invariant systems –Z transform –Convolution and correlation.	**CLO 1**	**9**
UNIT II		
Introduction to DFT: Efficient computation of DFT Properties of DFT – FFT algorithms – Radix-2 and Radix-4 FFT algorithms – Decimation in Time – Decimation in Frequency algorithms – Use of FFT algorithms in Linear Filtering and correlation.	**CLO 2**	**9**
UNIT III		
Structure of IIR: System Design of Discrete time IIR filter from continuous time filter – IIR filter design by Impulse Invariance. Bilinear transformation – Approximation derivatives – Design of IIR filter in the Frequency domain.	**CLO 3**	**10**
UNIT IV		
Symmetric & Anti-symmetric FIR filters: Linear phase filter – Windowing techniques – rectangular, triangular, Blackman and Kaiser windows – Frequency sampling techniques – Structure for FIR systems.	**CLO 4**	**9**
UNIT V		
Finite word length effects in FIR and IIR digital filters: Quantization, round off errors and overflow errors. Multi rate digital signal processing: Concepts, design of	**CLO 5**	**8**

practical sampling rate converters, Decimators, interpolators. Poly phase decompositions. Application of DSP – Model of Speech Wave Form – Vocoder.		
Total Hours		**45**

Learning resources:

Textbooks:

1. Oppenheim A V and Sehafer R W, "Discrete Time Signal Processing", Prentice Hall (1989).

2. Proakis J G and Manolakis D G, "Digital Signal Processing", Pearson Education India.

Reference Books:

1. Oppenheim A V, Willsky A S and Young I T, "Signal & Systems", Prentice Hall, (1983).

2. Ifeachor and Jervis, "Digital Signal Processing", Pearson Education India.
3. DeFatta D J, Lucas J G and Hodgkiss W S, "Digital Signal Processing", J Wiley and Sons, Singapore, 1988
4. Sanjit K Mitra "Digital Signal Processing" TMH

Online Resources:

1. https://nptel.ac.in/courses/117102060
2. https://archive.nptel.ac.in/courses/108/104/108104091/

Name of the Program:	B.Tech	Semester : 2	Level: UG
Course Name	Digital Signal Processing Laboratory	Course Code/ Course Type	UBTCE206 B
Course Pattern	2024	Version	1.0

Teaching Scheme				Assessment Scheme			
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/ Oral
-	1	-	1	2	25	-	25

Pre-Requisite: Signal and system, Mathematics, particularly linear algebra, calculus, and complex analysis.

Course Objectives (CO):	The objectives of Signals and Systems Laboratory are: 1. To implement Linear and Circular Convolution 2. To implement FIR and IIR filters 3. To Estimate power spectral densities using a variety of techniques 4. To Study the architecture of DSP processor 5. To learn programming of DSP hardware for real-time signal processing applications
Course Learning Outcomes (CLO):	Students would be able to: 1. Calculate and Plot DFT / IDFT of given DT signal. 2. Analyze the frequency response of discrete time systems. 3. Analyze and Observe Magnitude and phase characteristics (Frequency response Characteristics) of digital IIR-Butterworth, Chebyshev filters. 4. Analyze and Observe Magnitude and phase characteristics (Frequency response Characteristics) of digital FIR filters using window techniques. 5. Demonstrate their abilities towards DSP Processor based implementation of systems.

COURSE CURRICULUM

Course Contents/Syllabus:
(All the Practical's carry equal weightage in Summative Assessment and equal engagement)

Practical Plan

Assignment/ Practical/Activity Number	Assignment/Practical/ Activity Title	Week Number/ Turn	Details	CLO	Hours
1	Practical 1:	Week 1	To find DFT / IDFT of given DT signal	CLO1	2
2.	Practical 2:	Week 2	Program to obtain Linear Convolution of two finite length sequences	CLO1	2
3.	Practical 3:	Week 3	Program to obtain Linear Convolution of two finite length sequences	CLO1	2
4.	Practical 4:	Week 4	Program for computing Auto-correlation.	CLO3	2
5.	Practical 5:	Week 5	Program for computing Auto-correlation.	CLO3	2
6.	Practical 6:	Week 6	To find frequency response of a given system (in Transfer Function/ Differential equation form).	CLO 3	2
7.	Practical 7:	Week 7	To find frequency response of a given system (in Transfer Function/ Differential equation form).	CLO 3	2
8.	Practical 8:	Week 8	Implementation of FFT of given sequence	CLO 4	2
9.	Practical 9:	Week 9	Implementation of FFT of given sequence	CLO 4	2
10.	Practical 10:	Week 10	Implementation of LP FIR filter for given sequence	CLO 4	1
11.	Practical 11:	Week 11	Implementation of LP FIR filter for given sequence	CLO 4	1
12.	Practical 12:	Week 12	Implementation of HP FIR filter for given sequence	CLO 5	2
13.	Practical 13:	Week 13	Implementation of HP FIR filter for given sequence	CLO 5	2
14.	Practical 14:	Week 14	Implementation of HP IIR filter for given sequence	CLO 5	2
15.	Practical 15:	Week 15	Implementation of HP IIR filter for given sequence	CLO 5	2

Learning resources

Textbooks:

1. Oppenheim A V and Sehafer R W, "Discrete Time Signal Processing", Prentice Hall (1989).

2. Proakis J G and Manolakis D G, "Digital Signal Processing", Pearson Education India.

Reference Books:

1. Oppenheim A V, Willsky A S and Young I T, "Signal & Systems", Prentice Hall, (1983).

2. Ifeachor and Jervis, "Digital Signal Processing", Pearson Education India.

3. DeFatta D J, Lucas J G and Hodgkiss W S, "Digital Signal Processing", J Wiley and Sons, Singapore, 1988
4. Sanjit K Mitra "Digital Signal Processing" TMH

Online Resources/E-Learning Resources

1. https://nptel.ac.in/courses/117102060
2. https://archive.nptel.ac.in/courses/108/104/108104091/

Name of the Program:	BTECH CSE				Semester: IV	Level: UG	
Course Name	Java Laboratory				Course Code/ Course Type	UBTCE217/VSEC	
Course Pattern	2024				Version	1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/ Oral
-	1	-	1	2	25	-	25

Pre-Requisite:

2. Basic knowledge of Programming in C and C++

Course Objectives (CO):	The objectives of Java Programming are: 1. To learn the fundamentals of the Java programming language. 2. To learn object-oriented principles like abstraction, encapsulation, inheritance, and polymorphism and apply them in solving problems using java. 3. To apply the concepts of exception handling, multithreading and collection classes using java. 4. To develop software applications using JDBC connectivity. 5. To design the Graphical User Interface using applets and swing controls.
Course Learning Outcomes (CLO):	Students would be able to: 1. To grasp the fundamentals of the Java programming language. 2. To apply object-oriented principles like abstraction, encapsulation, inheritance, polymorphism in solving problems using java. 3. To create exception handling, multithreading code using java. 4. To develop software applications using JDBC connectivity. 5. To design the Graphical User Interface using event handling.

Assignment/Practical/Activity Number	Assignment/Practical/Activity Title	Week Number/ Turn	Details	CLO	Hours
1	Practical 1: Java control structures	Week 1/ Turn 1	Write a java program to define the data types, variable, operators, arrays and control structures.	CLO 1	2
2	Practical 2: Constructor Creation	Week 2 /Turn 1	Develop a Program to define class and constructors. Demonstrate constructors with method overloading.	CLO 1	2
3	Practical 3: Inheritance and interface	Week 3 /Turn 1	Develop a Program to define inheritance and show method overriding.	CLO 2	2
4	Practical 3: Inheritance and interface	Week 4 /Turn 1	Develop a Program to define inheritance and show method overriding.	CLO 2	2
5	Practical 4: Exception Handling	Week 5 /Turn 1	Develop a Program to demonstrate Exception Handling.	CLO 3	2
6	Practical 5: Multithreading	Week 6 /Turn 1	Develop a Program to demonstrate Multithreading.	CLO 3	2
7	Practical 5: Multithreading	Week 7 /Turn 1	Develop a Program to demonstrate Multithreading.	CLO 3	2
8	Practical 6: Input and output operations	Week 8 /Turn 1	Develop a Program to demonstrate I/O operations.	CLO 4	2
9	Practical 7: Database operations	Week 9 /Turn 1	Develop a Program to demonstrate Database handling.	CLO 4	2
10	Practical 7: Database operations	Week 10 /Turn 1	Develop a Program to demonstrate Database handling.	CLO 4	2
11	Practical 8: Network Programming	Week 11 /Turn 1	Develop a Program to demonstrate Network Programming.	CLO 5	2
12	Practical 9: Event Handling	Week 12 /Turn 1	Develop a Program to demonstrate Applet structure and event handling.	CLO 5	2
13	Practical 10: Layout Creation	Week 13 /Turn 1	Develop a Program to demonstrate Layout managers.	CLO 5	2
14	Practical 11: Mini Project	Week 14 /Turn 1	Develop a Project using java.	CLO 1-5	2
15	Practical 11: Mini Project	Week 15 /Turn 1	Develop a Project using java.	CLO 1-5	2
Total Hrs					**30**

Learning resources:
Textbooks:

1. "Java Fundamentals a Comprehensive Introduction" HerbertSchildt and DaleSkrien, TMH
2. "Head First Java: Your Brain on Java - A Learner's Guide", 1st Edition, by Bert Bates, Kathy Sierra

Reference Books:

1. "Java: the complete reference" by Herbert Schildt and DaleSkrien, TMH
2. "Java For Dummies (For Dummies" (Computer/Tech)) 8th Edition by Barry Burd.

Online Resources/E-learning Resources:

1. https://onlinecourses.nptel.ac.in/noc20_cs58/preview Programming in Java By Prof. Debasis Samanta, IIT Kharagpur
2. https://onlinecourses.nptel.ac.in/noc22_cs47/previ

Name of the Program:	Foreign Language	Semester: 4	Level: UG/PG
Course Name	German A1.2	Course Code/Course Type	UFL 202 A/AEC
Course Pattern	2024	Version	1.0

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/ Oral
2	-	-	-	2	20	30	-

Pre-Requisite:

1. Can understand and use familiar, everyday expressions and very simple sentences aimed at satisfying specific needs.

Course Objectives (CO):	The objectives of (German A1.2) are: 1. To get along with a basic vocab. 2. To understand German day to day culture. 3. Can communicate in routine situations. 4. To be able to have a direct exchange of information about familiar matters. 5. To describe own surroundings.
Course Learning Outcomes (CLO):	Students would be able to: **1.** Communicate in the areas of immediate importance. **2.** Able to frame simple sentences in formal conversation. **3.** Translate simple sentences from English to the German language and vice-versa. **4.** Construct a dialogue, in the German language, for basic human interactions in a social context. **5.** Take part in an interaction relating to basic conversation

Descriptors/Topics	CLO	Hours
UNIT I		
Kontakte planning of letter writing, ramification of Letter, ,writing and understanding, discussion about language learning, find information from texts, understand conversations on various topics, texts related to office life Grammar – Usage of Articles and Prepositions	**CLO 1**	**6**
UNIT II		
MeineWohnung Understand home advertisements, describe house, how to reply invitations, how to express 'likes and dislikes', speak about different forms of living, how to write a text on house Grammar – Adjectives	**CLO 2**	**6**
UNIT III		
AllesArbeit? Talk about daily routine, talk about past, understand job advertisements, understand blogs on jobs, express opinions about jobs, prepare telephonic dialogues, speak about jobs Grammar – Past tense, Sentence connectors	**CLO3**	**6**

UNIT IV		
Kleidung und Mode Speak about cloths and shopping, lead a discussion during cloths shopping, discussion in departmental store, understand and research information about Berlin Grammar – Separable and non-separable verbs	**CLO4**	**6**
UNITV		
Gesund und munter&Ab in den Urlaub Learn body parts, Health related dialogue, City orientation, Travel reports, discussion regarding different travel destinations and weather Grammar – Imperative, Time adverbs	**CLO5**	**6**
Total Hours		**30**

Learning resources:

Textbooks:

1. Netzwerk A1, Ernst klettVerlag&Goyal Publishers & Distributors Pvt. Ltd.
2. Studio d A1, CornelesenVerlag&Goyal Publishers & Distributors Pvt. Ltd.
3. NetzwerkNeu A1, Ernst klettVerlag&Goyal Publishers & Distributors Pvt. Ltd

Reference Books:

1. Hallo Deutsch A1,ErnstKlettVerlag, Goyal Publishers & Distributors Pvt. Ltd
2. ThemenAktuell 1, Hueberverlag
3. Maximal Ernst klettVerlag&Goyal Publishers & Distributors Pvt. Ltd.

Online Resources/:

1. https://youtube.com/@LearnGermanwithAnja?si=BkJYDPi7TS0fT4lr
2. https://youtube.com/@deutschlernenmitheidi?si=TkICIabzioaU0roZ
3. Instagram :instagram.com/learngermanwithanja

Name of the Program:	B. TECH CSE				Semester: 4	Level: UG	
Course Name	Project Based on Digital and Technological Solutions				Course Code/Course Type	UBTCE219/VEC	
Course Pattern	2024				Version	1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
NA	2	NA	2	4	25		

Pre-Requisite:

1. Basic knowledge of English

Course Objectives (CO):	This course will enable the students to: 1. Gain an understanding of emerging digital technologies and their potential applications in addressing societal challenges. 2. Apply design thinking methodologies to identify user needs, define project requirements, and develop innovative solutions. 3. Develop technical skills in software development, data analysis, and digital prototyping. 4. Collaborate effectively in interdisciplinary teams to design, implement, and evaluate digital solutions. 5. Demonstrate proficiency in project management techniques, including planning, budgeting, and resource allocation.
Course Learning Outcomes (CLO):	Students would be able to: 1. Ability to write a project proposal based on the refined requirement specification 2. Ability to work in a team and contribute to a team software design project 3. Ability to work in a team and contribute to the production of an enterprise software product 4. Ability to meet milestones and final goals in a team environment 5. Ability to write a final report fully documenting the design of a software design project

Descriptors/Topics	CLO	Hours
1. Introduction to Digital Innovation • Overview of course objectives, expectations, and project guidelines • Introduction to design thinking and user-centered design principles • Case studies of innovative digital solutions and their impact 2. Needs Assessment and Solution Design • Methods for conducting user research and defining project requirements • Ideation and concept generation techniques for digital solutions	**CLO1 to CLO5**	**60**

• Prototyping and user testing methodologies 3. Technology Selection and Development • Overview of emerging digital technologies, including AI, IoT, and blockchain • Introduction to programming languages and development frameworks • Hands-on workshops on software development and digital prototyping tools 4. Project Planning and Management • Project scoping, goal setting, and stakeholder analysis • Techniques for project planning, scheduling, and risk management • Budgeting and resource allocation for digital innovation projects 5. Implementation and Testing • Agile development methodologies and iterative prototyping • Quality assurance and testing strategies for digital solutions • Iterative feedback and refinement based on user testing 6. Evaluation and Impact Assessment • Methods for evaluating the usability, effectiveness, and scalability of digital solutions • Data analysis techniques for measuring project outcomes and impact • Documentation and reporting of project findings and recommendations		

Assessment:

1. Project Proposal: Written proposal outlining the project scope, objectives, and methodology (20%)
2. Project Implementation: Development and implementation of the digital solution, including documentation and code repository (30%)
3. Final Report: Written report summarizing the project process, outcomes, and impact assessment (30%)
4. Presentation: Oral presentation of project findings and demonstration of the digital solution (20%)

Name of the Program:	B.Tech/B.B.A/B.C.A/B.Sc/B.Pham	Semester : 4	Level: UG/PG
Course Name	Japanese language skill - L2	Course Code/Course Type	UFL201B/AEC
Course Pattern	2024	Version	1.0

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/ Oral
2	--	--	2	2	20	30	--

Pre-Requisite:

1. Desire to get acquainted with the Japanese language. Basic knowledge of Hiragana and Katakana.

Course Objectives (CO):	The objectives of Basic Japanese language skill are: 1. To meet the needs of ever-growing industry, with respect to language support. 2. To get introduced to Japanese society and culture through language. 3. To promote multilingualism in exposing students to different cultures 4. Fostering respect for linguistic diversity. 5. Learning additional language to develop a better memory, talent for problem solving, ability to concentrate.
Course Learning Outcomes (CLO):	After learning the course, the students will be able to: 1. Read & write words that have been borrowed from other language. 2. Comprehend and speak basic conversation with basic particles 3. Speak and write about Routine 4. Basic sentence patterns incorporated into short dialogues indicating how they are used in actual conversation. 5. To understand grammatical structure, and improve communication abilities.

Descriptors/Topics	CLO	Hours
UNIT I		
Katakana Script Katakana Script / Writing Kanji	**CLO 1**	**6**
UNIT II		
System of demonstrative words : Minna no Nihongo lesson no. 1,2 & 3	**CLO 2**	**6**

UNIT III		
Minna no Nihongo lesson no. 4 (Write and Speak basic sentences in correct tenses.	**CLO 3**	**6**
UNIT IV		
Reading : Basic conversation using particles Listening : conversation related to particles Speaking : Sentences about give, lend, teach, receive	**CLO 4**	**6**
UNIT V		
Tenses : Writing : Affirmative present ,past & future Negative present ,past,& future sentences Writing : About Routine	**CLO 5**	**6**
Total Hours		**30**

Learning resources

Textbooks:

1. Minna no Nihongo, "Japanese for everyone", Elementary Main Textbook, Goyal Publishers & Distributors Pvt. Ltd.

Reference books:

1. Shyoho Volume 1
2. Genki Japan
3. Haru Vol. 1 & 2

Online Resources:

1. https://youtu.be/1JephUxTHxg?si=ouCwTXZc_fYgY9Kh
2. https://youtu.be/9EfbkBkF2ag?si=rLNzc55_REacMoGu
3. https://youtu.be/DpEolYasgyg?si=dya9ue-YMSHO3VOG
4. https://youtu.be/itccOS1_LSk?si=hvPqILKlviuncMvA

SEMESTER-V

Name of the Program:		CSE			Semester: V	Level: UG	
Course Name		Computer Network			Course Code/ Course Type	UBTCE310/Major	
Course Pattern		2024			Version	1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/ Oral
3	-	-	3	3	40	60	-

Pre-Requisite:

3. Fundamental of Computers

Course Objectives (CO):	The objectives of Computer Network are: 1. To gain the knowledge of communication systems. 2. To Learn and understand the History of Computer Network and its evolution with the help of service models 3. To learn the various issues of Network layer, its management and Routing algorithms at Network layer 4. To learn the services offered by Transport Layer 5. To learn the session layer and Applications Layer protocols; and its services.
Course Learning Outcomes (CLO):	Students would be able to: 1. Identify various data communication techniques along with types of network 2. Interpret OSI and TCP/IP Protocol suit 3. Design routing algorithms to find shortest path in network 4. Compare TCP and UDP services 5. Demonstrate application layer protocols

Descriptors/Topics	CLO	Hours
UNIT I		
Introduction to Data Communication: Fundamentals of Data Communication, Type of Connections, Network Topologies, Types of Networks-LAN, WAN And MAN; Data and Signals, Periodic Analog Signals, Digital Signals, Transmission Impairment, Data Rate Limits, Performance; Introduction to Digital to Digital, Analog to Digital, Digital to Analog, Analog to Analog Conversions; Transmission Modes.	**CLO 1**	**9**
UNIT II		
Introduction to Computer Networks: Introduction to OSI and TCP/IP Protocol Suite, Classification of Addressing Mechanisms, Guided Media: Twisted Pair Cable, Coaxial Cable and Fiber-Optic Cable, Unguided Media: Wireless, Radio Waves, Microwaves and Infrared; Introduction to Data Link Layer.	**CLO 2**	**9**
UNIT III		
Network Layer and Routing Principles: Network Layer Services, Packet Switching: Datagram and Virtual Circuit Approach, Network Layer Performance: Delay, Throughput, Packet Loss, Congestion Control;	**CLO 3**	**9**

IPv4: Datagram Format; Routing Algorithms: Distance Vector, Link-state, Path Vector Routing.		
UNIT IV		
Transport Layer and its Services: Overview of Transport Layer, Transport Layer services, User Datagram Protocol (UDP): User Datagram, UDP Services, UDP Applications; Transmission Control Protocol (TCP): TCP Services, Features, TCP Segment, TCP Connection, TCP Congestion Control.	**CLO 4**	**9**
UNIT V		
Application Layer Protocols: Introduction to Application Layer, Client-Server Paradigm, Socket Interface, DHCP, FTP, TFTP, WWW & HTTP, Electronic Mail: SMTP, POP3, IMAP and MIME.	**CLO 5**	**9**
Total Hours		**45**

Learning resources:

Textbooks:

1. Behrouz A Forouzan , "Data Communications and Networking", 5th Ed, McGraw – Hill Education India Edition 2013, ISBN-13: 9781259064753.
2. Behrouz A. Forouzan,"TCP-IP protocol suite ", Tata McGraw Hill Edition, 4th Edition 2010, ISBN-13: 9780070706521.

Reference Books:

1. James F. Kurose, Keith W. Ross, "Computer Networking – A Top-Down Approach Featuring the Internet", Fifth Edition, Pearson Education, 2009.
2. S. Tanenbaum , "Computer, Networks", PHI Publication, 4th edition, ISBN: 8178087855.
3. William Stallings, "Data and Computer Communications", Person Education, 8th Edition, ISBN:- 9788131715369.

Online Resources:

1. Computer Networks and Internet Protocol By Prof. Soumya Kanti Ghosh, Prof. Sandip Chakraborty | IIT Kharagpur
   https://onlinecourses.nptel.ac.in/noc22_cs19/preview

2. Computer Networks By Dr. Narayan Patidar | Devi Ahilya Vishwavidyalaya, Indore
   https://onlinecourses.swayam2.ac.in/cec21_cs04/preview

Name of the Program:	CSE				Semester: V	Level: UG	
Course Name	Computer Network Laboratory				Course Code/ Course Type	UBTCE311/Major	
Course Pattern	2024				Version	1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/ Oral
-	1	-	1	2	25	-	25

Pre-Requisite:

1. Basic knowledge of python Programming

Course Objectives (CO):	The objectives of Computer Network Laboratory are: 1. To establish communication among the computing nodes in various networking architectures. 2. Configure the computing nodes with understanding of protocols and technologies. 3. Use different communicating modes and standards for communication. 4. Use modern tools for network traffic analysis. 5. To learn network programming
Course Learning Outcomes (CLO):	Students would be able to: 1. Understand working and architecture of college/ organization network. 2. Design network application by using various concepts of layered architecture. 3. Write program to analyze working of various protocols and packets. 4. Demonstrate LAN and WAN protocol behavior using Modern Tools. 5. Justify the working of error control and error detection mechanism using a program.

Assignment/Practical/Activity Number	Assignment/Practical/Activity Title	Week Number/ Turn	Details	CLO	Hours
1	Practical 1: Implement Regression models	Week 1/ Turn 1	Study the college / organization network, networking devices and its working in detail. Study the college/organization Server functioning and security parameters. (If possible, plan visit to the server room)	CLO1	2
2	Practical 2: Implement binary classification model	Week 2/ Turn 1	Study of Networking commands. 1. ping 2. ipconfig/ifconfig 3. Tracert 4. Netstat 5. NSLookup	CLO1	2
3	Practical 3: Implement Neural Network based classifier	Week 3 /Turn 1	Setup a wired LAN using Layer 2 Switch and then IP switch of minimum four computers. It includes preparation of cable, testing of cable using line tester, configuration machine using IP addresses, testing using PING utility and preparing server to send file to client. Demonstrate the	CLO2	2

			PING packets captured traces using Wireshark Packet Analyzer Tool.		
4	Practical 4: Implement GD	Week 4/ Turn 1	Write a program for error detection and correction for 7/8 bits ASCII codes using CRC.	CLO5	2
5	Practical 5: Implement KNN	Week 5 /Turn 1	Write a program to demonstrate subnetting and find the subnet masks.	CLO2	2
6	Practical 6: Implement clustering model	Week 6/ Turn 1	Write a program to prepare TCP and UDP packets using header files and send the packets to the destination machine in peer-to-peer mode	CLO3	2
7	Practical 7: Implement prediction model	Week 7 /Turn 1	Write a program using TCP sockets for wired network to implement peer to Peer Chat (Use JAVA/PYTHON)	CLO3	2
8	Practical 8: Prediction model using neural network	Week 8/ Turn 1	Write a program using UDP sockets for wired network to implement: a Peer to Peer Chat (Use JAVA/PYTHON)	CLO3	2
9	Practical 9: Prediction model using neural network	Week 9 /Turn 1	Write a program to simulate Go back N and Selective Repeat Modes of Sliding Window Protocol in peer-to peer mode.	CLO3	2
10	Practical 8: Prediction model using neural network	Week 10 / Turn 1	Write a program to capture and analyse following packet formats for wired network. 1. Ethernet 2. IP 3.TCP 4. UDP	CLO3	2
11	Practical 8: Prediction model using neural network	Week 11 /Turn 1 Week 12 /Turn 1	Configure RIP/OSPF/BGP using packet Tracer.	CLO4	4
12	Practical 8: Prediction model using neural network	Week 12/ Turn 1	Write a program for DNS lookup. Given an IP address input, it should return URL and vice-versa.	CLO4	2
13	Practical 8: Prediction model using neural network	Week 13 /Turn 1	Installing and configure DHCP server.	CLO4	2
14	Practical 8: Prediction model using neural network	Week 14 / Turn 1	Write a program to simulate the behaviour of link state routing protocol to find suitable path for transmission.	CLO3	2
15	Case study	Week 15 / Turn 1	To analyse troubleshooting of LAN switches and Configure and verify network device security features	CLO5	2
Total Hrs					**30**

Learning resources:

Textbooks:

1. Behrouz A Forouzan , "Data Communications and Networking", 5th Ed, McGraw – Hill Education India Edition 2013, ISBN-13: 9781259064753.
2. Behrouz A. Forouzan,"TCP-IP protocol suite ", Tata McGraw Hill Edition, 4th Edition 2010, ISBN-13: 9780070706521.

Reference Books:

1. James F. Kurose, Keith W. Ross, "Computer Networking – A Top-Down Approach Featuring the Internet", Fifth Edition, Pearson Education, 2009.
2. S. Tanenbaum , "Computer, Networks", PHI Publication, 4th edition, ISBN: 8178087855.
3. William Stallings, "Data and Computer Communications", Person Education, 8th Edition, ISBN:- 9788131715369.

Online Resources:

1. Computer Networks and Internet Protocol By Prof. Soumya Kanti Ghosh, Prof. Sandip Chakraborty | IIT Kharagpur https://onlinecourses.nptel.ac.in/noc22_cs19/preview
2. https://archive.nptel.ac.in/courses/106/105/106105183/

Name of the Program:	AIML	UBTML301Semester : V	Level: UG
Course Name	Artificial Intelligence	Course Code/ Course Type	
Course Pattern	2024	Version	1.0

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
3	-	-	3	45	40	60	-

Pre-Requisite: Proficiency in a programming language, such as Python or Java

Course Objectives (CO):	The objectives of Artificial Intelligence are: 1. Understanding of AI Concepts 2. Knowledge of Machine Learning Algorithms 3. Practical Skills in AI Programming 4. Understanding of Neural Networks and Deep Learning 5. Application of AI Techniques
Course Learning Outcomes (CLO):	Students would be able to: 1. Comprehend Fundamental Concepts 2. Apply Machine Learning Algorithms 3. Implement AI Models 4. Analyze and Evaluate AI Systems 5. Design Neural Network Architectures

Descriptors/Topics	CLO	Hours
UNIT I		
Introduction to Artificial Intelligence, History, AI models, Learning aspects, Intelligent Agents, Rational Agent, Environment types.	**CLO 1**	**09**
UNIT II		
Problem space and search, Toy Problems, Uninformed search methods – Breadth First Search, Uniform Cost Search, Depth First Search, Depth Limited Search, Iterative Deepening Search, Bi-directional Search, Heuristic search methods - Best first, Greedy, A*, AO*, Hill Climbing, Local Search and optimization - Simulated Annealing, Local Beam Search, Adversarial search -Minimax, Alpha-Beta Pruning	**CLO 2**	**09**
UNIT III		
Knowledge Representation, Wumpus World, Propositional Logic, Predicate Logic, Unification and Lifting, Representing Knowledge using rules, Frame systems, Semantic networks, Uncertainty and methods, Bayesian Probability and belief network, Probabilistic reasoning, Forward and backward reasoning, Making simple decisions.	**CLO 3** **CLO 4**	**09**
UNIT IV		
CSP as Search Problem, Backtracking Search for CSP, Forward checking, Constraint Propagation, Formulating Problem structure. Planning components, Blocks world, Goal Stack Planning, Planning as a state space search, Partial Order Planning, Multi-agent Planning.	**CLO 5** **CLO 6**	**09**
UNIT V		
Perceptron, Perceptron Learning, Introduction to Machine Learning, Supervised, unsupervised methods, classification, regression, Decision trees, basics of natural language processing, application areas of AI	**CLO 9** **CLO 10**	**09**
Total Hours:		**45**

Textbooks:

1. Stuart Russell and Peter Norvig (1995), "Artificial Intelligence: A Modern Approach", Third edition, Pearson, 2003.\
2. Elaine Rich and Kevin Knight "Artificial Intelligence", Tata McGraw Hill, 1991

Reference Books:

1. Patrick Henry Winston, "Artificial Intelligence", Addison-Wesley, 1992
2. Jiaweihan, MichelineKamber, "Data Mining: Concepts and systems", Morgan Kaufmann Publishers
3. Machine Learning, TomMitchell,McGraw Hill, 1997,ISBN: 978-0-070-42807-2

Online Resources:

1. https://www.edx.org/learn/artificial-intelligence
2. https://onlinecourses.nptel.ac.in/noc22_cs56/preview
3. https://www.w3schools.com/ai/ai_whatis.asp

Assignment/ Practical/ Activity Number	Assignment/Practical/ Activity Title	Week Number/ Turn	Details	CLO	Hours
1	Practical 1: Implement A* Search algorithm	Week 1/ Turn 1	Represents a node in the search space, containing the state, parent node, cost from the start node (g), and heuristic cost (h).	CLO1	2
2	Practical 2: Implement AO* Search algorithm	Week 2/ Turn 1	AO* (Adaptive A*) is an extension of the A* algorithm that dynamically updates the heuristic function during the search to provide a more informed search direction basic implementation of AO* in Python:	CLO1	2
3	Practical 3: Solve and implement the game of tic-tac-toe using mini-max	Week 3 /Turn 1	Implementing Tic-Tac-Toe using the Mini-Max algorithm involves creating a game tree where each node represents a game state, and then recursively evaluating each possible move to determine the best move for the current player.	CLO2	2
4	Practical 4: Implement and test hill climbing based search algorithms to solve Travelling Salesman Problem.	Week 4/ Turn 1	Hill climbing is a local search algorithm that starts with an arbitrary solution to a problem	CLO5	2
5	Practical 5: Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using any standard Heart Disease Data Set.	Week 5 /Turn 1	Python program that constructs a simple Bayesian network for diagnosing heart disease using the Cleveland Heart Disease dataset, one of the standard datasets used for heart disease diagnosis	CLO2	2
6	Practical 6: Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions.	Week 6/ Turn 1	Python program to implement the k-Nearest Neighbor (k-NN) algorithm to classify the Iris dataset, and print both correct and wrong predictions	CLO3	2
7	Practical 7: Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points.	Week 7 /Turn 1	Below is a Python implementation of the Locally Weighted Regression (LWR) algorithm	CLO3	2
8	Practical 8: Implement Decision Tree in Python?	Week 8/ Turn 1	Basic implementation of a Decision Tree classifier in Python	CLO3	2

9	Practical 9:	Week 9/ Turn 1	Implement 8-puzzle problem using Breadth First Search.	CLO3	2
10	Practical 10:	Week 10/ Turn 1	Implementation of Travelling Salesman Person	CLO3	2
11	Practical 11:	Week 11/ Turn 11	To Implement Bayesian Networks and perform inferences	CLO4	2
12	Practical 12:	Week 12/ Turn 12	To implement backward chaining algorithm	CLO3	2
13	Practical 13:	Week 13/ Turn 13	To Implement Forward Chaining Algorithm.	CLO5	2
14	Practical 14:	Week 14/ Turn 14	To solve constraint satisfaction problems.	CLO3	2
15	Practical 15:	Week 15/ Turn 15	To Implement Mini-max algorithm for game playing	CLO5	2

Textbooks:

3. Stuart Russell and Peter Norvig (1995), "Artificial Intelligence: A Modern Approach", Third edition, Pearson, 2003.\
4. Elaine Rich and Kevin Knight "Artificial Intelligence", Tata McGraw Hill, 1991

Reference Books:

4. Patrick Henry Winston, "Artificial Intelligence", Addison-Wesley, 1992
5. Jiaweihan, MichelineKamber, "Data Mining: Concepts and systems", Morgan Kaufmann Publishers
6. Machine Learning, TomMitchell,McGraw Hill, 1997,ISBN: 0-070-42807-2

Online Resources:

1. https://www.edx.org/learn/artificial-intelligence
2. https://onlinecourses.nptel.ac.in/noc22_cs56/preview
3. https://www.w3schools.com/ai/ai_whatis.asp

Descriptors/Topics	CLO	Hours
UNIT I WEB SCRIPTING LANGUAGES		
JavaScript: Introduction to Scripting languages, Introduction to JavaScript (JS), JS Variables and Constants, JS Variable Scopes, JS Data Types, JS Functions, JS Array, JS Object, JS Events. Advanced JavaScript: JSON - JSON Create, Key-Value Pair, JSON Access, JSON Array, JS Arrow Functions, JS Callback Functions, JS Promises, JS Async-Await Functions, JS Error Handling. AJAX: Why AJAX, Call HTTP Methods Using AJAX, Data Sending, Data Receiving, AJAX Error Handling. JQUERY: Why JQuery, How to Use, DOM Manipulation with JQuery, Dynamic Content Change with JQuery, UI Design Using JQuery.	**CLO 1**	**09**
UNIT I I FRONT END TECHNOLOGIES		
Front-End Frameworks: What is web framework? Why Web Framework? Web Framework Types. MVC: What is MVC, MVC Architecture, MVC in Practical, MVC in Web Frameworks. TypeScript: Introduction to TypeScript (TS), Variables and Constants, UNITs in TS. AngularVersion 10+: Angular CLI, Angular Architecture, Angular Project Structure, Angular Lifecycle, Angular UNITs, Angular Components, Angular Data Binding, Directives and Pipes, Angular Services and Dependency Injections (DI), Angular Routers, Angular Forms. ReactJS: Introduction to ReactJS, React Components, Inter Components Communication, Components Styling, Routing, Redux- Architecture, Hooks- Basic hooks, useState() hook, useEffect() hook, useContext() hook.	**CLO 2**	**09**
UNIT III BACK-END TECHNOLOGIES		
Node.JS: Introduction to Node.JS, Environment Setup, Node.JS Events, Node.JS Functions, Node.JS Built-in UNITs, File System, NPM, Install External UNITs, Handling Data I/O in Node.JS, Create HTTP Server, Create Socket Server, Microservices- PM2. ExpressJS: Introduction to ExpressJS, Configure Routes, Template Engines, ExpressJS as Middleware, Serving Static Files, REST HTTP Method APIs, Applying Basic HTTP Authentication, Implement Session Authentication.	**CLO 3** **CLO 4**	**09**
UNIT IV BACK-END WITH DATABASE		
MongoDB: NoSQL and MongoDB Basics, MongoDB-Node.JS Communication, CURD Operations using Node.JS, Mongoose ODM for Middleware, Advanced MongoDB. Big database Connectivity.	**CLO 5** **CLO 6**	**09**
UNIT V MOBILE WEB DEVELOPMENT		
Mobile-First: What is Mobile-First? What is Mobile Web? Understanding Mobile Devices and Desktop. JQuery Mobile: Introduction to the jQuery Mobile Framework, Set-up jQuery Mobile, Pages, Icons, Transitions, Layouts Widgets, Events, Forms, Themes, Formatting Lists, Header and Footer, CSS Classes, Data Attributes, Building a Simple Mobile Webpage	**CLO 9** **CLO 10**	**09**
Total Hours		**45**

Learning resources

Text Books:

1. Kogent Learning Solutions Inc, Web Technologies: HTML, JAVASCRIPT, PHP, JAVA, JSP, XML and AJAX, Blackbook, Dreamtech Press, Second Edition, ISBN: 9788177228496.
2. Raymond Camden, Andy Matthews, JQuery Mobile Web Development Essentials, Packt Publishing, Second Edition, 9781782167891.

Reference Books:

1. Steven M. Schafer, “HTML, XHTML and CSS”, Wiley India Edition, Fourth Edition,978-81- 265-1635-3
2. Dr.HirenJoshi, Web Technology and Application Development, DreamTech, First,ISBN:978-93- 5004-088-1
3. Steven M. Schafer, “HTML, XHTML and CSS”, Wiley India Edition, Fourth Edition,978-81-265- 1635-3
4. Ivan Bayross,”Web Enabled Commercial Application Development Using HTML, JavaScript, DHTML and PHP,BPB Publications,4th Edition,ISBN:978-8183330084.
5. URLs (Optional) - List of Online Courses

Online Resources:

1. https://www.udemy.com/course/advanced-web-developer-course-beginner-to advanced/?couponCode=ST8MT40924
2. https://www.shiksha.com/online-courses/web-development-courses-certification-training-by-nptel-st644
3. https://onlinecourses.swayam2.ac.in/nou20_cs05/preview

Name of the Program:	AIML	Semester: V	Level: UG
Course Name	Advanced Web Programming	Course Code/ Course Type	UBTML303 A
Course Pattern	2024	Version	1.0

Teaching Scheme				Assessment Scheme			
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
3	-	-	3	45	40	60	-

Pre-Requisite: Proficiency in a programming language, such as Python or Java

Course Objectives (CO):	The objectives of Advanced Web Programming are: 1. To familiarize students with Web Programming basic concepts. 2. To learn and understand Web scripting languages. 3. To explore the Front end& Back-end web programming skills. 4. To understand and learn Mobile web development. 5. To understand and learn Web application deployment.
Course Learning Outcomes (CLO):	1. Develop Static and Dynamic website using technologies like HTML, CSS, Bootstrap. 2. Demonstrate the use of web scripting languages. 3. Develop web application with Front End & Back End Technologies. 4. Develop mobile website using JQuery Mobile. 5. Deploy web application on cloud using AWS.

Assignment/Practical/Activity Number	Assignment/Practical/Activity Title	Week Number/ Turn	Details	CLO	Hours
1	Practical 1: Working with HTML CSS	Week 1/ Turn 1	a. Create a responsive web page which shows the ecommerce/college/exam admin dashboard with sidebar and statistics in cards using HTML, CSS and Bootstrap. b. Write a JavaScript Program to get the user registration data and push to array/local storage with AJAX POST method and data list in new page.	CLO1	2
2	Practical 2: Working with GitHub, NVIDEIA Docker	Week 2/ Turn 1	. Create version control account on GitHub and using Git commands to create repository and push your code to GitHub. b. Create Docker Container Environment (NVIDEIA Docker or any other). c. Create an Angular application which will do following actions: Register User, Login User, Show User Data on Profile Component.	CLO1	2
3	Practical 3: Working with Node.JS, ExpressJS	Week 3 /Turn 1	Create a Node.JS Application which serves a static website. b. Create four API using Node.JS, ExpressJS and MongoDB for CURD Operations on assignment.	CLO2	2

4	Practical 4: Working with AWS VPC or AWS Elastic	Week 4/ Turn 1	a. Create a simple Mobile Website using jQuery Mobile. b. Deploy/Host Your web application on AWS VPC or AWS Elastic Beanstalk. Mini Project.	CLO5	2
5	Practical 5: Working With AJAX POST	Week 5 /Turn 1	a.Create a responsive web page which shows the ecommerce/college/exam admin dashboard with sidebar and statistics in cards using HTML, CSS and Bootstrap. b. Write a JavaScript Program to get the user registration data and push to array/local storage with AJAX POST method and data list in new page.	CLO2	2

Learning resources

Text Books:

1. Kogent Learning Solutions Inc, Web Technologies: HTML, JAVASCRIPT, PHP, JAVA, JSP, XML and AJAX, Blackbook, Dreamtech Press, Second Edition, ISBN: 9788177228496.
2. Raymond Camden, Andy Matthews, JQuery Mobile Web Development Essentials, Packt Publishing, Second Edition, 9781782167891.

Reference Books:

1. Steven M. Schafer, "HTML, XHTML and CSS", Wiley India Edition, Fourth Edition,978-81- 265-1635-3
2. Dr.HirenJoshi, Web Technology and Application Development, DreamTech, First,ISBN:978-93- 5004-088-1
3. Steven M. Schafer, "HTML, XHTML and CSS", Wiley India Edition, Fourth Edition,978-81-265- 1635-3
4. Ivan Bayross,"Web Enabled Commercial Application Development Using HTML, JavaScript, DHTML and PHP,BPB Publications,4th Edition,ISBN:978-8183330084.
5. URLs (Optional) - List of Online Courses

Online Resources:

1. https://www.udemy.com/course/advanced-web-developer-course-beginner-to advanced/?couponCode=ST8MT40924
2. https://www.shiksha.com/online-courses/web-development-courses-certification-training-by-nptel-st644
3. https://onlinecourses.swayam2.ac.in/nou20_cs05/preview

Name of the Program:	B. Tech	Semester: 5	Level: UG
Course Name	Applied Statistical Techniques	Course Code/ Course Type	UBTCE308
Course Pattern	2024	Version	1.0

Teaching Scheme				Assessment Scheme			
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/ Oral
2	0	1	3	3	40	60	-

Prerequisite: Basic statistical concepts.

Course Objectives (CO):	The objectives of Advanced Statistical Techniques are: 1. To familiarize the students with advanced techniques in Statistics 2. To acquire knowledge of techniques of advanced level of sampling & estimation 3. To apply tests of hypothetical techniques 4. To understand applications that would enhance analytical thinking power. 5. To understand the where and how to apply parametric & non parametric tests with applications.
Course Learning Outcomes (CLO):	Students would be able to: 1. Students will be able to identify the advanced terms in statistics. 2. Explain the estimation & its techniques. 3. Apply knowledge of hypothesis techniques to test large and small samples. 4. understand & apply non parametric tests on practical situations. 5. To understand the where and how to apply parametric & non parametric tests with applications.

Descriptors/Topics	CLO	Hours
UNIT I		
Random sampling, Sampling from finite and infinite populations, with and without replacement, central limit theorem, Standard error of sampling, Sampling distribution of sample mean and proportion, stratified random sampling.	**CLO 1**	**6**
UNIT II		
Introduction, Types of estimation, Interval estimation, Point estimation: Maximum likelihood function, Method of moments, Criteria for good estimates: Unbiasedness, Consistency, Sufficiency by Neyman factorization theorem and Efficiency , their applications in estimation.	**CLO 2**	**6**
UNIT III		
Introduction, Hypothesis, Simple and composite hypothesis, Type I and Type II errors, Level of significance, Critical region, Student's-t test, Z-test.	**CLO 3**	**6**

UNIT IV		
Test of hypothesis for small & large sample by Chi-Square distribution, Student's-t distributions, F-distributions. Degree of freedom, Analysis of variance (ANOVA): one-way, two-way (without interactions), P-Value.	**CLO 4**	**6**
UNIT V		
Non-parametric Inference, Comparison with parametric inference, order statistics, Tolerance region, Sign test, Mann-Whitney test, Wilcoxon signed rank test, Run test, Kolmogorov-Smirnov test. Spearman's rank correlation test, Kendall's tau test, Chi-square test.	**CLO 5**	**6**
Total Hours	**…**	**30**

Learning resources:

Text Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2014.
2. Hugh Neill, Trigonometry: A complete Introduction, John Murray Learning, 2018.
3. George B. Thomas, Jr and Ross L. Finney, Calculus and Analytic Geometry, 9th Edition, 1998

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44thEdition, 2010.
2. Ron Larson, Trigonometry, Brooks/Cole, 9th Edition, 2013.
3. Robert E, Moyer, Trigonometry, Mc. Graw Hill, Addision-Wesely, 4th Edition, 2009.

Online Resources:

1. https://archive.nptel.ac.in/courses/115/103/115103028/
2. https://onlinecourses.nptel.ac.in/noc24_ge14/preview

Name of the Program:	B.TECH CSE	Semester: V	Level: UG
Course Name	Applied Data Science with Python	Course Code/ Course Type	UBTDS303B/PEC
Course Pattern	2024	Version	1.0

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/ Oral
3	NA	NA	3	3	40	60	NA

Pre-Requisite:

1. Fundamentals of Data science

Course Objectives (CO):	The objectives of Applied Data Science with Python are: 1. To gain the knowledge of panda library. 2. To Learn data representation 3. To select appropriate machine learning model for data interpretation 4. To learn data mining process using natural language processing. 5. To learn social network models
Course Learning Outcomes (CLO):	Students would be able to: 1. Analyze the data using the data knowledge of panda library. 2. Demonstrate the data using data representation tools 3. Evaluate the appropriate machine learning model 4. Explore data mining process using natural language processing. 5. Recognize social network models and their applications.

Descriptors/Topics	CLO	Hours
UNIT I		
Introduction to Data Science with Python: Fundamentals of Data Manipulation with Python,Basic Data Processing with Pandas, More Data Processing with Pandas, statistical test knowledge on DataFrames in pandas.Recognize other kinds of structured data such as networks, graphs, natural language.	**CLO 1**	**9**
UNIT II		
Applied Plotting, Charting & Data Representation in Python Principles of Information Visualization, Basic Charting, Charting Fundamentals, Applied Visualizations.	**CLO 2**	**9**

UNIT III		
Applied Machine Learning in Python Estimation and prediction in linear model-based supervised learning algorithms. strengths and weaknesses of supervised learning methods to choose the right algorithm for a task. Apply supervised machine learning algorithms in Python using scikit-learn and understand general principles, techniques such as regularization, feature scaling, and cross-validation to avoid overfitting or underfitting. evaluation metrics in machine learning, and how to interpret results when using them. Optimize machine learning algorithm by choosing appropriate evaluation metric for the task.	**CLO 3**	**9**
UNIT IV		
Applied Text Mining in Python: Common problems with raw text and perform textual cleaning tasks in Python, regular expressions (RegEx) to find textual patterns. different natural language tasks and process free text through the NLTK toolkit to tag language constructs onto text. Classification of Text,Compare text classification to other classification approaches, including Naive Bayes and Support Vector Machine algorithms.	**CLO 4**	**9**
UNIT V		
Applied Social Network Analysis in Python: Recognize and categorize real-world networks. Determine appropriate type of network to model real networked data. Construct and manipulate networks of different types using NetworkX, including bipartite graph and related algorithms such as graph projections, Degree distribution of a network and use NetworkX to visualize it. Recognize properties of real-world networks, such as power law degree distribution, high clustering and small average shortest paths. the mechanics of network generation models, such as Preferential Attachment and Small World Models and their properties, and use NetworkX for link prediction and node feature creation in real-world networks.	**CLO 5**	**9**
Total Hours		**45**

Learning resources:

Textbooks:

1. Applied Data Science with Python and Jupyter Paperback – 31 October 2018, by Alex Galea
2. Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython by Wes McKinney,Oreilly Publications.

Reference books:

1. Applied Data Science: Lessons Learned for the Data-Driven Business Hardcover 25 June 2019,by Martin Braschler, Thilo Stadelmann, Kurt Stockinger,
2. Python Data Science Handbook by Jake VanderPlas, Oreilly Publications

Online Resources:

1. https://github.com/yonycherkos/Applied-Data-Science-with-Python-Specialization/tree/main
2. https://www.udemy.com/course/applied-data-science-with-python-specialization
3. https://www.coursera.org/specializations/data-science-pytho

Name of the Program:		**AIML**			**Semester : V**	**Level: UG**	
Course Name		**Applied Data science with python Laboratory**			**Course Code/ Course Type**	**UBTML304B/Major**	
Course Pattern		**2024**			**Version**	1.0	
					Assessment Scheme		
Theory	**Practical**	**Tutorial**	**Total Credit**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical/ Oral**
-	1	-	1	2	25	-	25
Pre-Requisite: Basic knowledge of python Programming							
Course Objectives (CO):		The objectives of Applied Data Science with Python lab are: 1. To gain the knowledge of panda library. 2. To Learn data representation 3. To select appropriate machine learning model for data interpretation 4. To learn data mining process using natural language processing. 5. To learn social network models					
Course Learning Outcomes (CLO)		Students would be able to: 1. Analyze the data using the data knowledge of panda library. 2. Demonstrate the data using data representation tools 3. Evaluate the appropriate machine learning model 4. Explore data mining process using natural language processing. 5. Recognize social network models and their applications.					

Assignment/Practical/Activity Number	Assignment/ Practical/Activity Title	Week Number/ Turn	Details	CLO	Hours
1.	Practical 1:	Week 1/ Turn 1	Data Processing with Pandas	CLO1	6
2.	Practical 1:	Week 2 /Turn 1	Data Processing with Pandas	CLO1	6
3.	Practical 1:	Week 3 /Turn 1	Data Processing with Pandas	CLO1	6
4.	Practical 2:	Week 4/ Turn 1	Applied Plotting, Charting & Data Representation in Python	CLO1	6
5.	Practical 2:	Week 5 /Turn 1	Applied Plotting, Charting & Data Representation in Python	CLO1	6
6.	Practical 2:	Week 6 /Turn 1	Applied Plotting, Charting & Data Representation in Python	CLO1	6
7.	Practical 3:	Week 7/ Turn 1	Estimation and prediction in linear model-based supervised learning algorithms, Unsupervised models.	CLO5	6
8.	Practical 3:	Week8 /Turn 1	Estimation and prediction in linear model-based supervised learning algorithms, Unsupervised models.	CLO5	6
9.	Practical 3:	Week 9 /Turn 1	Estimation and prediction in linear model-based supervised learning algorithms, Unsupervised models.	CLO5	6
10.	Practical 4:	Week 10/ Turn 1	Implement Classification approaches, including Naive Bayes and Support Vector Machine algorithms.	CLO2	6
11.	Practical 4:	Week 11 /Turn 1	Implement Classification approaches, including Naive Bayes and Support Vector Machine algorithms.	CLO2	6
12.	Practical 4:	Week 12 /Turn 1	Implement Classification approaches, including Naive Bayes and Support Vector Machine algorithms.	CLO2	6
13.	Practical 5:	Week 13/ Turn 1	Implement Social network models using Networkx.	CLO4	6
14.	Practical 5:	Week 14 /Turn 1	Implement Social network models using Networkx.	CLO4	6
15.	Practical 5:	Week 15 /Turn 1	Implement Social network models using Networkx.	CLO4	6

Learning resources

Textbooks:

1. Applied Data Science with Python and Jupyter Paperback – 31 October 2018, by Alex Galea
2. Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython by Wes McKinney,Oreilly Publications.

Reference books:

1. Applied Data Science: Lessons Learned for the Data-Driven Business Hardcover 25 June 2019,by Martin Braschler, Thilo Stadelmann, Kurt Stockinger,
2. Python Data Science Handbook by Jake VanderPlas, Oreilly Publications

Online Resources:

1. https://github.com/yonycherkos/Applied-Data-Science-with-Python-Specialization/tree/main
2. https://www.udemy.com/course/applied-data-science-with-python-specialization
3. https://www.coursera.org/specializations/data-science-python

Name of the Program:		Foreign Language		Semester: 5		Level: UG/PG	
Course Name		German A2.1		Course Code/ Course Type		UFL301A/AEC	
Course Pattern		2024		Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
2	-	-	-	2	20	30	-

Pre-Requisite: Able to have a basic conversation in German.

Course Objectives (CO):	The objectives of GermanA2.1 are: 1. To get familiar with food culture in Germany. 2. To understand professional and educational concepts. 3. To apply advance grammar topics. 4. To Analyse advance text. 5. To Design and create texts in German
Course Learning Outcomes (CLO):	Students would be able to: 1. Comprehend food related texts. 2. Enhance writing skills in German language. **3.** Enhance professional speaking skills of German language**.** 4. Construct a dialogue, in the German language, for basic human interactions in a social context. 5. Take part in an interaction relating to formal conversation

Descriptors/Topics	CLO	Hours
UNIT I		
Rund ums Essen Kitchen and cooking, Food habits, Emotions and assumptions Grammar – Possessive articles, reflexive verbs	**CLO 1**	**6**
UNIT II		
Nach der Schulzeit Daily activities and experiences during school time, school subjects, school types Grammar – Changing prepositions	**CLO 2**	**6**
UNIT III		
Medien in Alltag Media, activities in media, film Grammar – Degree of comparison	**CLO3**	**6**
UNIT IV		
Groβe und kleine Gefühle /Festivals and celebrations, invitation cards, thanksgiving cards, Grammar – Adjective ending	**CLO4**	**6**
UNIT V		
Was machen Sie beruflich? & Ganz schon mobil	**CLO5**	**6**

Daily activities in the working world, different professions, public transport and travelling towards working place Grammar – Clauses, Modalverbs in past tense		
Total Hours		**30**

Learning resources:

Textbooks:

1. Netzwerk A1, Ernst klett Verlag & Goyal Publishers & Distributors Pvt. Ltd.
2. Studio d A1, Cornelesen Verlag & Goyal Publishers & Distributors Pvt. Ltd.
3. Netzwerk Neu A1, Ernst klett Verlag & Goyal Publishers & Distributors Pvt. Ltd

Reference Books:

1. Hallo Deutsch A1,Ernst Klett Verlag, Goyal Publishers & Distributors Pvt. Ltd
2. Themen Aktuell 1, Hueber verlag
3. Maximal Ernst klett Verlag & Goyal Publishers & Distributors Pvt. Ltd.

Online Resources/E-Learning Resources:

1. https://youtube.com/@LearnGermanwithAnja?si=BkJYDPi7TS0fT4lr
2. https://youtube.com/@deutschlernenmitheidi?si=TkICIabzioaU0roZ
3. instagram.com/learngermanwithanja

SEMESTER-VI

Name of the Program:		CSE			Semester : VI	Level: UG	
Course Name		Machine Learning			Course Code/ Course Type	UBTML305/Major	
Course Pattern		2024			Version	1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/ Oral
3	-	-	3	3	40	60	-

Pre-Requisite:

1. Applied Statistical Techniques
2. Introduction to Artificial Intelligence

Course Objectives (CO):	The objectives of Machine Learning are: 1. To explore the knowledge of Machine learning and its types. 2. To analyze various data pre-processing methods. 3. To learn Supervise learning methods. 4. To analyze the need of unsupervised learning methods. 5. To learn fundamental neural network algorithms.
Course Learning Outcomes (CLO):	Students would be able to: 1. Identify the needs and challenges of machine learning for real time applications. 2. Apply various data pre-processing techniques to simplify and speed up machine learning algorithms. 3. Apply appropriately supervised machine learning algorithms for real time applications. 4. Compare and contrast different clustering algorithms. 5. Design a neural network for solving engineering problems.

Descriptors/Topics	CLO	Hours
UNIT I		
Introduction To Machine Learning: Introduction to Machine Learning, Comparison of Machine learning with traditional programming, ML vs AI vs Data Science. Types of learning: Supervised, Unsupervised, and semi-supervised, reinforcement learning techniques, Models of Machine learning: Geometric model, Probabilistic Models, Logical Models, Grouping and grading models, Parametric and non-parametric models. Important Elements of Machine Learning- Data formats, Learnability, Statistical learning approaches.	**CLO 1**	**9**
UNIT II		
Feature Engineering: Concept of Feature, preprocessing of data: Normalization and Scaling, Standardization, Managing missing values, Introduction to Dimensionality Reduction, Principal Component Analysis (PCA), Feature Extraction: Kernel PCA, Local Binary Pattern. Introduction to various Feature Selection Techniques, Sequential Forward Selection, Sequential Backward Selection.	**CLO 2**	**9**

Statistical feature engineering: count-based, Length, Mean, Median, Mode etc. based feature vector creation. Multidimensional Scaling, Matrix Factorization Techniques.		
UNIT III		
Supervised Learning : Bias, Variance, Generalization, Underfitting, Overfitting, Linear regression, Regression: Lasso regression, Ridge regression, Gradient descent algorithm. Evaluation Metrics: MAE, RMSE, R2 Classification: K-nearest neighbour, Support vector machine. Ensemble Learning: Bagging, Boosting, Random Forest, Adaboost. Binary-vs-Multiclass Classification, Balanced and Imbalanced Multiclass Classification Problems, Variants of Multiclass Classification: One-vs-One and One-vs-All Evaluation Metrics and Score: Accuracy, Precision, Recall, Fscore, Cross-validation, MicroAverage Precision and Recall, Micro-Average F-score, Macro-Average Precision and Recall, Macro-Average F-score	**CLO 3**	**9**
UNIT IV		
Unsupervised Learning: K-Means, K-medoids, Hierarchical, and Density-based Clustering, Spectral Clustering. Outlier analysis: introduction of isolation factor, local outlier factor. Evaluation metrics and score: elbow method, extrinsic and intrinsic methods.	**CLO 4**	**9**
UNIT V		
Introduction To Neural Networks: Artificial Neural Networks: Single Layer Neural Network, Multilayer Perceptron, Back Propagation Learning, Functional Link Artificial Neural Network, and Radial Basis Function Network, Activation functions, Introduction to Recurrent Neural Networks and Convolutional Neural Networks.	**CLO 5**	**9**
Total Hours		**45**

Learning resources:

Textbooks:

1. "Introduction to Machine Learning" by Ethem Alpaydin, PHI , 2nd Edition-2013.
2. "Pattern recognition and machine learning" by Bishop, Christopher M., and Nasser M. Nasrabadi, Vol. 4.No. 4. New York: springer, 2006.

Reference Books:

1. "Machine learning", by Tom Mitchell, McGraw-Hill series in Computer Science, 1997 2. Shalev-Shwartz, Shai, and Shai Ben-David,
2. "Understanding machine learning: From theory to algorithms", by Shai Shalev-Shwartz and Shai Ben-David, Cambridge university press, 2017
3. "The Elements of Statistical Learning" Trevor Hastie, Robert Tibshirani and Jerome Friedman. Second Edition. 2009. [TH-2009]
4. "Mathematics for Machine Learning" by Marc Peter Deisenroth, A. Aldo Faisal, Cheng Soon Ong, Cambridge University Press (23 April 2020)
5. "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow", by Aurélien Géron O'Reilly Media, Inc. 2nd Edition

Online Resources:

1. https://developers.google.com/machine-learning/foundational-courses
2. Introduction to Machine Learning (IIT Madras): https://onlinecourses.nptel.ac.in/noc22_cs29/prevew

Name of the Program:		CSE			Semester: VI	Level: UG	
Course Name		Machine Learning Laboratory			Course Code/ Course Type	UBTML306/Major	
Course Pattern		2024			Version	1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/ Oral
NA	1	-	1	2	25	-	25

Pre-Requisite:

1. Basic knowledge of python Programming

Course Objectives (CO):	The objectives of Machine Learning are: 1. To explore the knowledge of Supervised Machine learning Algorithms. 2. To analyze different Classifier Models. 3. To learn unsupervised learning Models. 4. To analyze different clustering models.. 5. To explore different neural network architectures.
Course Learning Outcomes (CLO):	Students would be able to: 1. To implement Supervised Machine learning Algorithms. 2. To design different Classifier Models. 3. To apply unsupervised learning Models for real life problems. 4. To apply and evaluate different clustering models. 5. To create different neural network architecture models.

Assignment/Practical/Activity Number	Assignment/Practical /Activity Title	Week Number/ Turn	Details	CLO	Hours
1	Practical 1: Implement Regression models	Week 1/ Turn 1 Week 2 /Turn 1	Predict the price of the Uber ride from a given pickup point to the agreed drop-off location. Perform following tasks: 1. Pre-process the dataset. 2. Identify outliers. 3. Check the correlation. 4. Implement linear regression and random forest regression models. 5. Evaluate the models and compare their respective scores like R2, RMSE, etc. Dataset link: https://www.kaggle.com/datasets/yasserh/uber-fares-dataset	CLO1	4
2	Practical 2: Implement binary classification model	Week 3 /Turn 1 Week 4 /Turn 1	Classify the email using the binary classification method. Email Spam detection has two states: a) Normal State – Not Spam, b) Abnormal State – Spam. Use K-Nearest Neighbors and Support Vector Machine for classification. Analyze their performance.	CLO1	4

			Dataset link: The emails.csv dataset on the Kaggle https://www.kaggle.com/datasets/balaka18/email-spam-classification-dataset-csv		
3	Practical 3: Implement Neural Network based classifier	Week 5 /Turn 1 Week 6 /Turn 1	Given a bank customer, build a neural network-based classifier that can determine whether they will leave or not in the next 6 months. Dataset Description: The case study is from an open-source dataset from Kaggle. The dataset contains 10,000 sample points with 14 distinct features such as CustomerId, CreditScore, Geography, Gender, Age, Tenure, Balance, etc. Link to the Kaggle project: https://www.kaggle.com/barelydedicated/bank-customer-churn-modeling Perform following steps: 1. Read the dataset. 2. Distinguish the feature and target set and divide the data set into training and test sets. 3. Normalize the train and test data. 4. Initialize and build the model. Identify the points of improvement and implement the same. 5. Print the accuracy score and confusion matrix (5 points).	CLO5	4
4	Practical 4: Implement GD	Week 7 /Turn 1	Implement Gradient Descent Algorithm to find the local minima of a function. For example, find the local minima of the function $y=(x+3)^2$ starting from the point x=2	CLO2	2
5	Practical5: Implement KNN	Week 8 /Turn 1 Week 9 /Turn 1	Implement K-Nearest Neighbors algorithm on diabetes.csv dataset. Compute confusion matrix, accuracy, error rate, precision and recall on the given dataset. Dataset link : https://www.kaggle.com/datasets/abdallamahgoub/diabetes	CLO4	4
6	Practical 6: Implement clustering model	Week 10 /Turn 1 Week 11 /Turn 1	Implement K-Means clustering/ hierarchical clustering on sales_data_sample.csv dataset. Determine the number of clusters using the elbow method. Dataset link : https://www.kaggle.com/datasets/kyanyoga/sample-sales-data	CLO4	4
7	Practical 7: Implement prediction model	Week 12 /Turn 1 Week 13 /Turn 1	Use the following dataset to analyze ups and downs in the market and predict future stock price returns based on Indian Market data from 2000 to 2020. Dataset Link: https://www.kaggle.com/datasets/sagara9595/stock-data	CLO5	4
8	Practical 8: Prediction model using neural network	Week 14 /Turn 1 Week 15 /Turn 1	Build a machine learning model that predicts the type of people who survived the Titanic shipwreck using passenger data (i.e. name, age, gender, socio-economic class, etc.). Dataset Link: https://www.kaggle.com/competitions/titanic/data	CLO5	4

Learning resources:

Textbooks:

1. "Introduction to Machine Learning" by Ethem Alpaydin, PHI , 2nd Edition-2013.
2. "Pattern recognition and machine learning" by Bishop, Christopher M., and Nasser M. Nasrabadi, Vol. 4.No. 4. New York: springer, 2006.

Reference Books:

1. "Machine learning", by Tom Mitchell, McGraw-Hill series in Computer Science, 1997 2. Shalev-Shwartz, Shai, and Shai Ben-David,
2. "Understanding machine learning: From theory to algorithms", by Shai Shalev-Shwartz and Shai Ben-David, Cambridge university press, 2017
3. "The Elements of Statistical Learning" Trevor Hastie, Robert Tibshirani and Jerome Friedman. Second Edition. 2009. [TH-2009]
4. "Mathematics for Machine Learning" by Marc Peter Deisenroth, A. Aldo Faisal, Cheng Soon Ong, Cambridge University Press (23 April 2020)
5. "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow", by Aurélien Géron O'Reilly Media, Inc. 2nd Edition

Online Resources:

1. https://developers.google.com/machine-learning/foundational-courses
2. Introduction to Machine Learning (IIT Madras): https://onlinecourses.nptel.ac.in/noc22_cs29/prevew

Name of the Program:		**AIML**		**Semester: VI**		**Level: UG**	
Course Name		Software Engineering Project Management		Course Code/ Course Type		UBTCE312	
Course Pattern		**2024**		**Version**		1.0	
Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical/Oral**
2	-	-	2	30	40	60	-

Pre-Requisite: Proficiency in a programming language, such as Python or Java

Course Objectives (CO):	The objectives of Software Engineering Project Management are: 1. Understand Software Engineering & project management Fundamentals: 2. Apply Project Life Cycle Phases 3. To conceptualize the Software Development Life Cycle (SDLC) models. 4. Master Project Execution and Team Leadership: 5. Implement Risk Management Strategies:
Course Learning Outcomes (CLO):	1. Demonstrate a Fundamental Understanding 2. Develop Comprehensive Project Plans 3. Effectively Lead Project Teams 4. Apply Risk Management Strategies 5. Identify the Inputs, Tools and techniques to get the required

Descriptors/Topics	**CLO**	**Hours**
UNIT		
Definition and Importance Software Engineering & Project Management,The Software Product and Software Process Software Product and Process Characteristics, Three "R"-Reuse, Reengineering and Retooling, Software Process Models: Linear Sequential Model, Prototyping Model, RAD Model, Evolutionary Process Models like Incremental Model, Spiral Model, Component Assembly Model, RUP and Agile processes. Software Process customization and improvement, CMM, Product and Process Metrics).	**CLO 1**	**06**
UNIT II		
Requirement Elicitation, Analysis, and Specification Functional and Non-functional requirements, Requirement Sources and Elicitation Techniques, Analysis Modeling for Function-oriented and Object-oriented software development. System and Software Requirement Specifications, Requirement Validation, Traceability, Facilitated Application Specification Technique (FAST), Design Concepts and Principles Use case Modeling, Architectural Design, Architectural Views and Styles, User Interface Design, Function-oriented Design, SA/SD Component Based Design, Design Metrics. **SRS Case Studies**: Software Estimation: Size Estimation: Function Point (Numerical). Cost Estimation: COCOMO(Numerical), COCOMO-II (Numerical). Earned Value Management.	**CLO 2**	**06**
UNIT III		

Testing Strategies: A strategic approach to software testing, test strategies for c conventional software, black-box and white-box testing, validation testing, system testing, the art of debugging. **Product metrics:** Software quality, metrics for analysis model, metrics for design model, metrics for source code, metrics for testing, metrics for maintenance.	**CLO 3** **CLO 4**	**06**
UNIT IV		
Software Maintenance & Software Project Measurement Need and Types of Maintenance, Software Configuration Management (SCM), Software Change Management, Version Control, Change control and Reporting, Program Comprehension Techniques, Re-engineering, Reverse Engineering, Tool Support. Project Management Concepts, Feasibility Analysis, Project and Process Planning, Resources Allocations, Software efforts, Schedule, and Cost estimations, Project Scheduling and Tracking, Risk Assessment and Mitigation, Software Quality Assurance (SQA). Project Plan, Project Metrics. **Case Studies**: 1. Project Risk Management in Action 2. Quality Control and Process Improvement: Quality Control, Process improvement and activities Risk assessment simulation, Quality control exercises, Individual assignment on risk management, Group project on quality control.	**CLO 5** **CLO 6**	**06**
UNIT V		
Monitoring and Controlling Project Performance: Performance Measurement, Key Performance Indicators (KPIs), Status Reporting, Risk Monitoring, Change Control. Change Control and Configuration Management: Change Control, Configuration Management, Integration of Change Control and Configuration Management, Tools and Technologies.Project Closure and Evaluation: Project Evaluation, Performance Metrics, Stakeholder Feedback, Documentation Review, Benchmarking, Root Cause Analysis. Feedback to Team and Stakeholders, Closure of Evaluation Phase. **Case Studies on :** 1. Real-time project monitoring exercise 2. Group project on project closure 3. Final examination covering all topics Presentation on a case study of a project closure	**CLO 9** **CLO 10**	**06**
Total Hours		**: 30**

Learning resources:

Text Books:

1. "Project Management: A Managerial Approach" by Jack R. Meredith and Samuel J. Mantel Jr.
2. "Project Management: The Managerial Process" by Erik W. Larson and Clifford F. Gray.
3. "Effective Project Management: Traditional, Agile, Extreme" by Robert K. Wysocki.

Reference Books:

1. "Project Management: A Systems Approach to Planning, Scheduling, and Controlling" " by Harold Kerzner.
2. " Effective Project Management: Traditional, Agile, Extreme " by Robert K. Wysocki.
3. "The Art of Project Management "by Scott Berkun
4. Software Engineering, 5th and 7th edition, by Roger S Pressman, McGraw Hillpublication.
5. Managing Information Technology Project, 6edition, by Kathy Schwalbe, Cengage Learning publication.
6. Information Technology Project Management by Jack T Marchewka Wiley India publication.
7. Software Engineering 3rd edition by KK Agrawal, Yogesh Singh, New Age International publication.

Online Resources/E-Learning Resources:

1. https://www.coursera.org/courses?query=software%20project%20management
2. https://archive.nptel.ac.in/courses/106/105/106105218/3.
3. https://www.geeksforgeeks.org/software-engineering-software-project-management-spm/

Name of the Program:	B. Tech	Semester : VI	Level: UG
Course Name	DESIGN AND ANALYSIS OF ALGORITHMS	Course Code/Course Type	UBTCE213/ PCC
Course Pattern	2024	Version	1.0

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
3	-	-	3	3	40	60	-

Pre-Requisite: Knowledge of C Programming and DSA

Course Objectives (CO):	The objectives of (Name of course) are: 1. Describe and express performance analysis of various algorithms, Fundamentals of Data Structures and their applications. 2. Explain and demonstrate Divide and Conquer technique to provide solutions for well-known problems like searching, Sorting etc. 3. Discuss Greedy method and solve problems which are based on Greedy method such as Knapsack problem, Single-source Shortest Path, etc. 4. Use Dynamic Programming to solve problems like All Pairs Shortest paths, Travelling Salesperson (TSP), etc. and also compare with Greedy method. 5. Choose Backtracking Algorithms for solving N-Queens, Sum of subsets Problems and compare /Contrast with Branch and Bound Technique.
Course Learning Outcomes (CLO):	Students would be able to: 1. To compare worst-case running time of algorithms and describe the fundamental of algorithmic problems. 2. To describe and apply problem solving techniques such as divide-and- conquer, greedy method, dynamic programming, etc. 3. To compare and contrast among various problem-solving techniques. 4. To elaborate and demonstrate NP- completeness. 5. Te correctness of algorithms using inductive proofs and invariants.

Descriptors/Topics	CLO	Hours
UNIT I		
Foundations of Algorithm Analysis Algorithm, algorithm design strategies, time and space complexity, asymptotic notation, complexity analysis; Introduction to divide and conquer technique: merge sort, quick sort, binary search and its performance analysis, Strassen's matrix multiplication	CLO 1	9
UNIT II		
Divide and Conquer Algorithms	CLO 2	9

Concept and applications of divide and conquer approach in algorithm design, Concept and detail description of Binary Search algorithms and its analysis, Finding Minimum and maximum element in a list of items (Min-Max algorithm) and their analysis., Concepts of Order statistics, Median order. Brute force approach for selection, Selection in Worst Case Linear Time algorithm and its complexity analysis.		
UNIT III		
Greedy Algorithms Concept of Optimization Problems and Optimal solution. Introduction of Greedy Strategy for algorithm design. Elements of Greedy, Concept of Knapsak problem, Algorithm for Fractional Knapsack Problem examples and analysis of its complexity, Kruskal's and Prim's algorithms for Minimum Spanning Tree, their examples and complexity analysis. Correctness. Dijkstra Shortest Path Algorithms, example and its time complexity Purpose of Huffman Coding, Prefix Codes, Huffman Tree, Huffman Coding Algorithm, example and its Analysis.	**CLO 3**	**9**
UNIT IV		
Dynamic Programming Concepts of Dynamic Programming approach for algorithm design, Greedy Algorithm vs Dynamic Programming, Recursion vs Dynamic Programming. Elements of Dynamic Programming Approach Concept of Matrix Chain Multiplication, its Algorithm, examples and complexity analysis,0-1 Knapsack problem and its complexity analysis, Floyd Warshall Algorithms for all pair shortest path problem, example and its complexity analysis.Travelling Salesman Problem and its analysis.	**CLO 4**	**9**
UNITV		
Backtracking and NP Completeness Backtracking concept and its examples like 8 queen's problem, Hamiltonian cycle, Graph coloring problem etc. Introduction to branch & bound method, examples of branch and bound method like traveling salesman problem etc. Meaning of lower bound theory and its use in solving algebraic problem, introduction to parallel algorithms; String matching algorithms; Introduction to NP-completeness.	**CLO 5**	**9**
Total Hours		**45**

Learning resources:

Text Books:

1. Introduction to Algorithms, Coremen Thomas, Leiserson CE, Rivest RL, PHI.
2. Analysis & Design of Algorithm. Horowitz & Sahani, Computer Science Press, Latest Edition.

Reference Books:

1. The Design and Analysis of Algorithm, Ullmann, Addison-Wesley, Latest Edition.
2. Algorithm Design, Michael T Goodrich, Robarto Tamassia, Wiley India.

Online Courses:

1. http://www.bu.edu/met/metropolitan_college_people/student/resources/conduct/code.html.
2. https://onlinecourses.nptel.ac.in/noc19_cs47/preview

Name of the Program:	B.Tech	Semester : VI	Level: UG
Course Name	DESIGN AND ANALYSIS OF ALGORITHMS LAB	Course Code/Course Type	UBTCE214/ PCC
Course Pattern	2024	Version	1.0

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
-	1		1	2	-	-	25

Pre-Requisite: Knowledge of C Programming **and** DSA

Course Objectives (CO):	The objectives of (Name of course) are: 1. Describe and express performance analysis of various algorithms, Fundamentals of Data Structures and their applications. 2. Explain and demonstrate Divide and Conquer technique to provide solutions for well-known problems like searching, Sorting etc. 3. Discuss Greedy method and solve problems which are based on Greedy method such as Knapsack problem, Single-source Shortest Path, etc. 4. Use Dynamic Programming to solve problems like All Pairs Shortest paths, Travelling Salesperson (TSP), etc. and also compare with Greedy method. 5. Choose Backtracking Algorithms for solving N-Queens, Sum of subsets Problems and compare /Contrast with Branch and Bound Technique.
Course Learning Outcomes (CLO):	Students would be able to: 1. To compare worst-case running time of algorithms and describe the fundamental of algorithmic problems. 2. To describe and apply problem solving techniques such as divide-and- conquer, greedy method, dynamic programming, etc. 3. To compare and contrast among various problem-solving techniques. 4. To demonstrate NP- completeness. 5. Te correctness of algorithms using inductive proofs and invariants.

Assignment/Practical/Activity Number	Assignment/Practical/Activity Title	Week Number/Turn	Details	CLO	Hours
1	Practical 1: Basic iterative algorithms GCD algorithm, Fibonacci Sequences, Sequential and Binary Search.	Week 1		CLO1	2
2	Practical 2: Basic iterative sorting algorithms: Bubble Sort, selection Sort, Insertion Sort.	Week 2		CLO1	2
3	Practical3: Binary Search with Divide and conquer approach.	Week 3		CLO2	2
4	Practical 4: Merge Sort, Heap sort, Quick Sort, Randomized Quick Sort.	Week 4		CLO 2	2
5	Revision	Week 5			2
6	Practical5: Selection Problem with divide and Conquer approach	Week 6		CLO3	2
7	Practical6: Fractional Knapsack Problem, Job sequencing with deadline, Kruskal's algorithm, Prims algorithm, Dijkstra's Algorithm	Week 7		CLO3	2
8	Practical 7: Implement the dynamic programming algorithms.	Week 8		CLO4	2
9	Practical 8: Algorithms using Backtracking approach	Week 9		CLO4	2
10	Practical 9: Implement approximation Algorithm.	Week 10		CLO5	2
11	Practical 10: Implement Backtracking and NP Completeness	Week 11		CLO5	2
12	Revision	Week 12			2
13	Mini Project /Task	Week 13/14/15		CLO1/2/3/4/5	6
Total Hours					**30**

Learning resources:

Text Books:

Introduction to Algorithms, Coremen Thomas, Leiserson CE, Rivest RL, PHI.

1. Analysis & Design of Algorithm. Horowitz & Sahani, Computer Science Press, Latest Edition.

Reference Books

1. The Design and Analysis of Algorithm, Ullmann, Addison-Wesley, Latest Edition.
2. Algorithm Design, Michael T Goodrich, Robarto Tamassia, Wiley India.

URLs (Optional) - List of Online Courses

1. http://www.bu.edu/met/metropolitan_college_people/student/resources/conduct/code.html.
2. https://nptel.ac.in/courses/106106131

UNIT II		
Unsupervised Classification: Clustering for unsupervised learning and classification Clustering concept-C-means algorithm-Hierarchical clustering procedures-Graph theoretic approach to pattern clustering- Validity of clustering solutions. Structural Pattern Recognition: Elements off or mal grammars-String generation as pattern Syntactic Description-Parsing-Stochastic grammars structural representation. Feature Extraction and Selection: Entropy minimization-Karhunen-Loeve trans formation-Feature selection through Functions Approximation-Binary feature selection.	**CLO 2**	**09**

Name of the Program:	**AIML**	**Semester: VI**	**Level: UG**
Course Pattern	**2024**	**Version**	**1.0**

UNIT III		
Neural Networks and Kernel Machines: Neural network structures for pattern recognition Neural network based pattern associators– Self organizing networks-Support vector machines (SVM)-Kernel machines, Maximum margin classification, and generalizability and VC (Vapnik-Chervonenkis) dimension. Neuro Fuzzy and Genetic Algorithm classification Fuzzy Logic-Fuzzy pattern classifiers Neuro-Fuzzy Systems-Pattern classification and optimization using Genetic Algorithms, Recent Trends in pattern recognitions.	**CLO 3** **CLO 4**	**09**

Teaching Scheme				**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical/Oral**
3	-	-	3	45	40	60	-

UNIT IV		
Introduction to Optimization: Historical Development, Engineering applications of Optimization, Design vector and constraints, Constraint surface, Objective function, Classification of Optimization Problems	**CLO 5** **CLO 6**	**09**

Pre Requisite:

1. knowledge of linear algebra.
2. Proficiency in probability and statistics.
3. Understanding of multivariate calculus.

UNIT V		
Classical Optimization Techniques Single variable optimization, Constrained and unconstrained multi-variable 06 optimization, Direct substitution method, Lagrange's method of multipliers, Karush-Kuhn-Tucker conditions. Linear Programming: Standard form of an LP problem, Graphical Solution of an LP problem, Simplex 05 method, Dual simplex method. Non-linear Programming, Evolutionary Algorithms An overview of evolutionary algorithms	**CLO 9** **CLO 10**	**09**

Total Hours		**45**

Course Objectives (CO):	The objectives of Pattern recognition and Optimization are: pattern recognition and Optimization. 1. To understand the concept of pattern recognition and the basic approach to the development of pattern recognition and machine intelligence algorithms. 2. To apply the knowledge of feature extraction methods, feature evaluation, and data mining on real life. 3. To apply both supervised and unsupervised classification methods to detect and characterize patterns in real-world data. 4. Develop prototype pattern recognition algorithms that can be used to study algorithm 5. To understand and learn Pattern Recognition and Optimization techniques
Course Learning Outcomes (CLO):	1. Understand the need and significance of mathematical **fundamentals** in pattern recognition to solve real- time problems. 2. Explore on supervised learning algorithms and to apply them for solving problems 3. Design pattern recognition models to extract interesting patterns from structured data like graph, syntactic **description** etc. 4. Understand the impact of dimensionality reduction on the design of intelligent models and to apply the dimensionality reduction techniques on data. 5. Apply various machine learning techniques like artificial neural networks, Support Vector machines, Fuzzy inference engines etc.to solve real-world problems.

Learning resources:

Text Books:

1. Duda R.O., and Hart.P.E.,Pattern Classification and Scene Analysis, second edition, Wiley, 2001.
2. Robert J.Schalkoff, Pattern Recognition: Statistical, Structural and Neural Approaches, JohnWiley& Sons Inc., New York, 2007.
3. Trevor H, Robert T,Jerome Friedman, The Elements of Statistical Learning, Springer Series,2017.
4. 4 J. K. Sharma, "Operations Research", Macmillan, 5th Edition, 2012.

5. R. Pannerselvan, "Operations Research", 2nd Edition, PHI Publications, 2006.
6. A. M. Natarajan, P. Balasubramani, A. Tamilarasi, "Operations Research", Pearson Education, 2013

Name of the Program:	**AIML**			**Semester: VI**		**Level: UG**	
Course Name	Pattern recognition and Optimization Lab			Course Code/ Course Type		**UBTML308 A**	
Course Pattern	**2024**			**Version**		1.0	
Teaching Scheme					**Assessment Scheme**		
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical/Oral**
-	1	-	1	15	25	-	25

Pre-Requisite:
1. Programming Languages.
2. Mat lab/ Scilab

Course Objectives (CO):	The objectives **of** Pattern recognition and Optimization are: pattern recognition and 1. To familiarize students with MATLAB/Scilab/Python Programming basic concepts. 2. To learn and understand Pattern Recognition and Optimization techniques. 3. To explore Open-Source Software. 4. To understand and learn Computational facility. 5. To understand and learn Pattern Recognition and Optimization techniques
Course Learning Outcomes (CLO):	1. Develop Pattern recognition techniques algorithm. 2. Demonstrate the use Pattern recognition and optimization techniques. 3. Develop optimization techniques. 4. Develop Pattern recognition techniques algorithm using Python/MATLAB. 5. Deploy Pattern recognition techniques using Mat lab/ Scilab.

Reference Books:

1. Tou and Gonzales, Pattern Recognition Principles, Wesley Publication Company, London, 1974.
2. Morton Nadier and Eric Smith P., Pattern Recognition Engineering, John Wiley & Sons, NewYork, 1993.
3. Christopher M Bishop, Pattern Recognition and Machine Learning. Springer. 2011.
4. Engineering Optimization Theory and Practice, S.S.Rao, New Age International (P) Ltd, Publishers
5. .Kalyanmoy Deb Multi-objective optimization using evolutionary algorithms John Wiley Publications 3. Jasbir S. Arora Introduction to Optimum Design McGraw Hill Publication.

Online Resources:

1. https://www.researchgate.net/publication/216814160_Interactive_ELearning_System_Using_Pattern_Recognition_and_Augmented_Reality
2. https://nptel.ac.in/courses/117105101
3. https://www.youtube.com/watch?v=BROB96fXtPI

assignment/Practical/Activity Number	Assignment/Practical/ Activity Title	Week Number/ Turn	Details	CLO	Hours
1	Practical 1: Working with MATLAB	Week 1/ Turn 1	Implementation of Linear Regression using Gradient Descent	CLO1	2
2	Practical 2: Working with MATLAB	Week 2 /Turn 2	Implementation of Unrestricted Search methods	CLO1	2
3	Practical 3: Working with MATLAB	Week 3/ Turn 3	Implementation of Golden Section Method Optimization	CLO1	2
4	Practical 4: Working with MATLAB	Week 4 /Turn 4	Implementation of Fibonacci Method	CLO5	2
5	Practical 5: Working with MATLAB	Week 5 /Turn 5	Implementation of Bacteria Foraging	CLO5	2
6	Practical 6: Working with MATLAB	Week 6 /Turn 6	Particle Swarm Optimization	CLO2	2
7	Practical 7: Working with MATLAB	Week 7 /Turn 7	Univariate methods Ant colony optimization	CLO2	2
8	Practical 8: Working with MATLAB	Week 8 / Turn 8	Improving Fraud Detection in Financial Transactions through	CLO4	2
9	Practical 9: Working with MATLAB	Week 9 / Turn 9	Pattern Recognition and Optimization	CLO4	2
10	Practical 10: Working with MATLAB	Week 10 / Turn 10	Implement a basic SVM classifier using Python and NumPy without kernel functions.	CLO4	2
11	Practical 11: Working with MATLAB	Week 11 / Turn 11	Train the SVM classifier on a synthetic dataset with two classes.	CLO4	2
12	Practical 12: Working with MATLAB	Week 12/ Turn 12	Implement the DE/rand/1/bin strategy to solve a constrained optimization problem.	CLO4	2
13	Practical 13: Working with MATLAB	Week 13/ Turn 13	Introduces heuristic optimization techniques inspired by biological evolution, such as genetic algorithms, evolutionary strategies, or particle swarm optimization.	CLO5	2
14	Practical 14: Working with MATLAB	Week 14/ Turn 14	Graphical Solution of an LP Problem: Visualizing the feasible region and finding the optimal solution using graphical methods for two-variable problems.	CLO5	2
15	Practical 15: Working with MATLAB	Week 15/ Turn 15	Implementation of Gradient Descent	CLO5	2

Learning resources:

Text Books:

1. Duda R.O., and Hart.P.E.,Pattern Classification and Scene Analysis, second edition, Wiley, 2001.

2. Robert J.Schalkoff, Pattern Recognition: Statistical, Structural and Neural Approaches, JohnWiley& Sons Inc., New York, 2007.

3. Trevor H, Robert T,Jerome Friedman, The Elements of Statistical Learning, Springer Series,2017.

4 J. K. Sharma, "Operations Research", Macmillan, 5th Edition, 2012.

5. R. Pannerselvan, "Operations Research", 2nd Edition, PHI Publications, 2006.

6. A. M. Natarajan, P. Balasubramani, A. Tamilarasi, "Operations Research", Pearson Education, 2013

Reference Books:

1. Tou and Gonzales, Pattern Recognition Principles, Wesley Publication Company, London, 1974.
2. Morton Nadier and Eric Smith P., Pattern Recognition Engineering, John Wiley & Sons, NewYork, 1993.
3. Christopher M Bishop, Pattern Recognition and Machine Learning. Springer. 2011.
4. Engineering Optimization Theory and Practice, S.S.Rao, New Age International (P) Ltd, Publishers
5. .Kalyanmoy Deb Multi-objective optimization using evolutionary algorithms John Wiley Publications 3. Jasbir S. Arora Introduction to Optimum Design McGraw Hill Publication

Name of the Program:	AIML				Semester: VI		Level: UG
Course Name	Image Processing				Course Code/ Course Type		UBTML309B/PEC
Course Pattern	2024				Version		1.0
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/ Oral
3	-	-	3	3	40	60	-

Pre-Requisite:

1. Digital Signal Processing

Course Objectives (CO):	The objectives of Image Processing are: 1. To become familiar with digital image fundamentals 2. To get exposed to simple image enhancement techniques in Spatial and Frequency domain. 3. To learn concepts of degradation function and restoration techniques. 4. To study the image segmentation and representation techniques. 5. To become familiar with image compression and recognition methods
Course Learning Outcomes (CLO):	Students would be able to: 1. Learn the basics and fundamentals of digital image processing, such as Digitization, sampling, quantization, and 2D-transforms. 2. Operate on images using the techniques of smoothing, sharpening and enhancement in spatial Domain. 3. Learn the basics of compression digital image and their different types. 4. Analyze the restoration concepts and filtering techniques. 5. Explore the basics of segmentation & features extraction techniques.

Descriptors/Topics	CLO	Hours
UNIT I		
Introduction to Digital Image Processing: - Introduction Fundamental Steps in Digital Image Processing, Components of an Image Processing System, Sampling and Quantization, Representing Digital Images (Data structure), Some Basic Relations, Human visual system, Sampling & quantization, Representing digital images, Spatial & graylevel resolution, Image file formats, Basic relationships between pixels, Distance Measures. Basic operations on images-image addition, subtraction, logical operations, scaling, translation, rotation. Image Histogram. Color fundamentals & models – RGB, HSI YIQ.	**CLO 1**	**9**
UNIT II		
Image Enhancement in Spatial Domain:- Some Basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic/Logic Operations. Spatial domain enhancement: Point operations- Log transformation, Power-law transformation, Piecewise linear transformations, Histogram equalization. Filtering operations- Image smoothing, Image sharpening. Frequency domain enhancement: 2D DFT, Smoothing and Sharpening in frequency domain. Homomorphic filtering. Restoration: Noise models, Restoration using	**CLO 2**	**9**

inverse filtering and Wiener filtering. Restoration: Noise models, Restoration using Inverse filtering and Wiener filtering		
UNIT III		
Image Compression: Types of redundancy, Fidelity criteria, Lossless compression – Runlength coding, Huffman coding, Bitplane coding, Arithmetic coding. Introduction to DCT, Wavelet transform. Lossy compression – DCT based compression, Wavelet based compression. Image and Video Compression Standards – JPEG, MPEG	**CLO 3**	**9**
UNIT IV		
Image Segmentation and Morphological Operations: Image Segmentation: Point Detections, Line detection, Edge Detection-First order derivative - Prewitt and Sobel. Second order derivative – LoG, DoG, Canny. Edge linking, Hough Transform, Thresholding - Global, Adaptive. Otsu's Method. Region Growing, Region Splitting and Merging. Morphological Operations: Dilation, Erosion, Opening, Closing, Hit-or-Miss transform, Boundary Detection, Thinning, Thickening, Skeleton.	**CLO 4**	**9**
UNIT V		
Image Restoration and Description: Image Restoration, degradation model, Properties, Noise models, Mean Filters , Order Statistics , Adaptive filters , Band reject Filters, Band pass Filters ,Notch Filters , Optimum Notch Filtering, Inverse Filtering, Wiener filtering. Representation, Chain codes, Polygonal approximation, Signatures. Boundary Descriptors, Shape numbers, Fourier Descriptors, Statistical moments. Regional Descriptors, Topological, Texture. Principal Components for Description.	**CLO 5**	**9**
Total Hours		**45**

Learning resources:

Textbooks:

1. Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing, Pearson, Third Edition, 2010.
2. Anil K. Jain, Fundamentals of Digital Image Processing, Pearson, 2002.

Reference Books:

1. Kenneth R. Castleman, Digital Image Processing, Pearson, 2006.
2. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, Digital Image Processing using MATLAB, Pearson Education, Inc., 2011.

Online Resources:

1. Digital Image Processing, IIT Kharagpur ,Prof. P.K. BiswasLink: https://nptel.ac.in/courses/117105079
2. NPTEL Video Course : NOC:Digital Image ProcessingLink: https://www.digimat.in/nptel/courses/video/117105135/L02.html

Name of the Program:	B.TECH CSE				Semester : VI	Level: UG	
Course Name	Image processing Laboratory				Course Code/ Course Type	UBTML310B/PEC	
Course Pattern	2024				Version	1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tut	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/ Oral
-	1	-	1	2	25	-	25

Pre-Requisite: Digital signal Processing

Course Objectives (CO):	The objectives of Image Processing are: 1. To become familiar with digital image fundamental operations 2. To get exposed to simple image enhancement techniques in Spatial and Frequency domain. 3. To learn concepts of degradation function and restoration techniques. 4. To study the image segmentation and representation techniques. 5. To become familiar with image compression and recognition methods
Course Learning Outcomes (CLO):	Students would be able to: 1. Learn the basics and fundamentals of digital image processing operations, such as Digitization, sampling, quantization, and 2D-transforms. 2. Operate on images using the techniques of smoothing, sharpening and enhancement in spatial Domain. 3. Learn the basics of compression digital image and their different types. 4. Analyze the restoration concepts and filtering techniques. 5. Explore the basics of segmentation & features extraction techniques.

Assignment/Practical/Activity Number	Assignment/Practical/Activity Title	Week Number/ Turn	Details	CLO	Hours
1	Practical 1: Image Creation	Week 1/ Turn 1 Week 2 /Turn 1	Conversion of 24 bit color image to 8 bit, 4 bit image.	CLO1	2
2	Practical 2: Implement morphological operations	Week 3 /Turn 1	Perform Morphological operations –Erosion, Dilation, Opening, Closing	CLO1	2
3	Practical 3: Implement different operations on images	Week 4 /Turn 1	Apply image negation and power-law correction operations on image.	CLO1	2
4	Practical 4: Use statistical parameters to compare images	Week 5 /Turn 1	Study of statistical properties- Mean, Standard deviation, Variance & histogram plotting.	CLO1	2
5	Practical 5: Image Enhancement	Week 6 /Turn 1	Enhance image using histogram	CLO2	2

			equalization and stretching.		
6	Practical 6: Use of Spatial Domain	Week 7 /Turn 1	To perform image filtering in spatial domain.	CLO2	2
7	Practical 7: Use of Frequency domain	Week 8 /Turn 1	To perform image filtering in frequency domain	CLO4	2
8	Practical 8: Image smoothing	Week 9 /Turn 1	Perform image smoothing and sharpening operations	CLO2	2
9	Practical 9: Image edge detection	Week 10 /Turn 1	Detect image edges using Sobel, Prewitt and Roberts"s operator.	CLO4	2
10	Practical 10: Image Compression	Week 11 /Turn 1	Compress image using DCT / Wavelet transform.	CLO3	2
11	Practical 11: Thresholding model	Week 12 /Turn 1	Apply Global and adaptive thresholding to an image.	CLO4	2
12	Practical 12: Image Classification	Week 13 Week 14 Week 15	To perform image classification / recognition	CLO5	2
Total hours					30

Learning resources:

Textbooks:

1. Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing, Pearson, Third Edition, 2010.
2. Anil K. Jain, Fundamentals of Digital Image Processing, Pearson, 2002.

Reference Books:

1. Kenneth R. Castleman, Digital Image Processing, Pearson, 2006.
2. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, Digital Image Processing using MATLAB, Pearson Education, Inc., 2011.

Online Resources/E-learning Resources:

1. Digital Image Processing, IIT Kharagpur ,Prof. P.K. BiswasLink: https://nptel.ac.in/courses/117105079
2. NPTEL Video Course : NOC:Digital Image ProcessingLink: https://www.digimat.in/nptel/courses/video/117105135/L02.html
3. https://cse19-iiith.vlabs.ac.in/Introduction.html

Name of the Program:	B. Tech CSE	Semester: VI	Level: UG
Course Name	Data Visualization Techniques	Course Code/ Course Type	UBTDS 309 / **Program Elective**
Course Pattern	**2024**	Version	1.0

Teaching Scheme				Assessment Scheme			
Theory	**Practical**	**Tutorial**	**Total Credits**	**Hours**	**CIA (Continuous Internal Assessment)**	**ESA (End Semester Assessment)**	**Practical/Oral**
3	0	0	3	3	40	60	-

Pre-Requisite: Computer Network

Course Objectives (CO):	The objectives of Data Visualization Techniques are: 1. To recall the concepts of data visualization to develop charts, maps, tables, and other visual representations of data. 2. To recognize visualization tools to conduct data analysis, especially exploration of an unfamiliar dataset. 3. To apply the concept of interactive dashboards to combine several visualizations into a cohesive and functional whole. 4. To analyze and design features animations techniques. 5. To evaluate various principles of visualization.
Course Learning Outcomes (CLO):	Students would be able to: 1. Students will be able to understand the basics of plotting techniques. 2. Explain the procedure various data visualization methods. 3. Apply knowledge of various animation types. 4. Analyze data the various principles of visualization. 5. Evaluate how to perform group operations.

Descriptors/Topics	CLO	Hours
UNIT I		
Basic Plotting: Line plot - Bar plot - Pie Chart - Scatter Plot - Histogram - Stacked Bar Charts - Sub Plots - Matplotlib, Searborn, Plotly - Seaborn Styles.	**CLO 1**	**9**
UNIT II		
Applied Visualizations: Box plot - Density Plot - Area Chart - Heat map - Tree map - Graph Networks	**CLO 2**	**9**
UNIT III		
Interactive Visualizations and Animations: Dynamic charts - Dynamic maps - Animation types - 2D, 3D, Motion Animation - Animation Principles - Altair Package - Statistical Visualizations.	**CLO 3**	**9**

UNIT IV		
Principles of Information Visualization: Visual Perception and Cognition - Gestalt's Principles - Tufte's Principles - Applications of Principles of Information Visualization - Dashboard Design.	**CLO 4**	**9**
UNIT V		
Data Aggregation and Group operations: Group by Mechanics, Data aggregation, General split-apply-combine, Pivot tables and cross tabulation.	**CLO 5**	**9**
Total Hours		**45**

Learning resources:

Textbooks:

1. McKinney, W.(2017). Python for Data Analysis: Data Wrangling with Pandas, NumPy and IPython. 2nd edition. O'Reilly Media.
2. O'Neil, C., & Schutt, R. (2013). Doing Data Science: Straight Talk from the Frontline O'Reilly Media.
3. Tamara Munzner, Visualization Analysis and Design, A K Peters Visualization Series, CRC Press, 2014.

Reference Books:

1. Scott Murray, Interactive Data Visualization for the Web, O'Reilly, 2013.
2. Alberto Cairo, The Functional Art: An Introduction to Information Graphics and Visualization, New Riders, 2012.
3. Nathan Yau, Visualize This: The FlowingData Guide to Design, Visualization and Statistics, John Wiley & Sons, 2011.

Online Resources:

1. https://freevideolectures.com/course/4041/nptel-introduction-to-learning-analytics/11
2. https://nptel.ac.in/courses/111106415
3. https://elearn.nptel.ac.in/shop/iit-workshops/completed/data-visualization-with-r/?v=c86ee0d9d7ed

Name of the Program:	B. Tech CSE	Semester: VI	Level: UG
Course Name	Data Visualization Techniques Lab	Course Code/ Course Type	UBTDS310 / Program Elective
Course Pattern	2024	Version	1.0

Teaching Scheme				Assessment Scheme			
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
-	1	-	1	2	-	-	50

Pre-Requisite: Computer Network

Course Objectives (CO):	The objectives of Data Visualization Techniques Lab are: 1. To recall the concepts of NumPy operations 2. To recognize and explore pandas libraries. 3. To apply the concept data visualization using tableau. 4. To analyze and design features animations techniques. 5. To evaluate various principles of visualization.
Course Learning Outcomes (CLO):	Students would be able to: 1. Students will be able to understand the basics of numpy and pandas techniques. 2. Elaborate the procedure of various data visualization methods. 3. Apply knowledge of web scrapping. 4. Analyze data the various dashboard attributes. 5. Evaluate how to perform data visualization using tableau.

Assignment/ Practical/Activity Number	Assignment/Practical/Activity Title	Week Number/Turn	Details	CLO	Hours
1	Practical 1: Numpy and Pandas	Week 1 Week 2 Week 3 Week 4 Turn 1/ Turn 2/ Turn 3/ Turn 4	1. Creating a NumPy Array 2. The Shape and Reshaping of NumPy Array 3. Expanding and Squeezing a NumPy Array 4. Indexing and Slicing of NumPy Array	CLO1	2
		Week 5 Week 6 Week 7 Week 8 Turn 1/ Turn 2/ Turn 3/ Turn 4	2.1 Perform following operations using pandas. 2.2 Perform following operations using pandas. 2.3 Read the following file formats using pandas. 2.4 Read the following file formats.	CLO 1	2

2.	Practical2: Discussion of workflow Exploratory Visualization	Week 9 Week 10 Week 11 Week 12 Turn 1/ Turn 2/ Turn 3/ Turn 4	3.1 Data Joins 3.2 Creating visualizations with Tableau.	CLO 2	2
		Week 11/ Turn 1	3.3 Sorting, Top N, bottom N 3.4 Filtering 3.5 Maps	CLO 2	2
3	Practical 3: Web Scraping	Week 12/ Turn 1	Demonstrate web scraping using python	CLO 3	2
4	Practical 4: Dashboard development & Tableau	Week 13/ Turn 1	4.1 Dashboard design principles 4.2 Dashboard interactivity 4.3 Connected "drill-down" dashboards	CLO 4	2
5		Week 14 Week 15 Turn 1/ Turn 2	4.4 Datasets exploration using tableau. 4.5Fiscal Year Calculations and Parameter explorations	CLO 5	2

Learning resources:

Textbooks:

1. McKinney, W. (2017). Python for Data Analysis: Data Wrangling with Pandas, NumPy and IPython. 2nd edition. O'Reilly Media.
2. O'Neil, C., & Schutt, R. (2013). Doing Data Science: Straight Talk from the Frontline O'Reilly Media.
3. Tamara Munzner, Visualization Analysis and Design, A K Peters Visualization Series, CRC Press, 2014.

Reference Books:

1. Scott Murray, Interactive Data Visualization for the Web, O'Reilly, 2013.
2. Alberto Cairo, The Functional Art: An Introduction to Information Graphics and Visualization, New Riders, 2012.
3. Nathan Yau, Visualize This: The FlowingData Guide to Design, Visualization and Statistics, John Wiley & Sons, 2011.

Online Resources:

1. https://freevideolectures.com/course/4041/nptel-introduction-to-learning-analytics/11
2. https://nptel.ac.in/courses/111106415
3. https://elearn.nptel.ac.in/shop/iit-workshops/completed/data-visualization-with-r/?v=c86ee0d9d7ed

Name of the Program:	B.Tech	Semester : VI	Level: UG
Course Name	Financial Analytics	Course Code/Course Type	UBTML309/ PCC
Course Pattern	2024	Version	1

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
3			3	3	40	60	

Pre-Requisite: Knowledge of C Programming

Course Objectives (CO):	The objectives of Financial Analytics are: 1. To learn to model financial time series using liner ARMA type time series. 2. To study and analyze to test and model heteroscedastic effects using ARCH /GARCH type time series. 3. To learn how to test for unit root and construct ARMA models. 4. identify trends and patterns, measure liquidity and solvency 5. To assess financial performance, evaluate the financial position, identify trends
Course Learning Outcomes (CLO):	Students would be able to: 1. Approach and analyze any financial data. 2. Differentiate between various time series models. 3. Perform cross-validation of various financial models developed. 4. Forecast future observations on financial data. 5. Students will exhibit the leadership capacity and teamwork skills for business decision making

Descriptors/Topics	CLO	Hours
UNIT I		
Asset Returns – Bond Yields and Prices – Implied Volatility – Examples and Visualization of financial data – Multivariate returns. Simple autoregressive models – Simple moving average models – Simple ARMA models – Unit Root nonstationarity – Exponential smoothing.	CLO 1	9
UNIT II		
Seasonal models – Regression models with time series errors – Long memory models.	CLO 2	9
UNIT III		
Characteristics of Volatility – Structure of a model – Testing for ARCH Effect – ARCH Model –GARCH Model – GARCH-M Model – Exponential Garch Model – Threshold GARCH model – Stochastic volatility model – alternative approaches. Garch Volatility Term structure – Option pricing and hedging – Time Varying Correlations and Betas – Minimum Variance Portfolios – Prediction.	CLO 3	9
UNIT IV		
Nonsynchronous trading – Bid ask spread of trading prices – Empirical characteristics of trading data – Models for price changes.	CLO 4	9

UNITV		
Risk measure and Coherence – Risk metrics –Extreme value approach to Value at Risk – Peak over thresholds	CLO 5	9
Total Hours		**45**

Learning resources:

Text Books:

1.Ruey S. Tsay An Introduction to Analysis of Financial Data with R, Wiley, 2013.

2.Statistical Analysis of Time-Series Data in SPlus, by Ren´e Carmona, Springer, March 4, 2004.

Reference Books:

1. Analysis of Financial Time Series, by Ruey S. Tsay, 3rd edition, Wiley Series in Probability and Statistics, 2010.
2. William G. Foote, Financial Engineering Analytics: A Practice Manual Using R, 2018.

Online Courses:

1. https://onlinecourses.nptel.ac.in/noc23_mg12/preview
2. https://nptel.ac.in/courses/110107073

Name of the Program:		B.Tech	Semester: VI			Level: UG	
Course Name		Financial Analytics Lab	Course Code/Course Type			UBTML310/ PCC	
Course Pattern		2024	Version			1	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
3	-	-	3	3	40	60	-

Pre-Requisite: Knowledge of C Programming

Course Objectives (CO):	The objectives of Financial Analytics Lab are: 1. To learn to model financial time series using liner ARMA type time series. 2. To study and analyze to test and model heteroscedastic effects using ARCH /GARCH type time series. 3. To learn how to test for unit root and construct ARMA models. 4. identify trends and patterns, measure liquidity and solvency 5. To assess financial performance, evaluate the financial position, identify trends
Course Learning Outcomes (CLO):	Students would be able to: 1. Approach and analyze any financial data. 2. Differentiate between various time series models. 3. Perform cross-validation of various financial models developed. 4. Forecast future observations on financial data. 5. Students will exhibit the leadership capacity and teamwork skills for business decision making

Assignment/Practical/Activity Number	Assignment/Practical/Activity Title	Week Number/Turn	Details	CLO	Hours
1	Practical 1: Given a simple daily return of a concern as data, implement and execute a R program to compute the sample mean	Week 1		CLO1	2
2	Practical 2: Given a simple daily return of a concern as data, implement and execute a R program to compute the standard deviation,	Week 2		CLO1	2
3	Practical 3: Given a simple daily return of a concern as data, implement and execute a R program to compute the skewness, excess kurtosis	Week 3		CLO2	2
4	Practical 4: Given a simple daily return of a concern as data, implement and execute a R program to compute the, minimum and maximum of each simple return series.	Week 4		CLO 2	2
5	Revision	Week 5			2
6	Practical 5: Consider the daily range (daily high–daily low) of Apple	Week 6/7		CLO3	4

	stock from January 2, 2023 to December 23, 2024. One can obtain the data by the package quantmod from Yahoo.				
7	Practical 6: Compute the first 100 lags of ACF of the series. Is there evidence of long-range dependence? Why? If the range series has long memory, build an ARMA model for the data.	Week 8/9		CLO3/CLO4	4
8	Practical 7: Consider the 30-year conventional mortgage rates from April 1971 to November 2011. Build a pure time series model for the monthly mortgage rate. Perform model checking and find the fitted model.	Week 10/11		CLO4/CLO5	4
9	Revision	Week 12			2
10	Mini Project /Task	Week 13/14/15		CLO1/2/3/4/5	6
Total Hours					**30**

Learning resources:
Text Books:

1. Ruey S. Tsay An Introduction to Analysis of Financial Data with R, Wiley, 2013.
2. Statistical Analysis of Time-Series Data in SPlus, by Ren´e Carmona, Springer, March 4, 2004.

Reference Books:

1. Analysis of Financial Time Series, by Ruey S. Tsay, 3rd edition, Wiley Series in Probability and Statistics, 2010.
2. William G. Foote, Financial Engineering Analytics: A Practice Manual Using R, 2018.

Online Courses:

1. https://onlinecourses.nptel.ac.in/noc23_mg12/preview
2. https://nptel.ac.in/courses/110107073

Name of the Program:	Foreign Language	Semester: 6	Level: UG/PG
Course Name	German A2.2	Course Code/ Course Type	UFL302 A/AEC
Course Pattern	2024	Version	1.0

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
2	-	-	2	2	20	30	-

Pre-Requisite: Can use simple means to describe the things related to immediate needs

Course Objectives (CO):	The objectives of German A2.2 are: 1. To understand the main points when the standard language is used. 2. Describe dreams, goals and hopes. 3. To implement the acquired grammar topics. 4. To deal with most situations typically encountered in the language region. 5. To Design and create texts in the areas of personal interest.
Course Learning Outcomes (CLO):	Students would be able to **1.** Comprehend advance vocabulary terms. **2.** Enhance expression skills in German language. **3.** Enhance professional speaking skills of German language. **4.** Construct short statements justifying own views and plans. **5.** Take parts in an interaction associated with the topics such as work, school, leisure time, travelling ex.

Descriptors/Topics	CLO	Hours
UNIT I		
Gelernt ist gelernt Different learning problems, exams and presentations Grammar – KII, Genetive	**CLO 1**	**6**
UNIT II		
Sportlich sportlich Different sport activities, connection between sport and different emotions, Grammar – deshalb and trotzdem	**CLO 2**	**6**
UNIT III		
Zusammen leben Conflicts in an apartment, living in different types and living with pets	**CLO3**	**6**

Grammar –Connectors (als and wenn)		
UNIT IV		
Gute unterhaltung Describe a picture, discussion on different music styles Grammar – Interrogative articles	**CLO4**	**6**
UNIT V		
Wie die Zeit vergeht! & Typisch, oder? Express different wishes, write a story, speak about proverbs, speak about cliche Grammar – Relative sentences	**CLO5**	**6**
Total Hours		**30**

Learning resources:

Textbooks:

1. Netzwerk A1, Ernst klett Verlag & Goyal Publishers & Distributors Pvt. Ltd.
2. Studio d A1, Cornelesen Verlag & Goyal Publishers & Distributors Pvt. Ltd.
3. Netzwerk Neu A1, Ernst klett Verlag & Goyal Publishers & Distributors Pvt. Ltd

Reference Books:

1. Hallo Deutsch A1,Ernst Klett Verlag, Goyal Publishers & Distributors Pvt. Ltd
2. Themen Aktuell 1, Hueber verlag
3. Maximal Ernst klett Verlag & Goyal Publishers & Distributors Pvt. Ltd.

Online Resources:

1. https://youtube.com/@LearnGermanwithAnja?si=BkJYDPi7TS0fT4lr
2. https://youtube.com/@deutschlernenmitheidi?si=TkICIabzioaU0roZ
3. instagram.com/learngermanwithanja

Pimpri Chinchwad University
Learn | Grow | Achieve

COURSE SYLLABUS
AUDIT COURSE

Name of the Program:		BTech.		Semester: 5/6		Level: UG	
Course Name		Aptitude And Logical Reasoning		Course Code/ Course Type		ACALR301/AC	
Course Pattern		2024		Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/ Oral
2	0	0	0	2	50	-	-
Pre-Requisite:							
Course Objectives (CO):		The objectives of Aptitude and Logical Reasoning are: 1. To Familiarize Students with Different Types of Mathematical Problems. 2. To learn and Strengthen Logical Reasoning Skills. 3. To Develop Critical Thinking Skills. 4. To Improve Quantitative and Numerical Skills. 5. To Prepare Students for Standardized Tests and build Confidence in Problem-Solving.					
Course Learning Outcomes (CLO):		Students would be able to: 1. Students will develop enhanced problem-solving abilities through Exposure to various types of aptitude and logical reasoning problems. 2. Sharpen their analytical thinking skills by learning to analyze and interpret different types of data, patterns, and logical structures. 3. Cultivate critical thinking abilities by challenging students to evaluate and assess information, arguments, and scenarios using logical reasoning principles. 4. Apply different forms of logical reasoning, such as deductive reasoning, inductive reasoning, and critical reasoning, to solve problems and make decisions. 5. Students will be able to develop soft skills and communication skills					

Descriptors/Topics	CLO	Hours
UNIT I		
Quantitative Aptitude: Number System, Problems on Ages, Percentage, Average, Time and Work, Profit and Loss, Permutation and Combination	**CLO 1**	**8**
UNIT II		
Logical Reasoning: Number Series, Letter Series, Coding and Decoding, Calendars, Clocks	**CLO 2**	**8**
UNIT III		
Verbal Reasoning: Subject-Verb Agreement, Preposition and Verbal Analogy, Closet test	**CLO2,3**	**7**

UNIT IV		
Personality Development: Resilience, Motivation and Listening skills, Self-confidence, Body language, Leadership, Goal setting, Emotional intelligence, Personal growth and development	**CLO 3**	**7**
UNIT V		
Soft Skills and Communication Skills: Introduction to Teamwork, Collaboration and Time Management, Communication Skills, Organization Skills, Introduction to Critical Thinking, Leadership, Negotiation and Presentation Skills, Time Management, Adaptability Skills, Actively listening in conversations, Public speaking, Effectively communicating ideas to others, Introduction to Career Development, Goal Setting, Emotional Intelligence Fundamentals, Building Adaptability and Resilience	**CLO2,3**	**8**
Total Hours	**30**	

Learning resources:

Textbooks:

1. Quantitative Aptitude for Competitive Examinations, R.S Agarwal, 2017
2. Quantitative Aptitude for All Competitive Examinations by Abhijit Guha,6th edition,2016
3. Word Power Made Easy by Norman Lewis, 2023

Reference Books:

1. The Pearson Guide to Quantitative Aptitude for Competitive Examinations by Dinesh khattar, 2nd Edition

CIA Guidelines:

1. Online Quiz (Based on MCQ)- 20 marks
2. Activity (with short Report Submission) - 20 Marks
3. Academic Sincerity - 10 marks
4. Few of the suggested Activities are Assignments, Debates, Poster presentations, Model making, Group presentation, Field visits and Group Discussions.

Name of the Program:	B.Tech/B.B.A/B.C.A/B.Sc/B.Pham	Semester: 3/4	Level: UG
Course Name	Constitution of India	Course Code/ Course Type	ACCOI201/AC
Course Pattern	2024	Version	1.0

Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/Oral
2	0	0	0	2	50	-	-

Pre-Requisite:	
Course Objectives (CO):	The objectives of Constitution of India are: 1. To familiarize the students with the key elements of the Indian constitution. 2. To enable students to grasp the constitutional provisions and values. 3. To acquaint the students with the powers and functions of various constitutional offices and institutions. 4. To make students understand the basic premises of Indian politics. 5. To make students understand the role of constitution and citizen-oriented measures in a democracy
Course Learning Outcomes (CLO):	Students would be able to: 1. Analyze the basic structure of Indian Constitution. 2. Remember their Fundamental Rights, DPSP's and Fundamental Duties (FD's) of our constitution. 3. know about our Union Government, political structure & codes, procedures. 4. Comprehend our State Executive & Elections system of India. 5. Access the Amendments and Emergency Provisions, other important provisions given by the constitution

Descriptors/Topics	CLO	Hours
UNIT I		
Introduction to Indian Constitution: The Necessity of the Constitution, The Societies before and after the Constitution adoption. Introduction to the Indian constitution, The Making of the Constitution, The Role of the Constituent Assembly. The Preamble of Indian Constitution & Key concepts of the Preamble. Salient features of India Constitution.	**CLO 1**	**8**
UNIT II		
FR's, FD's and DPSP's: Fundamental Rights and its Restriction and limitations in different Complex Situations. Directive Principles of State Policy (DPSP) and its present relevance in our society with examples. Fundamental Duties and its Scope and significance in Nation building	**CLO 2**	**5**

UNIT III		
Governance and Constitution: Federalism in India - Features, Local Government -Panchayats –Powers and functions; 73rd and 74th amendments, Election Commission – Composition, Powers and Functions; Electoral Reforms, Citizen oriented measures – RTI and PIL – Provisions and significance.	**CLO 3**	**5**
UNIT IV		
Union Executive: Parliamentary System, Union Executive – President, Prime Minister, Union Cabinet, Parliament - LS and RS, Parliamentary Committees, Important Parliamentary Terminologies. Supreme Court of India, Judicial Reviews and Judicial Activism.	**CLO 4**	**5**
UNIT V		
State Executive & Elections, Amendments and Emergency Provisions: State Executive, Election Commission, Elections & Electoral Process. Amendment to Constitution (How and Why) and Important Constitutional Amendments till today. Emergency Provisions.	**CLO 5**	**7**
Total Hours		**30**

Learning resources:

Text Books:

1. "Constitution of India" (for Competitive Exams) - Published by Naidhruva Edutec Learning Solutions, Bengaluru. – 2022.
2. "Engineering Ethics", M. Govindarajan, S.Natarajan, V.S.Senthilkumar, Prentice –Hall, 2004.

Reference Books:

1. "SamvidhanaOdu" - for Students & Youths by Justice HN NagamohanDhas, Sahayana, kerekon.
2. "Constitution of India, Professional Ethics and Human Rights" by Shubham Singles, Charles E. Haries, and et al: published by Cengage Learning India, Latest Edition – 2019.
3. "Introduction to the Constitution of India", (Students Edition.) by Durga Das Basu (DD Basu): Prentice –Hall, 2008.
4. "The Constitution of India" by Merunandan K B: published by Merugu Publication, Second Edition, Bengaluru.

CIA Guidelines

Online Quiz (Based on MCQ)- 20 marks

Activity (with short Report Submission) - 20 Marks

Academic Sincerity - 10 marks

Few of suggested activities are Assignments, Debates, Poster presentations, Model making, Group presentation, Field visits and Group Discussions.

Few of suggested topics related to Constitution of India are:
Debate Topics

- Rights and duties
- Base of Reservation and need

Assignment

- Characteristics of Constitution
- Working of Constitution

Name of the Program:		B.Tech/B.B.A/B.C.A/B.Sc/B.Pham		Semester: 5/6		Level: UG	
Course Name		Environmental Studies		Course Code/ Course Type		ACEVS301/AC	
Course Pattern		2024		Version		1.0	
Teaching Scheme					Assessment Scheme		
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical /Oral
2	0	0	1	2	50	-	-
Pre-Requisite: nil							
Course Objectives (CO):				The objectives of Environmental Studies are: 1. Understand about multidisciplinary nature of environmental Studies and natural resources 2. Understand about solid E waste and global impacts of air pollution and its control strategies 3. To learn about technics for Industrial water management and treatment processes 4. To understand about interlinking of rivers and disaster management 5. To impart knowledge about existing environmental laws and legislations			
Course Learning Outcomes (CLO):				Students would be able to: 1. Comprehend the breadth and interdisciplinary nature of environmental issues, resources 2. Identify the sources, effects, and remedial measures for E waste and Air Pollution 3. Analyze for Industrial water management and treatment processes 4. Analyze about interlinking of rivers and disaster management 5. Evaluate existing environmental laws and legislations with case studies			

Descriptors/Topics	CLO	Hours
UNIT I		
Multidisciplinary Nature of Environmental Studies: Definition, scope, environment, and its relation to the branch. Introduction to basic terminologies. Sustainable development Goals, natural resources and associated problems- water, solar, mineral and energy, actual sustainability report study, Water conservation, rain water harvesting. Resettlement and rehabilitation of people; its problems, concerns and case studies.	**CLO 1**	**6**
UNIT II		
Solid Waste, E waste and Air Pollution: Sources and types of solid wastes, introduction to solid waste management. Introduction to E- waste, generation and case studies. Air Pollution Definition, sources, classification of air pollution. Air pollutants: CO, CO_2, SO_2, NO_X, hydrocarbons and aerosols. Specific phenomena related with air	**CLO 2**	**6**

pollution- Greenhouse effect, Acid rain, Ozone layer depletion and Smog, Control of Air Pollution.		
UNIT III		
Industrial waste water treatment: Important terminologies related to waste water treatment process. Preliminary, primary, secondary, and tertiary waste water treatment process. Waste water treatment process of (a) Paper and pulp (b) Oil refinery (c) Petrochemical (d) Sugar industries. Case studies.	**CLO 3**	**6**
UNIT IV		
Environmental priorities in India and sustainable development: Ganga Action plan, Interlinking of rivers, Natural disasters and their management. Disaster management: floods, earthquake, cyclone and landslides.	**CLO 4**	**6**
UNIT V		
Environmental Legislations and case studies: National: Environment Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and Control of Pollution) Act, International: Montreal protocol, Kyoto protocol, Rio summit and Paris agreement.	**CLO 5**	**6**
Total Hours		**30**

Learning resources:

Textbooks:

1. Kaushik, A and Kaushik C.P. Perspective in Environmental studies. New Age International Publications
2. Iqbal H. Khan, Naved Ahsan. Textbook of Solid Wastes Management. CBS Publisher & Distributors P Ltd.

Reference Books:

1. S. K. Garg. Sewage Disposal and Air pollution Engineering. Khanna Publishers
2. M. N. Roa, H. V. N. Rao. Air Pollution. Mc.Graw Hill.

Online Resources:

1. https://nitsri.ac.in/Department/CHEMISTRY/EVS_MATERIAL_2.pdf
2. https://onlinecourses.swayam2.ac.in/cec19_bt03/preview
3. https://onlinecourses.swayam2.ac.in/cec19_bt03/preview

CIA Guidelines

Online Quiz (Based on MCQ)- 20 marks

Activity (with short Report Submission) - 20 Marks

Academic Sincerity - 10 marks

Suggested activities are Assignments, Debates, Poster presentations, Model making, Group presentation, Field visits and Group Discussions

Few of suggested topics related to Environmental studies are:

Debate Topics

- Montreal Protocol/Kyoto Protocol
- Development Pro/Cons

Activities

- E waste Management / Project (Apply Computer engineering knowledge to find control pollution or any other environmental problem)
- Sustainable development goals poster presentation/ Plantation driv

Name of the Program:	B.Tech/B.B.A/B.C.A/B.Sc/B.Pham	Semester : 1/2	Level: UG
Course Name	UHV-I: Professional Ethics	Course Code/ Course Type	ACUHV101/AC
Course Pattern	2024	Version	1.0

Teaching Scheme				Assessment Scheme			
Theory	Practical	Tutorial	Total Credits	Hours	CIA (Continuous Internal Assessment)	ESA (End Semester Assessment)	Practical/ Oral
2	0	0	0	2	50	-	-

Pre-Requisite: UHV-I

Course Objectives (CO):	The objectives of Universal Human Value- Professional Ethics are: 1. To make the students understand the importance of ethical behavior 2. To expose the students to the ethical practices to be followed in profession 3. To sensitize the students to become responsible persons who will uphold ethics in profession when they pursue their career 4. To make students understand Psychological and Philosophical approaches 5. To make students understand social responsibility and corporate Sustainability
Course Learning Outcomes (CLO):	Students would be able to: 1. Equip themselves with an understanding of moral, professional and personal values. 2. Comprehend the need of ethics in shaping their profession The learners will hone their decision-making skills. 3. Refine their business ethics based on psychological and philosophical perspective. 4. Assess the need for a balance between ecology, and economy. 5. Equip themselves with a better understanding of themselves and the society they live in and the responsibilities they shoulder in creating a sustainable world.

Descriptors/Topics	CLO	Hours
UNIT I		
Individual and Professional Ethics: Introduction to Professional Ethics, Morals, Values and Ethics – Personal and Professional- Sensé of Professional Ethics – Code of Ethics by NSPE-Making decisions with ethical dimensions– definition–roadmap to ethical decision making–common standards– internal obstacles – bias – empathy	CLO 1	8
UNIT II		
Business Ethics: Philosophical approaches to Business Ethics – ethical reasoning – ethical issues in business - Social Responsibility of Business-	CLO 2	5

conflict of interest–cultural relativism-Ethical Leadership-Resisting un-ethical authority and domination-Global Business Ethics.		
UNIT III		
Psychological Approaches: Ethical Theories-Psychological and Philosophical Approaches-Myths about Morality-conflict of interest in psychological perspective - Courage-Integrity – ethical dilemma – Emotional Intelligence (Mahabharata- Iskcon Publications)	**CLO 3**	**5**
UNIT IV		
Workplace Ethics: Ethics in changing domains of Research–academic integrity–intellectual honesty-Role of Engineers and Managers-Ethical issues in Diverse workplace – competition – free will- Confidentiality – employee rights – Intellectual property rights – discrimination	**CLO 4**	**5**
UNIT V		
Safety, Responsibilities and Rights: Ecology, and Economy-Risk benefit analysis and reducing risk SDGs–Corporate social responsibility and Corporate Sustainability - CSR in India - Sustainability Case Studies	**CLO 5**	**7**
Total Hours		**30**

Learning resources

Textbooks:

1. _Subramanian. R. *Professional Ethics*, Oxford Publication,2013.
2. Nagarasan. R. S. *Professional Ethics and Human Values*. New Age International Publications, 2006.

Reference Book:

1. Mike W Martin and Roland Schinzinger, *Ethics in Engineering*,4th edition, Tata McGraw Hill Publishing Company Pvt Ltd, New Delhi,2014

Online Resources:

1. https://www.nspe.org/resources/ethics/code-ethics
2. https://www.toolshero.com/tag/ethical-decision-making/
3. https://pagecentertraining.psu.edu/public-relations-ethics/introduction-to-public-relations-ethics/lesson-1/ethical-theories/
4. https://peer.asee.org/case-studies-in-engineering-ethics.pdf

CIA Guidelines

Online Quiz (Based on MCQ)- 20 marks

Activity (with short Report Submission) - 20 Marks

Academic Sincerity - 10 marks

Few of the suggested activities are Assignments, Debates, Poster presentations, Model making, Group presentation, Field visits and Group Discussions.

Few of suggested topics related to UHV1- Professional Ethics are:
Debate Topics

- Ethical Approach versus Realistic Approach
- Individual and Social Approach
- Dilemma between heart and Mind

Activity

- ❖ Analyze the wastage (Electricity or any other) at work place? How you managed.

Assignment

- ➢ Analyze the code of ethics at work place
- ➢ If you fulfil the duties, rights will automatically fall in place. Justify the statement

References:

1. https://uhv.org.in/https://vvce.ac.in/wp-content/uploads/2021/04/Realising-Aspirations-of-NEP2020-UHV.pdf

Descriptors/Topics	CLO	Hours
UNIT I		
Course Introduction - Need, Basic Guidelines, Content and Process for Value Education Purpose and motivation for the course, recapitulation from Universal Human Values-I, Self-Exploration–what is it? - Its content and process; Personality Traits- Self Excellence, „Natural Acceptance" and Experiential Validation- as the process for self-exploration, Adaptability, Belief and Understanding- Self discipline, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfil the above human aspirations: understanding and living in harmony at various levels.	**CLO 1**	**8**
UNIT II		
Understanding Harmony in the Human Being - Harmony in Myself: Understanding human being as a co-existence of the sentient „I" and the material „Body", Understanding the needs of Self („I") and „Body" - happiness and physical facility, Understanding the Body as an instrument of „I" (I being the doer, seer and enjoyer)- Habits and Hobbies, SWOT Analysis (Activity) ,Understanding the characteristics and activities of „I" and harmony in „I" – Dalai Lamas" Tibetan Personality Test – Dr. Menninger"s Psychometric Test., Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail	**CLO 2**	**5**
UNIT III		
Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship: Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship, Understanding the meaning of Trust; Difference between intention and competence, Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship, Friends and Foes, Empathy, False Prestige.	**CLO 3**	**5**
UNIT IV		
Understanding Harmony in the Nature and Existence - Whole existence as Coexistence: Understanding the harmony in the Nature and its Equanimity, Respect for all, Nature as Teacher, Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature, Understanding Existence as Co-existence of mutually interacting units in all- pervasive space, Holistic perception of harmony at all levels of existence.	**CLO 4**	**5**
UNIT V		
Implications of the above Holistic Understanding of Harmony on Professional Ethics: Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Vision for the Holistic alternatives, UHVs for entrepreneurship	**CLO 5**	**7**
Total Hours		**30**

Learning resources

Textbooks:

1. _Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010
2. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
3. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

Reference Books:

The Story of Stuff (Book).

1. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
2. Small is Beautiful - E. F Schumacher
3. Slow is Beautiful - Cecile Andrews

Online Resources:

1. https://www.studocu.com/in/document/jss-science-and-technology-university/human-values/uhv-handout-2-
2. harmony-in-the-human-being/
3. https://vvce.ac.in/wp-content/uploads/2021/04/Realising-Aspirations-of-NEP2020-UHV.pdf
4. https://vemu.org/uploads/lecture_notes/22_12_2022_1850871704.pdf

CIA Guidelines

Online Quiz (Based on MCQ)- 20 marks

Activity (with short Report Submission) - 20 Marks

Academic Sincerity - 10 marks

Few of suggested activities are Assignments, Debates, Poster presentations, Model making, Group presentation, Field visits and Group Discussions.

Few of suggested topics related to UHVII-Understand Harmony are:

Debate Topics

- Materialistic things make you happy
- Happiness in individualism and family
- Spirituality vs Materialistic
- Satisfaction of Body and self (Soul)

Assignment

Students maintain a reflective account of the times they felt happy and prosperous and the causes of that happiness and prosperity for them.

References:

1. https://uhv.org.in/
2. https://vvce.ac.in/wp-content/uploads/2021/04/Realising-Aspirations-of-NEP2020-UHV.pdf

Course Exit Policy

UG Certificate in B Tech CSE-AIML: Students who opt to exit after completion of the first year and have scored required credits offered by the school in the program structure will be awarded a UG certificate in **B Tech CSE**, provided they must earn additional credits during the summer vacation of the first year.

First Year														
Course Code	**Course Name**	**Course Type**	**Teaching Scheme**						**Assessment Scheme**					
									Theory		**OR/PR**			
			Th	**Pr**	**Tut**	**Credit**	**Hrs**		**CIA**	**ESA**	**CIA**	**ESA**	**Total**	

In-house/ Sponsored/ Case Study/ Fieldwork

UG Diploma in B Tech CSE-AIML: Students who opt to exit after completion of the second year and have scored the required credits offered by the school in the program structure will be awarded a UG diploma in B Tech CSE, provided they must earn additional credits during the summer vacation of the second year.

Second Year														
Course Code	**Course Name**	**Course Type**	**Teaching Scheme**						**Assessment Scheme**					
									Theory		**OR/PR**			
			Th	**Pr**	**Tut**	**Credit**	**Hrs**		**CIA**	**ESA**	**CIA**	**ESA**	**Total**	
UDEXCS201	Artificial Intelligence lab/MOOCs-Data Visualization using R Programming	VSC	-	**2**		**2**	**4**		-	-	**50**		**50**	
UDEXCS202	Project/ Internship	VSC	-	**4**		**4**	**8**		-	-	**50**	**50**	**100**	

***Project- In house/ Sponsored/ Case Study/ Field work**

Applicable for 4 Year UG Program only

3-year UG Degree in BSc Engg CSE-AIML: Students who opt to exit after completion of the third year and have scored required credits offered by the school in the program structure will be awarded a UG degree in BSc Engg CSE, provided they must earn additional credits during the summer vacation of the third year

Third Year														
Course Code	Course Name	Course Type	Teaching Scheme						Assessment Scheme				
									Theory		OR/PR		
			Th	Pr	Tut	Credit	Hrs		CIA	ESA	CIA	ESA	Total
UDEXCS301	Computer Vision Lab./MOOCs-Data Visualization Tools	VSC	-	2		2	4		-	-	50		50
UDEXCS302	Project/ Internship	VSC	-	4		4	8		-	-	50	50	100

***Project- In house/ Sponsored/ Case Study/ Field work**

Course Exit Policy

UG Certificate in B Tech CSE-AIML: Students who opt to exit after completion of the first year and have scored required credits offered by the school in the program structure will be awarded a UG certificate in **B Tech CSE**, provided they must earn additional credits during the summer vacation of the first year.

First Year													
Course Code	Course Name	Course Type	Teaching Scheme						Assessment Scheme				
									Theory		OR/PR		
			Th	Pr	Tut	Credit	Hrs		CIA	ESA	CIA	ESA	Total

In-house/ Sponsored/ Case Study/ Fieldwork

UG Diploma in B Tech CSE-AIML: Students who opt to exit after completion of the second year and have scored the required credits offered by the school in the program structure will be awarded a UG diploma in B Tech CSE, provided they must earn additional credits during the summer vacation of the second year.

Second Year													
Course Code	Course Name	Course Type	Teaching Scheme						Assessment Scheme				
									Theory		OR/PR		
			Th	Pr	Tut	Credit	Hrs		CIA	ESA	CIA	ESA	Total
UDEXCS201	Artificial Intelligence /MOOCs- Data Visualization using R Programming	VSC	**2**			**2**	**2**		-	-	**50**		**50**
UDEXCS202	Project/ Internship	VSC	-	**4**		**4**	**8**		-	-	**50**	**50**	**100**

***Project- In house/ Sponsored/ Case Study/ Field work**

Applicable for 4 Year UG Program only

3-year UG Degree in BSc Engg CSE-AIML: Students who opt to exit after completion of the third year and have scored required credits offered by the school in the program structure will be awarded a UG degree in BSc Engg CSE, provided they must earn additional credits during the summer vacation of the third year

Third Year														
Course Code	Course Name	Course Type	Teaching Scheme						Assessment Scheme				
									Theory		OR/PR		
			Th	Pr	Tut	Credit	Hrs		CIA	ESA	CIA	ESA	Total
UDEXCS301	Computer Vision /MOOCs- Data Visualization Tools	VSC	**2**			**2**	**2**		-	-	**50**		**50**
UDEXCS302	Project/ Internship	VSC	-	**4**		**4**	**8**		-	-	**50**	**50**	**100**

***Project- In house/ Sponsored/ Case Study/ Field work**