Mahatma Education Society's

Pillai College of Engineering

(Autonomous)

Affiliated to University of Mumbai

Dr. K. M. Vasudevan Pillai's Campus , Sector 16, New Panvel – 410 206.

PCE
PILLAI COLLEGE OF ENGINEERING
AUTONOMOUS

Department of Information Technology

Curriculum Implementation as per NEP 2020 w.e.f AY 2023-24

of

B.Tech. in Information Technology

for

The Admission Batch of AY 2023-24

First Year - Effective from Academic Year **2023-24**

Second Year - Effective from Academic Year **2024-25**

Third Year - Effective from Academic Year **2025-26**

Fourth Year - Effective from Academic Year **2026-27**

as per

Choice Based Credit and Grading System

Mahatma Education Society's

Pillai College of Engineering

Vision

Pillai College of Engineering (PCE) will admit, educate and train a diverse population of students who are academically prepared to benefit from the Institute's infrastructure and faculty experience, to become responsible professionals or entrepreneurs in a technical arena. It will further attract, develop and retain, dedicated, excellent teachers, scholars and professionals from diverse backgrounds whose work gives them knowledge beyond the classroom and who are committed to making a significant difference in the lives of their students and the community.

Mission

To develop professional engineers with respect for the environment and make them responsible citizens in technological development both from an Indian and global perspective. This objective is fulfilled through quality education, practical training and interaction with industries and social organizations.

Dr. K. M. Vasudevan Pillai's Campus , Sector - 16, New Panvel – 410 206

Department of Information Technology

Vision

To become a reputable world-class institution that is responsive to national, regional and global development needs through engagement in dynamic knowledge creation, innovation and application.

Mission

To expand the frontiers of knowledge through provision of excellent conditions for teaching-learning and research. To produce graduates who are worthy in character and sound judgments. To contribute to the transformation of society through creativity and innovation. To serve as a dynamic custodian of society's salutary values and thus sustain its integrity.

Program Educational Objectives (PEOs):

Within four years after graduation, the graduates are expected to apply their expertise to contemporary problem solving, be engaged professionally, and have continued to learn and adapt, and have contributed to their organizations through leadership and teamwork. More specifically, the objectives are expertise, engagement, learning, leadership and teamwork.

I. Graduates should be able to demonstrate peer- recognized expertise together with the ability to articulate that expertise and use it for contemporary problem solving in the analysis, design, and evaluation of computer and software systems, including system integration and implementation.

II. Graduates should be able to demonstrate engagement in the engineering profession, locally and globally, by contributing to the ethical, competent, and creative practice of engineering or other professional careers.

III. Graduates should be able to demonstrate sustained learning and adapting to a constantly changing field through graduate work, professional development, and self study.

IV. Graduates should be able to demonstrate leadership and initiative to ethically advance professional and organizational goals, facilitate the achievements of others, and obtain substantive results.

V. Graduates should be able to demonstrate a commitment to teamwork while working with others of diverse cultural and interdisciplinary backgrounds.

Program Outcomes:

Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. 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.
3. 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.
4. 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.
5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. 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.
7. 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.
8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. 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.
11. 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.
12. 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.

Program Specific Outcomes (PSOs):

PSOs are statements that describe what the graduates of a specific engineering program should be able

1. To analyze and appropriately design for developing and deploying the tested system and application softwares to deliver quality products for business success and societal peace.

2. To apply the knowledge of techniques and technologies, ethics, engineering and management principles and soft skills to pursue higher education and become successful entrepreneurs to provide world-wide solutions to real world problems in diverse environments.
3. To provide a safe and healthy tomorrow by researching, evaluating, forecasting and communicating the current and new technologies for an individual or organization for performing tasks related to E-governance, E-Learning, and Training.

The Autonomous status of the institute has given an opportunity to design and frame the curriculum in such a way that it incorporates all the needs and requirements of recent developments in all fields within the scope of the Technical education. This curriculum will help graduates to attain excellence in their respective field. The curriculum has a blend of basic and advanced courses along with provision of imparting practical knowledge to students through minor and major projects. The syllabus has been approved and passed by the Board of Studies.

Outcome based education is implemented in the academics and every necessary step is undertaken to attain the requirements. Every course has its objectives and outcomes defined in the syllabus which are met through continuous assessment and end semester examinations. Evaluation is done on the basis of Choice Based Credit and Grading System (CBCGS). Optional courses are offered at department and institute level. Selection of electives from the same specialization makes the student eligible to attain a B. Tech. degree with respective specialization.

Every learner/student will be assessed for each course through (i) an Internal/Continuous assessment during the semester in the form of either Practical Performance, Presentation, Demonstration or written examination and (ii) End Semester Examination (ESE), in the form of either theory or viva voce or practical, as prescribed by the respective Board Studies and mentioned in the assessment scheme of the course content/syllabus. This system involves the Continuous Evaluation of students' progress Semester wise. The number of credits assigned with a course is based on the number of contact hours of instruction per week for the course. The credit allocation is available in the syllabus scheme of each semester.

The performance of a learner in a semester is indicated by a number called Semester Grade Performance Index (SGPI). The SGPI is the weighted average of the grade points obtained in all the courses by the learner during the semester. For example, if a learner passes five courses (Theory/labs./Projects/ Seminar etc.) in a semester with credits C1, C2, C3, C4 and C5 and learners grade points in these courses are G1, G2, G3, G4 and G5 respectively, then learners SGPI is equal to:

$$SGPI = \frac{C_1G_1 + C_2G_2 + C_3G_3 + C_4G_4 + C_5G_5}{C_1 + C_2 + C_3 + C_4 + C_5}$$

The learner's up to date assessment of the overall performance from the time s/he entered for the programme is obtained by calculating a number called the Cumulative Grade Performance Index (CGPI), in a manner similar to the calculation of SGPI. The CGPI therefore considers all the courses mentioned in the scheme of instructions and examinations, towards the minimum requirement of the degree learners have enrolled for. The CGPI at the end of this semester is calculated as,

$$CGPI = \frac{C_1G_1 + C_2G_2 + C_3G_3 + \ldots + C_i * G_i + \ldots + C_nG_n}{C_1 + C_2 + C_3 + \cdots + C_i + \ldots + C_n}$$

The Department of Information Technology offers a B. Tech. programme in Information Technology. This is an eight semester course. The complete course is of 160 credits which comprises core courses and elective courses. The elective courses are distributed over 4 specializations. The specializations are:

1. AI and Robotics
2. IoT and Data Analytics
3. Information Security and Forensics
4. Bioinformatics

The students also have a choice of opting for Institute level specializations. These are

1. Business and Entrepreneurship
2. Bio-Engineering
3. Engineering Design
4. Art and Humanities
5. Applied Science
6. Life Skills, Repair, Maintenance and Safety

As minimum requirements for the credits to be earned during the B.Tech in Information Technology program, a student will have to complete a minimum of three specializations of which two are to be chosen from the department list and one has to be from the Institute level specialization list. In order to complete each specialization, a minimum of three courses under that specialization has to be completed. The credit requirement for the B.Tech. in Information Technology course is tabulated in Table 1.

This curriculum prepared for effective and successful implementation of NEP 2020 w.e.f admission year 2023-24 in accordance with the guidelines set forth by the NEP with a hope to envisage the active engagement and cohesive efforts of all the stakeholders.

Table 1. Distribution of Credits across Four Years B.Tech in Information Technology Degree Programme

SN	Course Category	Group	Credits
1	Basic Science Course (BSC)	BSC / ESC	29
2	Engineering Science Course (ESC)		7
3	Programme Core Course (PCC)	Program Courses	36
4	Programme Elective Course (PEC)		23
5	Multidisciplinary Minor (MD M)	Multidisciplinary Courses	16
6	Open Elective (OE)		6
7	Vocational and Skill Enhancement Course (VSEC)	Skill Courses	10
8	Ability Enhancement Course (AEC)	Humanities Social Science and Management (HSSM)	4
9	Entrepreneurship/Economics/ Management Courses		2
10	Indian Knowledge System (IKS)		2
11	Value Education Course (VEC)		4
12	Research Methodology (RM)	Experiential Learning Courses (ELC)	3
13	Comm. Engg. Project (CEP)/Field Project (FP)		2
14	Project		8
15	Internship/ OJT		8
16	Co-curricular Courses (CC)	Liberal Learning Courses	4
Total Credits =			**164**

Department Level Optional Courses (DLOC)

Bachelor of Technology in Information Technology

Semester	DLOC	1. AI and Robotics	2. IoT and Data Analytics	3. Information Security and Forensics	4. Bioinformatics
Sem-V	DLOC-I	IT 311	IT 312	IT 313	IT 314
		Image and Video Processing	Wireless Technology and 5G	Cryptography and Security	Fundamentals of Computational Biology
Sem-VI	DLOC-II	IT 321	IT 322	IT 323	IT 324
		Genetic Algorithms and Fuzzy Systems	Internet of Everything	Cyber Security	Introduction to Bioinformatics
	DLOC-III	IT 331	IT 332	IT 333	IT 334
		Deep Learning	Big Data Analytics	Penetration Testing	Computational Genomics
Sem-VII	DLOC-IV	IT 441	IT 442	IT 443	IT 444
		Natural Language Processing	Industrial IOT	Digital Forensics	Structural Bioinformatics
	DLOC-V	IT 451	IT 452	IT 453	IT 454
		Computer Vision	Information Retrieval	Multimedia Forensics	Systems Biology
Sem-VIII	DLOC-VI	IT 461	IT 462	IT 463	IT 464
		Robotics	Social Media Analytics	Social Frauds and Privacy	Computer Aided Drug Design

Semester Wise Breakup of Marks and Credits

Bachelor of Technology in Information Technology

FE 2023-24	Sem 1		Sem 2		Sem 3		Sem 4		Sem 5		Sem 6		Sem 7		Sem 8	
B.Tech IT	Credit	Marks	Credit	Marks	Credit	Marks	Credit	Marks	Credit	Marks	Credit	Marks	Credit	Marks	Credit	Marks
Course 1	4	125	4	125	4	125	4	125	4	150	4	150	3	100	3	100
Course 2	2.5	100	2.5	100	4	150	4	125	4	125	3	100	4	150	3	100
Course 3	2.5	100	2.5	100	4	150	4	150	3	100	4	150	1	50	2	50
Course 4	4	150	3	100	2	100	3	100	4	150	4	150	4	150	8	200
Course 5	3	100	4	150	2	50	2	60	3	100	3	100	4	150	4	100
Course 6	2	100	2	75	2	50	2	50	2	50	2	50	4	150		
Course 7	2	50	2	100	2	50	1	50								
Course 8	2	50	2	50												
Total =	**22**	775	**22**	800	**20**	675	**20**	660	**20**	675	**20**	700	**20**	750	**20**	550

Total Credits = 164

Total Marks = 5585

Program Structure for
Bachelor of Technology in Information Technology
Semester I

Course Code	Course Name	Course Category	Teaching Scheme (Contact Hours)			Credits Assigned			
			Theory	Prac	Tut	Theory	Pract	Tut	Total
FY 101	Engineering Mathematics I	BSC	3	2	-	3	1	-	4
FY 102	Engineering Physics I	BSC	2	1	-	2	0.5	-	2.5
FY 103	Engineering Chemistry I	BSC	2	1	-	2	0.5	-	2.5
FY 104	C Programming	ESC	3	2	-	3	1	-	4
FY 105	Basic Electrical Engineering *	ESC	3	-	-	3	-	-	3
FY 106	Basic Workshop I and BEE Lab *	Skill Courses	-	2+2$	-	-	2	-	2
FY 107	Indian Knowledge System (IKS)	HSSM	-	2+2#	-	-	2	-	2
FY 108	Co-curricular Course I	Liberal Learning Courses	-	4	-	-	2	-	2
Total			**13**	**18**	**-**	**13**	**9**	**-**	**22**

Course Code	Course Name	Examination Scheme							
		Theory							
		Internal Assessment			End Sem Exam	Exam Duration (Hrs)	Term Work	Pract/ Oral	Total
		IA1	IA2	Avg					
FY 101	Engineering Mathematics I	40	40	40	60	2	25	-	125
FY 102	Engineering Physics I	30	30	30	45	2	25	-	100
FY 103	Engineering Chemistry I	30	30	30	45	2	25	-	100
FY 104	C Programming	40	40	40	60	2	25	25	150
FY 105	Basic Electrical Engineering *	40	40	40	60	2	-	-	100
FY 106	Basic Workshop I and BEE Lab *	-	-	-	-	-	50+25$	25$	100
FY 107	Indian Knowledge System (IKS)	-	-	-	-	-	50	-	50
FY 108	Co-curricular Course I	-	-	-	-	-	50	-	50
Total				**180**	**270**	**10**	**275**	**50**	**775**

BSC-Basic Science Course; ESC-Engineering Science Course; VSEC-Vocational Skill and Skill Enhancement Course; VSC - Vocational Skill Course; AEC-Ability Enhancement Course; IKS-Indian Knowledge System; Value Education Course (VEC); VCC-Co-curricular Courses; * Course may be offered in Sem I or Sem II; # Lecture class wise; $ BEE lab is a part of VSEC course and Termwork and viva marks of BEE should be considered under credit of VSEC

Indian Knowledge System (IKS)

Indian Knowledge System (IKS)	Course 1	Course 2	Course 3	Course 4
	Introduction to IKS	Indian Health Services	Indian Agriculture	Indian Education

Program Structure for
Bachelor of Technology in Information Technology
Semester II

Course Code	Course Name	Course Category	Teaching Scheme (Contact Hours)			Credits Assigned			
			Theory	Pract	Tut	Theory	Pract	Tut	Total
FY 109	Engineering Mathematics II	BSC	3	2	-	3	1	-	4
FY 110	Engineering Physics II	BSC	2	1	-	2	0.5	-	2.5
FY 111	Engineering Chemistry II	BSC	2	1	-	2	0.5	-	2.5
FY 112	Engineering Mechanics and Graphics *	ESC	3	-	-	3	-	-	3
FY 113	Java Programming	PCC	3	2	-	3	1	-	4
FY 114	Professional Communication and Ethics I	AEC	1	2	-	1	1	-	2
FY 115	Basic Workshop Practice-II and EMG lab *	Skill Courses	-	2+2$	-	-	2	-	2
FY 116	Co-curricular Course II	Liberal Learning Courses	-	2+2#	-	-	2	-	2
Total			**13**	**18**	**-**	**13**	**9**	**-**	**22**

Course Code	Course Name	Examination Scheme							
		Theory							
		Internal Assessment			End Sem Exam	Exam Duration (Hrs)	Term Work	Pract /Oral	Total
		IA 1	IA 2	Avg					
FY 109	Engineering Mathematics II	40	40	40	60	2	25	-	125
FY 110	Engineering Physics II	30	30	30	45	2	25	-	100
FY 111	Engineering Chemistry II	30	30	30	45	2	25	-	100
FY 112	Engineering Mechanics and Graphics *	40	40	40	60	3	-	-	100
FY 113	Java Programming	40	40	40	60	2	25	25	150
FY 114	Professional Communication and Ethics I	20	20	20	30	1	25		75
FY 115	Basic Workshop Practice-II and EMG lab *	-	-	-	-	-	50+25$	25$	100
FY 116	Co-curricular Course II	-	-	-	-	-	50	-	50
Total				**200**	**300**	**12**	**250**	**50**	**800**

BSC-Basic Science Course; ESC-Engineering Science Course; VSEC-Vocational Skill and Skill Enhancement Course; VSC - Vocational Skill Course; AEC-Ability Enhancement Course; IKS-Indian Knowledge System; Value Education Course (VEC); VCC-Co-curricular Courses; * Course may be offered in Sem I or Sem II; # Lecture class wise; $ BEE lab is a part of VSEC course and Termwork and viva marks of BEE should be considered under credit of VSEC

Program Structure for
Bachelor of Technology in Information Technology
Semester III

Course Code	Course Name	Course Category	Teaching Scheme (Contact Hours)			Credits Assigned			
			Theory	Pract	Tut	Theory	Pract	Tut	Total
IT 201	Engineering Mathematics III	BSC	3	-	1*	3	-	1	4
IT 202	Data Structure and Analysis of Algorithm	PCC	3	2	-	3	1	-	4
IT 203	Database Management System	PCC	3	2	-	3	1	-	4
IT 204	Communication Engineering	MD M	2	-	-	2	-	-	2
IT 205	Professional Communication II	AEC	-	2	1	-	1	1	2
IT 206	Human Values and Social Ethics	VEC	2	-	-	2	-	-	2
IT 207	Programming Lab I (Python)	CEP	-	2+2#	-	-	2	-	2
Total			**13**	**10**	**2**	**13**	**5**	**2**	**20**

Course Code	Course Name	Examination Scheme							
		Theory							
		Internal Assessment			End Sem Exam	Exam Duration (Hrs)	Term Work	Pract /Oral	Total
		IA 1	IA 2	Avg					
IT 201	Engineering Mathematics III	40	40	40	60	2	25	-	125
IT 202	Data Structure and Analysis of Algorithm	40	40	40	60	2	25	25	150
IT 203	Database Management System	40	40	40	60	2	25	25	150
IT 204	Communication Engineering	40	40	40	60	2	-	-	100
IT 205	Professional Communication II	40	40	40	60	2	-	-	100
IT 206	Human Values and Social Ethics	-	-	-	-	-	50	-	50
IT 207	Programming Lab I (Python)	-	-	-	-	-	25	25	50
Total				**200**	**300**	**10**	**150**	**75**	**725**

PCC-Programme Core Course; BSC-Basic Science Course; ESC-Engineering Science Course; Open Elective (OE); MD M-Multidisciplinary Minor; HSSM-Humanities Social Science and Management; VSEC-Vocational Skill and Skill Enhancement Course; VSC - Vocational Skill Course; AEC-Ability Enhancement Course; IKS-Indian Knowledge System; Value Education Course (VEC); ELC-Experiential Learning Courses; VCC-Co-curricular Courses; *Tutorial 1hr Batchwise; #Lecture class wise

Program Structure for
Bachelor of Technology in Information Technology
Semester IV

Course Code	Course Name	Course Category	Teaching Scheme (Contact Hours)			Credits Assigned			
			Theory	Pract	Tut	Theory	Pract	Tut	Total
IT 208	Engineering Mathematics IV	BSC	3	-	1*	3	-	1	4
IT 209	Automata Theory and System Software	PCC	3	-	1	3	-	1	4
IT 210	Operating Systems	PCC	3	2	-	3	1	-	4
IT 211	Computer Architecture and Logic Design	MD M	3	-	-	3	-	-	3
IT 212	Personal Finance Management	HSSM	2	-	-	2	-	-	2
IT 213	Innovation and Entrepreneurship	VEC	2	-	-	2	-	-	2
IT 214	Programming Lab II (Web)	VSEC	-	2	-	-	1	-	1
	Total		**16**	**4**	**2**	**15**	**2**	**2**	**20**

Course Code	Course Name	Examination Scheme							
		Theory							
		Internal Assessment			End Sem Exam	Exam Duration (Hrs)	Term Work	Pract /Oral	Total
		IA 1	IA 2	Avg					
IT 208	Engineering Mathematics IV	40	40	40	60	2	25	-	125
IT 209	Automata Theory and System Software	40	40	40	60	2	25	-	125
IT 210	Operating Systems	40	40	40	60	2	25	25	150
IT 211	Computer Architecture and Logic Design	40	40	40	60	2	-	-	100
IT 212	Personal Finance Management	20	20	20	40	2	-	-	60
IT 213	Innovation and Entrepreneurship	-	-	-	-	-	50	-	50
IT 214	Programming Lab II (Web)	-	-	-	-	-	25	25	50
Total				**180**	**280**	**10**	**150**	**50**	**660**

PCC-Programme Core Course; BSC-Basic Science Course; ESC-Engineering Science Course; Open Elective (OE); MD M-Multidisciplinary Minor; HSSM-Humanities Social Science and Management; SEC-Skill Enhancement Course; VSEC-Vocational Skill and Skill Enhancement Course; VSC - Vocational Skill Course; AEC-Ability Enhancement Course; IKS-Indian Knowledge System; Value Education Course (VEC); ELC-Experiential Learning Courses; VCC-Co-curricular Courses; *Tutorial 1hr Batchwise; #Lecture class wise

Program Structure for
Bachelor of Technology in Information Technology
Semester V

Course Code	Course Name	Course Category	Teaching Scheme (Contact Hours)			Credits Assigned			
			Theory	Pract	Tut	Theory	Pract	Tut	Total
IT 301	Computer Network and Security	PCC	3	2	-	3	1	-	4
IT 302	Machine Intelligence	PCC	3	2	-	3	1	-	4
IT 303	Microprocessor and Microcontroller	MD	3	-	-	3	-	-	3
IT 304	Programming Lab III (Android)	VSEC	-	2+2#	-	-	2	-	2
IT 3XY	DLOC I	PEC	3	2	-	3	1	-	4
IL 3XX	ILOC I	OE	3	-	-	3	-	-	3
Total			**15**	**10**	**-**	**15**	**5**	**-**	**20**

Course Code	Course Name	Examination Scheme							
		Theory							
		Internal Assessment			End Sem Exam	Exam Duration (Hrs)	Term Work	Pract /Oral	Total
		IA 1	IA 2	Avg					
IT 301	Computer Network and Security	40	40	40	60	2	25	25	150
IT 302	Machine Intelligence	40	40	40	60	2	25	-	125
IT 303	Microprocessor and Microcontroller	40	40	40	60	2	-	-	100
IT 304	Programming Lab III (Android)	-	-	-	-	-	25	25	50
IT 3XY	DLOC I	40	40	40	60	2	25	25	150
IL 3XX	ILOC I	40	40	40	60	2	-	-	100
Total				**200**	**300**	**10**	**100**	**75**	**675**

PCC-Programme Core Course; BSC-Basic Science Course; ESC-Engineering Science Course; Open Elective (OE); MD M-Multidisciplinary Minor; HSSM-Humanities Social Science and Management; SEC-Skill Enhancement Course; VSEC-Vocational Skill and Skill Enhancement Course; VSC - Vocational Skill Course; AEC-Ability Enhancement Course; IKS-Indian Knowledge System; Value Education Course (VEC); ELC-Experiential Learning Courses; VCC-Co-curricular Courses; *Tutorial 1hr Batchwise; #Lecture class wise

Sem- V DLOC	1. AI and Robotics	2. IoT and Data Analytics	3. Information Security and Forensics	4. Bioinformatics
DLOC I	**IT 311**	**IT 312**	**IT 313**	**IT 314**
	Image and Video Processing	Wireless Technology and 5G	Cryptography and Security	Fundamentals of Computational Biology

Sem- V ILOC	1. Business and Entrepreneurship	2. Bio-Engineering	3. Engineering Design	4. Art and Humanities	5. Applied Science	6. Life Skills, Repair, Maintenance and Safety
ILOC I	**IL**	**IL**	**IL**	**IL**	**IL**	**IL**
	IPR and Patenting	Introduction to Bioengineering	Product Design	Visual Art	Computational Physics	Vehicle Safety

Program Structure for
Bachelor of Technology in Information Technology
Semester VI

Course Code	Course Name	Course Category	Teaching Scheme (Contact Hours)			Credits Assigned			
			Theory	Pract	Tut	Theory	Pract	Tut	Total
IT 305	Software Engineering and Project Management	MD	3	2	-	3	1	-	4
IT 306	Data Mining and Business Intelligence	PCC	3	-	-	3	-	-	3
IT 3XY	DLOC II	PEC	3	2	-	3	1	-	4
IT 3XY	DLOC III	PEC	3	2	-	3	1	-	4
IL 3XX	ILOC II	OE	3	-	-	3	-	-	3
IT 391	Major Project I	VSEC	-	4	-	-	2	-	2
Total			**15**	**10**	**-**	**15**	**5**	**-**	**20**

Course Code	Course Name	Examination Scheme							
		Theory							
		Internal Assessment			End Sem Exam	Exam Duration (Hrs)	Term Work	Pract/ Oral	Total
		IA 1	IA 2	Avg					
IT 305	Software Engineering and Project Management	40	40	40	60	2	25	25	150
IT 306	Data Mining and Business Intelligence	40	40	40	60	2	-	-	100
IT 3XY	DLOC II	40	40	40	60	2	25	25	150
IT 3XY	DLOC III	40	40	40	60	2	25	25	150
IL 3XX	ILOC I	40	40	40	60	2	-	-	100
IT 391	Major Project I	-	-	-	-	-	25	25	50
Total				**200**	**300**	**10**	**100**	**100**	**700**

PCC-Programme Core Course; BSC-Basic Science Course; ESC-Engineering Science Course; Open Elective (OE); MD M-Multidisciplinary Minor; HSSM-Humanities Social Science and Management; SEC-Skill Enhancement Course; VSEC-Vocational Skill and Skill Enhancement Course; VSC - Vocational Skill Course; AEC-Ability Enhancement Course; IKS-Indian Knowledge System; Value Education Course (VEC); ELC-Experiential Learning Courses; VCC-Co-curricular Courses; *Tutorial 1hr Batchwise; #Lecture class wise

Sem-VI Specialization	1. AI and Robotics	2. IoT and Data Analytics	3. Information Security and Forensics	4. Bioinformatics
DLOC II	**IT 321**	**IT 322**	**IT 323**	**IT 324**
	Genetic Algorithms and Fuzzy Systems	Internet of Everything	Cyber Security	Introduction to Bioinformatics
DLOC III	**IT 331**	**IT 332**	**IT 333**	**IT 334**
	Deep Learning	Big Data Analytics	Penetration Testing	Computational Genomics

Sem- VI ILOC	1. Business and Entrepreneurship	2. Bio-Engineering	3. Engineering Design	4. Art and Humanities	5. Applied Science	6. Life Skills, Repair, Maintenance and Safety
ILOC II	**IL**	**IL**	**IL**	**IL**	**IL**	**IL**
	e- Commerce and e-Business	Medical Image Processing	Technologies for Rural Development	Economics	GIS and Remote Sensing	Maintenance of Electronics and Mechanical Equipment

Program Structure for
Bachelor of Technology in Information Technology
Semester VII

Course Code	Course Name	Course Category	Teaching Scheme (Contact Hours)			Credits Assigned			
			Theory	Pract	Tut	Theory	Pract	Tut	Total
IT 401	Cloud Computing	PCC	3	-	-	3	-	-	3
IT 402	Data Science and Visualization	MD	3	2	-	3	1	-	4
IT 403	Skill Lab I (DevOps)	SEC	-	2	-	-	1	-	1
IT 4XY	DLOC IV	PEC	3	2	-	3	1	-	4
IT 4XY	DLOC V	PEC	3	2	-	3	1	-	4
IT 492	Major Project II	Project	-	8	-	-	4	-	4
Total			**12**	**16**	**-**	**12**	**8**	**-**	**20**

Course Code	Course Name	Examination Scheme							
		Theory					Term Work	Pract /Oral	Total
		Internal Assessment			End Sem Exam	Exam Duration (Hrs)			
		IA 1	IA 2	Avg					
IT 401	Cloud Computing	40	40	40	60	2	-	-	100
IT 402	Data Science and Visualization	40	40	40	60	2	25	25	150
IT 403	Skill Lab I (DevOps)	-	-	-	-	-	25	25	50
IT 4XY	DLOC IV	40	40	40	60	2	25	25	150
IT 4XY	DLOC V	40	40	40	60	2	25	25	150
IT 492	Major Project II	-	-	-	-	-	100	50	150
Total				**160**	**240**	**8**	**225**	**150**	**775**

PCC-Programme Core Course; BSC-Basic Science Course; ESC-Engineering Science Course; Open Elective (OE); MD M-Multidisciplinary Minor; HSSM-Humanities Social Science and Management; OJT-On Job Training; SEC-Skill Enhancement Course; VSEC-Vocational Skill and Skill Enhancement Course; VSC - Vocational Skill Course; AEC-Ability Enhancement Course; IKS-Indian Knowledge System; Value Education Course (VEC); ELC-Experiential Learning Courses; VCC-Co-curricular Courses; *Tutorial 1hr Batchwise; #Lecture class wise

Sem-VII Specialization	1. AI and Robotics	2. IoT and Data Analytics	3. Information Security and Forensics	4. Bioinformatics
DLOC IV	IT 441	IT 442	IT 443	IT 444
	Natural Language Processing	Industrial IOT	Digital Forensics	Structural Bioinformatics
DLOC V	IT 451	IT 452	IT 453	IT 454
	Computer Vision	Information Retrieval	Multimedia Forensics	Systems Biology

Program Structure for
Bachelor of Technology in Information Technology
Semester VIII

Course Code	Course Name	Course Category	Teaching Scheme (Contact Hours)			Credits Assigned			
			Theory	Pract	Tut	Theory	Pract	Tut	Total
IT 404	Research Methodology	RM	3	-	-	3	-	-	3
IT 405	Skill Lab II (R Programming)	VSEC	-	4	-	-	2	-	2
IT 4xx	DLOC VI	PEC	3	-	-	3	1	-	3
IT 493	Major Project III	Project	-	8	-	-	4	-	4
IT 494	Internship	OJT	-	16	-	-	8	-	8
Total			**6**	**28**	**-**	**6**	**14**	**-**	**20**

Course Code	Course Name	Examination Scheme							
		Theory							
		Internal Assessment			End Sem Exam	Exam Duration (Hrs)	Term Work	Pract/ Oral	Total
		IA 1	IA 2	Avg					
IT 404	Research Methodology	40	40	40	60	2	-	-	100
IT 405	Skill Lab II (R Programming)	-	-	-	-	-	25	25	50
IT 4xx	DLOC VI	40	40	40	60	2	-	-	100
IT 493	Major Project III	-	-	-	-	-	50	50	100
IT 494	Internship	-	-	-	-	-	100	100	200
Total				**80**	**120-**	**4**	**150**	**150**	**500**

PCC-Programme Core Course; BSC-Basic Science Course; ESC-Engineering Science Course; Open Elective (OE); MD M-Multidisciplinary Minor; HSSM-Humanities Social Science and Management; OJT-On Job Training; SEC-Skill Enhancement Course; VSEC-Vocational Skill and Skill Enhancement Course; VSC - Vocational Skill Course; AEC-Ability Enhancement Course; IKS-Indian Knowledge System; Value Education Course (VEC); ELC-Experiential Learning Courses; VCC-Co-curricular Courses; *Tutorial 1hr Batchwise; #Lecture class wise

Semester VIII Specialization	1. AI and Robotics	2. IoT and Data Analytics	3. Information Security and Forensics	4. Bioinformatics
DLOC VI	IT 461	IT 462	IT 463	IT 464
	Robotics	Social Media Analytics	Social Frauds and Privacy	Computer Aided Drug Design

Course Code	Course Name	Teaching Scheme	Contact Hours				Credits Assigned			
			TH	Pract	Tut	Total	TH	Pract	Tut	Total
IT 101	Engineering Mathematics I		3	2	-	5	3	1	-	4
		Examination Scheme	Internal Assessment			End Sem Exam		Term Work	Pract	Oral	Total Marks
			IA1	IA2	Avg	TH	Hrs				
			40	40	40	60	2	25	-	-	125

1. Course Objectives: The course is aimed:

1. To develop the basic Mathematical skills of engineering students that are imperative for effective understanding of complex numbers in engineering subjects.
2. To acquaint students with the hyperbolic,logarithmic functions and Logic.
3. To understand differentiation and expansions of functions .which will serve as basic tools for specialized studies in many fields of engineering and technology.
4. To learn the partial differentiation techniques and its applications used in engineering problems.
5. To learn the applications of Matrices useful in engineering.
6. To provide hands on experience using SCILAB software to handle Mathematical modelling.

2. Course Outcomes: On successful completion of course learner/student will be able to:

1. Apply the basic concept of complex numbers and use it to solve problems in engineering.
2. Apply the basic concept of Hyperbolic,logarithmic functions and Logic in engineering problems.
3. Apply the concept of expansion of functions, successive differentiation and vector differentiation in optimization problems.
4. Use the basic concepts of partial differentiation in finding the Maxima and Minima required in engineering problems.
5. Use the concept of matrices in solving the system of equations used in many areas of research..
6. Apply the concept of numerical Methods for solving the engineering problems with the help of SCILAB software.

4. Detailed Theory Syllabus:

Module	Detailed Contents	Hrs
1	**Complex Numbers Prerequisite** Review of Complex Numbers- Algebra of Complex Number, Cartesian, polar and exponential form of complex number. 1.1. De Moivre's Theorem.(Without Proof) 1.2. Expansion of sinnθ, cosnθ in terms of sines and cosines of multiples of θ and Expansion of sinnθ, cosnθ in powers of sinθ, cosθ. 1.3. Powers and Roots of complex numbers.	2 2 2
2	**Hyperbolic , Logarithm functions and Logic** 2.1 Introduction to Hyperbolic functions,Logarithmic functions, Separation of real & Imaginary parts. 2.2 Propositional logic, logical equivalence, Negation of given statement,predicates & Quantifiers, Normal form, mathematical induction.	3 3
3	**Successive Differentiation, Expansion of Function and Vector Differentiation** **Prerequisite:- Derivative of standard functions and Rules of derivative** 3.1 Successive differentiation: nth derivative of standard functions. Leibnitz's Theorem (without proof) and problems. 3.2 Taylor's Theorem (Statement only) and Taylor's series, Maclaurin's series (Statement only). Expansion of$e^{\wedge}$ (x), sin(x), cos(x), tan(x), sinh(x), cosh(x), tanh(x),log(1+x), sin−1(x), cos−1 (x), tan−1 (x). 3.3 Vector function of scalar quantities, Vector operator del,gradient,Grad Phi,Directional derivatives.Divergence and curl and their Physical interpretation.	2 2 2

4	**Partial Differentiation and Applications of Partial Differentiation** 4.1 Partial Differentiation: Function of several variables, Partial derivatives of first and higher order. Differentiation of composite function. 4.2. Euler's Theorem on Homogeneous functions with two independent variables (without proof). Deductions from Euler's Theorem. 4.3 Maxima and Minima of a function of two independent variables, Lagrange's method of undetermined multipliers with one constraint. Jacobian of two independent variables.	4 2 3
5	**Matrices** **Prerequisite:** Inverse of a matrix, addition, multiplication and transpose of a matrix,Elementary row and column transformation. 5.1.Symmetric, Skew‐ Symmetric, Hermitian, Skew Hermitian,Unitary, Orthogonal Matrices and properties of Matrices (Without Proof). 5.2 Rank of a Matrix using Echelon forms, reduction to normal form and PAQ form. 5.3.System of homogeneous and non –homogeneous equations, their consistency and solutions.	2 2 2
6	**Numerical Methods** 6.1 **Solution of system of linear algebraic equations**, (1) Gauss Elimination,(2)Gauss Jacobi Iteration Method (3) Gauss Seidel Iteration Method, 6.2 **Solutions of Transcendental equations** (1) Bisection method (2) Secant Method (3) Newton Raphson	3 3

5.Theory Assessment:

Internal Assessment Test: Assessment consists of two class tests of 40 marks each. The first class test is to be conducted when approx. 40% syllabus is completed and the second class test when an additional 35% syllabus is completed.

End Semester Theory Examination:

1. Question paper will comprise of a total 05 questions, each carrying 20 marks.
2. Total 03 questions need to be solved.
3. Question No: 01 will be compulsory and based on the entire syllabus wherein 4 sub-questions of 5 marks each will be asked.
4. Remaining questions will be randomly selected from all the modules.
5. Weightage of each module will be proportional to no. of respective lecture mentioned in the syllabus.

6. Term Work:

General Instructions:

1. Batch wise practicals are to be conducted. The number of students per batch should be as per norms.
2. Students must be encouraged to write SCILAB Programs in the laboratory. Each Student has to perform at least 4. SCILAB practicals and at least 6 assignments on the entire syllabus.
3. SCILAB Practicals will be based on (i) Gauss Elimination(ii) Gauss Seidel Iteration method (iii) Gauss Jacobi Iteration Method (iv) Bisection method (v) Secant Method (vi) Newton Raphson (vii) Matrices (viii) Maxima and Minima.(At least four).

The distribution of Term Work marks will be as follows :

Attendance (Theory, Practicals) : 05 marks
Assignments on entire syllabus : 10 marks
SCILAB Practicals : 10 marks

7. **References:**

1. Higher Engineering Mathematics, Dr.B.S.Grewal, Khanna Publication
2. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley EasternLimited, 9thEd.
3. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Narosa publication,
4. Matrices, Shanti Narayan, S. Chand publication.
5. Applied Numerical Methods with MATLAB for Engineers and Scientists by Steven Chapra, TMH.

Back to Scheme

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
IT 103	Engineering Physics I	Contact Hours	2	1	-	3
		Credits	2	0.5	-	2.5

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
IT 103	Engineering Physics I	30	30	30	45	25	–	--	100

1. Prerequisite: NA

2.Course Objectives:
The course is aimed:
1. To impart knowledge of basic concepts in applied physics and founding principles of technology.
2. To provide the knowledge and methodology necessary for solving problems in the field of engineering.
3. To develop scientific temperament for scientific observations, recording, and inference drawing essential for technology studies.

3.Course Outcomes:
On successful completion of course learner/student will be able to:
1. Explain the limits of Classical Physics and apply the fundamentals of quantum mechanics to study the one dimensional motion of microscopic particles.
2. Apply the knowledge of superconductivity to SQUID and Magnetic levitation.
3. Able to understand fundamental concepts of classical optics and applications of interference in science and technology.
4. Understand the fundamentals of Theory of relativity and its use in various technological applications.
5. Comprehend the concepts of electrodynamics and Maxwell's equations and their use in telecommunication systems.
6. Apply the concepts of electromagnetism in focusing systems and CRO.

4. Detailed Theory Syllabus:

Sr. No.	Module	Detailed Contents	Hrs.	CO Mapping
1	Quantum Mechanics	**Quantum Mechanics** De Broglie hypothesis of matter waves; properties of matter waves; wave packet, phase velocity and group velocity; Wave function; Physical interpretation of wave function; Heisenberg uncertainty principle; non existence of electron in nucleus.	6	1
2	Superconductivity	**Superconductivity** Critical temperature, critical magnetic field, Meissner's effect, Type I and Type II and high Tc superconductors; BCS Theory (concept of Cooper pair); Josephson effect Applications of superconductors- SQUID, MAGLEV.	3	2

3	Thin Film Interference	**Thin Film Interference** Interference by division of amplitude and by division of wave front; Interference in thin film of constant thickness due to reflected and transmitted light; origin of colours in thin film; Wedge shaped film(angle of wedge and thickness measurement); Newton's rings Applications of interference - Determination of thickness of very thin wire or foil; determination of refractive index of liquid; wavelength of incident light; radius of curvature of lens; testing of surface flatness; Anti-reflecting films and Highly reflecting film.	6	3
4	Special theory of relativity	**Special theory of relativity** Postulates of special theory of relativity, Inertial and non-inertial frames of refrances. Gallilian transformation equations, Limitations of gallilian transformation equations Lorentz Transformation equations Length contraction and time dilation. Einstein's Mass energy relation. LIGO Project , Discovery of 4 degree Kelvin Cosmic background radiation	4	4
5	Electrodynamics	**Electrodynamics** Scalar and vector fields, Cartesian, Cylindrical and Spherical Coordinate system, gradient, curl and divergence in Cartesian coordinate system, line integral, surface integral, volume integral, divergence theorem, Stoke's theorem, Maxwell's Equations.	4	5
6	Electron Optics	**Electron Optics** Electrostatic focusing , Magnetostatic focusing, Cathode Ray Tube(CRT), Construction and working of CRO. Lissajous figures.	2	6

5. Suggested Experiments: (Any five)

1. Determination of radius of curvature of a lens using Newton's ring set up
2. Determination of diameter of wire/hair or thickness of paper using Wedge shape film method and estimation of Young's modulus of the material.
3. Brewster's law (Polarisation of light by reflection through glass slab.)
4. To study the nature of polarisation of laser light using photocell and quarter wave plate (QWP)
5. Use of CRO for measurement of frequency and amplitude.
6. Determination of unknown frequency by Lissajous figures.

6. Internal Assessment:

Internal Assessment Test: Assessment consists of two class tests of 30 marks each. The first class test is to be conducted when approx. 40% syllabus is completed and the second class test when an additional 35% syllabus is completed.

End Semester Theory Examination: In question, paper weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.

1. Question paper will consist of 3 questions, each carrying 15 marks.
2. Question number 1 will be compulsory and based on maximum contents of the syllabus
3. Remaining questions will be mixed in nature (for example, if Q.2 has part (a) from module 3 then part (b) will be from other than module 3)
4. Total three questions need to be solved.

Term work:

Term Work shall consist of a minimum five experiments.

The distribution of marks for term work shall be as follows:

Laboratory work (Experiments and Journal) :10 marks
Project Groupwise or Topic Presentation : 10 marks
Attendance (Theory and Practical) : 05 marks

The final certification and acceptance of TW ensures the satisfactory performance of laboratory work and minimum passing in the TW.

7. **References:**

1. A text book of Engineering Physics-Avadhanulu & Kshirsagar, S. Chand
2. A textbook of Optics - N. Subramanyam and Brijlal, S.Chand
3. Fundamentals of optics by Jenkins and White, McGrawHill
4. Modern Engineering Physics – Vasudeva, S.Chand
5. Concepts of Modern Physics- ArtherBeiser, Tata McGraw Hill
6. A TextBook of Engineering Physics, S. O. Pillai, New Age International Publishers
7. Optics - Ajay Ghatak, Tata McGraw Hill8. Introduction to Electrodynamics- D. J. Griffiths, Pearson publication
8. Introduction to Electrodynamics- D. J. Griffiths, Pearson publication
9. Physics for Engineers, M.R. Srinivasan, New Age International Publishers.
10. Introduction to Special Relativity- Robert Resnick, John Wiley and sons.

Back to Scheme

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
IT 105	Engineering Chemistry I	Contact Hours	2	-	01	3
		Credits	2	-	0.5	2.5

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
IT 105	Engineering Chemistry I	30	30	30	45	25	–	--	100

1. Prerequisite: NA

2.Course Objectives:
The course is aimed :

1. To impart a scientific approach and to familiarize the applications of chemistry in the field of engineering.
2. The student with the knowledge of the basic chemistry, will understand and explain scientifically the various problems related to chemistry in the industry/engineering field.
3. To develop abilities and skills that are relevant to the study and practice of chemistry.

3. Course Outcomes:
On successful completion of course learner/student will be able to:

1. To understand and analyse the combustion mechanisms of various fuels and be able to characterize the fuels.
2. To select various lubricants for different industrial applications.
3. To become familiarized with corrosion forms and their effects and to recognize and use the method of corrosion protection.
4. To analyse the quality of water and will be able to suggest methods to improve water quality.
5. To assess the environmental impact and understand the methods for their minimisation.

Detailed Theory Syllabus:

Sr. No	Module	Detailed Content	Hours	CO Mapping
1	Fuels and Combustion	**Fuels and Combustion** **Pre-requisite:** What are fuels, Types of fuels, Characteristics of fuels. 1.1. Calorific value of a fuel - HCV and LCV, Theoretical determination of calorific value of fuel by Dulong's formula, Numerical problems 1.2 Solid fuels : Coal, Analysis of coal - Proximate and Ultimate analysis, Numerical problems Liquid fuels: Composition and Classification, Octane number, Cetane number, Biodiesel Gaseous Fuels: LPG and CNG 1.3. Combustion of fuels – Numerical problems for calculating the amount of air needed for the complete combustion of solid and gaseous fuels.	5	1

2	Lubricants	**Lubricants** **Pre-requisite**: Definition of Lubricants and Lubrication, functions of lubricants 2.1 Mechanisms of lubrication – Thick film, Thin film and Extreme pressure 2.2 Classification of lubricants - Solid (MoS_2, graphite), Semi solid (greases), Liquid (animal/vegetable oils, mineral oils, synthetic oils) 2.3 Properties of lubricants and their significance - Viscosity and Viscosity Index, Flash and Fire Points, Cloud and Pour Points, Acid Number, Saponification Number, Steam Emulsification Number and related numerical problems.	4	2
3	Corrosion	**Corrosion** **Pre-requisite:-** corrosion , corrosion product, electrochemical series, corrosive and non corrosive metals. 3.1 Mechanism of corrosion - Chemical and Electrochemical corrosion. 3.2 Types of corrosion : Galvanic corrosion, Differential aeration corrosion, Pitting corrosion, Intergranular corrosion, Waterline corrosion, Stress corrosion. 3.3 Factors Affecting Corrosion Rate : - (i) Nature of metal, (ii) Nature of environment.	4	3
4	Corrosion Prevention	**Corrosion Prevention** 4.1 Methods of Corrosion Control : Material selection, Design, Cathodic protection, Anodic protection 4.2 Protective Coatings: Metallic coatings anodic coating (galvanizing) and cathodic coating (Tinning), Different Methods of Applying Metallic Coatings (No explanation needed) 4.3 Organic coatings – Paints and Special Paints.	3	4
5	Water and Its Treatment	**Water and Its Treatment** **Pre-requisite :** Knowledge of sources of water, Possible impurities in water, Characteristics imparted by impurities in water. 5.1 Hardness in water – types & its units, Determination of hardness by EDTA method, and numerical problems. 5.2. Effects of Hard water in boilers - Priming and Foaming, Scales and Sludges, Boiler corrosion, caustic embrittlement. 5.3 Softening of water- Ion exchange process. 5.4 Desalination of brackish water- Reverse Osmosis, Electrodialysis, Ultrafiltration. 5.5 Municipal water treatment – Primary, secondary and tertiary, BIS specification of drinking water.	5	5
6	Environmental Chemistry	**Environmental Chemistry** **Pre-requisite:** Definition of Environment and Primary concept of environmental pollution**.** 6.1 Concept and Scope of Environmental Chemistry. 6.2 Environmental Pollution and Control Water Pollution - BOD and COD, determination and numerical problems E- pollution and N- pollution 6.2 Concept of 12 principles of Green chemistry, discussion with examples, numericals on atom economy.	3	6

5. Suggested Experiments:

1. Determination of Hardness in water
2. Determination of Viscosity of oil by Redwood Viscometer
3. Determination of Flash point of a lubricant using Abel‘s apparatus
4. Determination of Acid Value and Saponification Value of an oil.
5. Determination of Chloride content of water by Mohr‘s Method
6. Determination of moisture content in coal sample.
7. Study of the effect of different environments (Acid, Base) on corrosion rate.
8. Determination of COD Value of water.
9. Removal of hardness using ion exchange column. Calorific value of liquid fuel

6. Theory Assessment:

Internal Assessment Test: Assessment consists of two class tests of 30 marks each. The first class test is to be conducted when approx. 40% syllabus is completed and the second class test when an additional 35% syllabus is completed.

End Semester Theory Examination: In question paper weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.

1. Question paper will consist of 3 questions, each carrying 15 marks.
2. Question number 1 will be compulsory and based on maximum contents of the syllabus
3. Remaining questions will be mixed in nature (for example, if Q.2 has part (a) from module 3 then part (b) will be from other than module 3)
4. Total three questions need to be solved.

7. Practical Assessment

Term work:

Term Work shall consist of a minimum five experiments. The distribution of marks for term work shall be as follows:

Laboratory work (Experiments and Journal)	: 10 marks
Assignments and Viva on modules	: 10 marks
Attendance (Theory and Tutorial)	: 05 marks

The final certification and acceptance of TW ensures the satisfactory performance of laboratory work and minimum passing in the TW.

8. References:

1. Engineering Chemistry – P.C.Jain and Monika Jain, Dhanpat Rai Publications
2. A Textbook of Engineering Chemistry, - Shashi Chawla (DhanpatRai publications)
3. A textbook of Engineering Chemistry - S.S. Dara, S. Chand Publishing House
4. Engineering Chemistry – O.G. Palanna , Tata Mc Graw Hill
5. Environmental Chemistry – A.K.De, New Age International

Back to Scheme

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
IT 107	Basic Electrical and Electronics Engineering *	Contact Hours	3	2	-	5
		Credits	3	1	-	4

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
IT 107	Basic Electrical and Electronics Engineering *	40	40	40	60	25	25	--	150

1. Prerequisite: NA

2. Course Objectives:
The course is aimed
1. To provide knowledge on fundamentals of D.C. circuits.
2. To provide knowledge of D.C network theorems and its applications.
3. To impart knowledge on fundamentals of A.C. circuits
4. To impart knowledge on fundamentals of single phase A.C circuits and its applications.
5. To impart knowledge on fundamentals of 3-Φ A.C. circuits and its applications.
6. To impart knowledge on OP-AMP and IC555.

3. Course Outcomes:
On successful completion of course learner/student will be able to:
1. Apply basic concepts to analyse D.C circuits.
2. Apply various D.C network theorems to determine the circuit response/ behavior.
3. Apply basic concepts to analyze A.C waveforms.
4. Evaluate and analyze single phase A.C circuits.
5. Evaluate and analyze three phase A.C circuits.
6. Implement applications using OPAMP and timer circuit.

4. Detailed Theory Syllabus:

Module	Detailed Contents	Hrs.
1	**DC Circuits** Series and Parallel circuits, Concept of short and open circuits,Star-delta transformation, Ideal and practical voltage and current source,Kirchhoff 's laws, Mesh and Nodal analysis (super node and super mesh included), Source transformation.	6
2	**DC Theorems** Linear and Nonlinear Circuit,Active and passive network,Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, (Source transformation not allowed for Superposition theorem).	6
3	**AC fundamentals** Generation of alternating voltages, A.C terminology, RMS and Average value, form factor, crest factor, Phasor representation of alternating quantities , addition and subtraction of alternating quantities using phasors	3
4	**Single Phase AC Circuits** AC through pure resistor, inductor and capacitor. AC through R-L , R-C and R-L-C series and	9

	parallel circuits, phasor diagrams, power and power factor, series and parallel resonance, Q-factor**.**	
5	**Three Phase AC Circuits** Three phase voltage and current generation, star and delta connections (balanced load only), relationship between phase and line currents and voltages in star and delta connections, Phasor diagrams, Basic principle of wattmeter, measurement of power by two wattmeter method.	6
6	**Operational Amplifier and Integrated Circuits** Basics of semiconductor devices, Ideal characteristics of operational amplifiers (OP-AMP), concept of virtual ground, OP-AMP as inverting and non inverting amplifier, adder and subtractor, integrator and differentiator, OP-AMP as a comparator with different applications. Introduction to IC555 as a timer circuit, internal block diagram of IC555, Astable and Monostable Multivibrator using IC 555.	6

5. Suggested List of Experiments: (Any five)

1. Mesh and Nodal analysis.(Module 1)
2. Verification of Superposition Theorem.(Module 2)
3. Verification Thevenin's Theorem.(Module 2)
4. Study of R-L series and R-C series circuits. (Module 3 and Module 4)
5. R-L-C series resonance circuit / parallel resonant circuit. (Module 3 and Module 4)
6. Relationship between phase and line currents and voltages in three phase system (star & delta).(Module 5)
7. Power and phase measurement in three phase system by one wattmeter method.(Module 5)
8. Power and phase measurement in three phase system by two wattmeter method.(Module 5)
9. LTSpice Simulation of OPAMP as an integrator/ differentiator.(Module 6)
10. LTSpice Simulation of 555 Timer as an Astable Multivibrator/ Monostable Multivibrator. (Module 6)

6. Theory Assessment:

Internal Assessment Test: Assessment consists of two class tests of 40 marks each. The first class test is to be conducted when approx. 40% syllabus is completed and the second class test when an additional 35% syllabus is completed.

End Semester Theory Examination:

1. Question paper will comprise of a total 05 questions, each carrying 20 marks.
2. Total 03 questions need to be solved.
3. Question No. 1 will be compulsory and based on the entire syllabus wherein 4 sub-questions of 5 marks each will be asked.
4. Remaining questions will be randomly selected from all the modules.
5. Weightage of each module will be proportional to number of respective lectures mentioned in syllabus.

7. Practical Assessment

Term Work: General Instructions: Term work consists of performing minimum 06 practicals . Final certification and acceptance of the term work ensures satisfactory performance of laboratory work.

The distribution of Term Work marks will be as follows –

Attendance (Theory, Practicals) : 05 marks
Assignments on entire syllabus : 10 marks
Laboratory work (Journal) : 10 marks

8.Text/References Books:

1. B.L.Theraja, "Electrical Technology" Vol-I and II, S. Chand Publications, 23 rd ed. 2003.
2. Joseph A Edminister, "Schaum's outline of theory and problems of electric circuits", TMH, 2ed.
3. "Electronics Devices & Circuit Theory", by Boylestad, Pearson Education India .
4. D P Kothari and I J Nagrath, "Theory and Problems of Basic Electrical Engineering", PHI 13ed, 2011.
5. "Basic Electrical & Electronics Engineering (BEE)", by Prof. B. R. Patil, Oxford Higher Education.
6. "Basic Electrical & Electronics Engineering (BEE) by Prof.Ravish Singh", McGraw Hill Education.

Back to Scheme

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
IT 111	C Programming	Contact Hours	2	2	-	4
		Credits	2	1	-	3

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
IT 111	C Programming	40	40	40	60	25	–	25	150

1. Prerequisite: NA

2. Course Objectives:

1. To provide exposure to problem-solving by developing algorithms and designing flowchart.
2. Implement the logic to solve real world problems using the C programming language.
3. To develop solutions using different programming concepts.
4. To be able to write and read data from files.
5. To decompose solutions into smaller units using functions.
6. To create different types of data-structure using structure, arrays and pointers.

3. Course Outcomes:

1. Understand the basic terminology used in computer programming.
2. Use different data types, operators and keywords to write programs
3. Able to logically code using control statements and loops.
4. Use the concepts of arrays, strings,functions and Structures to structure complex programs
5. Use of pointers to access different user defined data types like arrays, Strings and Structures
6. Use different data structures and open/create/update basic data files.

4. Detailed Syllabus:

Sr. No.	Module	Detailed Content	Hrs.	CO Mapping
1	Fundamentals of C Programming	History of C programming language and its features 1.1 Algorithm & Flowchart : Three construct of Algorithm and flowchart: Sequence, Decision (Selection) and Repetition 1.2 Character Set, Identifiers and keywords, Data types, Constants, Variables. 1.3 Operators-Arithmetic, Relational and logical, Assignment, Unary, Conditional, Bitwise, Comma, other operators. Expression, statements, Preprocessor, Structure of basic C program.	5	1,2
2	Control Flow Statements	2.1 Decision making statements- if statement, if-else statement , if-else-if ladder, nested if-else, switch statement 2.2 Looping – while , do-while, for 2.3 Jump Statements- break, continue, goto, return, exit	10	2,3

3	Functions	3.1 Introduction to Functions, declaring and defining function, calling function, passing arguments to a function, recursion and its application. 3.2 Library functions – getchar( ), putchar( ), gets( ), puts( ), Math function, Ctype functions 3.3 Storage classes in C-auto, extern, static, register	5	4
4	Arrays, Strings and Structures	4.1 Array Introduction, Declaration, Initialization, Accessing array element, One and Two-dimensional array. 4.2 Strings Introduction, String using char array, String handling functions 4.3 Structure Introduction,Declaration, Initialization, Nested structure, Array of Structure.	10	3,4
5	Pointers	5.1 Pointer :Introduction, Definition, Pointer Variables, Referencing and Dereferencing operator, Pointer Arithmetic, Pointers to Pointers, void Pointer, 5.2 Pointers to Array and Strings, Passing Arrays to Function, Accessing structure using pointers, Array of Pointers, call by value and call by reference. 5.3 Dynamic Memory Allocation using malloc, calloc, realloc, free	6	5
6	File Handling	6.1 Introduction, types of Files, File Operations- Opening, Modes of opening a file, Closing, Creating, Reading, Processing File.	3	6

5. Suggested List of Experiment:

1. Write algorithm and draw flowchart to find roots of quadratic equation
2. Write a program to swap two integers with and without using temporary variables.
3. Write a program to calculate the volume of a cone. Accept radius & height from the user
4. Write a program to find the greatest among three integers using ternary operator & if-else.
5. An electric power distribution company charges its domestic customer as follows :

Consumption Units	**Rate of charge**
0 - 200	0.50 per unit
201 - 400	Rs. 100 plus 0.65 per unit excess of 200 units
401 - 600	Rs. 230 plus 0.85 per unit excess of 400 units
601 & above	Rs. 390 plus 1.00 per unit excess of 600 units.

Program should read units consumed for a customer and calculate the total bill.

6. Write a program to take input for a character and print the month names starting with that character using a switch case. (Ex: I/P = 'A', O/P = April, August).
7. Write a program to find the result of the series: 1 - 22/3 + 32/5 - .....+ n2/(2n-1)
8. Write a program to print the following pattern : (Take input for the no. of lines 'N').

```
*
* *
* * *
* * * *
```

9. Write a program to print the following pattern : (Take input for the no. of lines 'N').

```
1
12A
123BA
1234CBA
```

10. Write a program to find if the given number is palindrome number or not

11. Write a program for the sum of natural numbers using a recursive function.
12. Write a program to illustrate different ways of passing parameters to a function to demonstrate increment/decrement operators.
13. Write a program to cyclically rotate elements of the integer array in the right direction.
14. Write a program to find transpose using the same matrix.
15. Write a program to find the reverse of a string using another string (Define a user defined function to find the length of the string).
16. Write a program using Structure to accept employee name, emp_id, date_of_joining and salary. Display the result in descending order of salary. Store data for N Employees.
17. Write a program to dynamically allocate memory for the user entered size 'N' of an array, accept 'N' integers from the user and find the average of these integers using function and pointer (Pass array to the function using pointer).
18. Write a program to accept a set of characters from the user until the user presses the full stop ('.') and store it in a text file. Read from the file and display the contents of the file.

6. Theory Assessments:

Internal Assessment Test: Assessment consists of two class tests of 40 marks each. The first class test is to be conducted when approx. 40% syllabus is completed and the second class test when an additional 35% syllabus is completed.

End Semester Theory Examination:

1. Question paper will comprise of a total 05 questions, each carrying 20 marks.
2. Total 03 questions need to be solved.
3. Question No. 1 will be compulsory and based on the entire syllabus wherein 4 sub-questions of 5 marks each will be asked.
4. Remaining questions will be randomly selected from all the modules.
5. Weightage of each module will be proportional to number of respective lectures mentioned in the syllabus.

7. Practical Assessment:

Term Work: Experiments (20 Programs) and Assignments (2 Assignments) should be completed by students on the given time duration.

Total	: 25 Marks
Experiments	: 15 Marks
Assignment	: 05 Marks
Attendance	: 05 Marks

The final certification and acceptance of TW ensures the satisfactory performance of laboratory work and minimum passing in the TW.

Oral: Oral Exams should be conducted on Programming in C subject for a given list of experiments. Total: 25 Marks

8. Text/References Books:

1. "Programming in ANSI C", by E. Balaguruswamy, Tata McGraw-Hill Education
2. "A Computer Science –Structure Programming Approaches using C ", Behrouz F., Cengage Learning
3. "Let Us C", by Yashwant Kanetkar, BPB Publication
4. "MASTERING C" by K.R.Venugopal and SudeepR.Prasad , Tata McGraw-Hill Publications
5. "Programming Techniques through C", by M. G. Venkateshmurthy, Pearson Publication.
6. "Programming in C", by Pradeep Dey and Manas Gosh, Oxford University Press.
7. Schaum's outlines "Programming with C", by Byron S. Gottfried, Tata McGraw-Hill Publications.
8. "Basics of Computer Science", by BehrouzForouzan , Cengage Learning .

Back to Scheme

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
IT 117	Basic Workshop Practice I	Contact Hours		2	-	2
		Credits	–	1	-	1

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
IT 117	Basic Workshop Practice I	–	-	–		25	25	--	50

1.Prerequisites: NA

2.Course Objectives

1. To impart training to help the students develop engineering skill sets.
2. To inculcate respect for physical work and hard labor.
3. To get exposure to interdisciplinary engineering.

3. Course Outcomes:

Learners will be able to...

1. Develop the necessary skill required to handle/use different fitting tools.
2. Develop skills required for hardware maintenance.
3. Able to install an operating system and system drives.
4. Able to identify the network components and perform basic networking and crimping.
5. Able to prepare the edges of jobs and do simple arc welding.
6. Develop the necessary skill required to handle/use different plumbing tools.
7. Demonstrate the turning operation with the help of a simple job.

Detail Syllabus:

Trade	Detailed Content	Hrs.
Trade 1 and 2 are compulsory. Select any ONE trade topics out of the topic at trade 3 to 5. Demonstrations and hands on experience to be provided during the periods allotted for the same. Report on the demonstration including suitable sketches is also to be included in the term work CO-1 is related to Trade-1 CO-2 to CO-4 is related to Trade-2 CO-5 is related to Trade-3 CO-6 is related to Trade-4 CO-7 is related to Trade-5 CO evaluation is to be done according to the opted Trades in addition to Compulsory Trades.		
Trade-1	Fitting (Compulsory): Use and setting of fitting tools for chipping, cutting, filing, marking, center punching, drilling, tapping. Term work to include one job involving following operations : filing to size, one simple male- female joint, drilling and tapping	10

Trade-2	Hardware and Networking: (Compulsory) Dismantling of a Personal Computer (PC), Identification of Components of a PC such as power supply, motherboard, processor, hard disk, memory (RAM, ROM), CMOS battery, CD drive, monitor, keyboard, mouse, printer, scanner, pen drives, disk drives etc. · Assembling of PC, Installation of Operating System (Any one) and Device drivers, Boot-up sequence. Installation of application software (at least one) · Basic troubleshooting and maintenance · Identification of network components: LAN card, wireless card, switch, hub, router, different types of network cables (straight cables, crossover cables, rollover cables) Basic networking and crimping. NOTE: Hands on experience to be given in a group of not more than four students	8
Trade-3	Welding: Edge preparation for welding jobs. Arc welding for different job like, Lap welding of two plates, butt welding of plates with simple cover, arc welding to join plates at right angles.	6
Trade-4	Plumbing: Use of plumbing tools, spanners, wrenches, threading dies, demonstration of preparation of a domestic line involving fixing of a water tap and use of coupling, elbow, tee, and union etc	6
Trade-5	Machine Shop: At least one turning job is to be demonstrated and simple job to be made for Term Work in a group of 4 students	6

Laboratory Assessment
Internal Assessment: 50 marks
Term Work:

1. All the jobs mentioned above
2. Complete Work-Shop Book giving details of drawing of the job and time sheet

The distribution of marks for Term work shall be as follows:

Job Work : 30 marks
Workshop book : 10 marks
Attendance : 10 marks

Books/References:

1. Workshop Technology by H K Hajara Choudhary
2. Manufacturing Technology by R C Jain
3. Workshop Technology by R S Khurmi and J S Gupta
4. Workshop Technology by Chapman.

Back to Scheme

Course Code	Course Name	Teaching Scheme	Contact Hours				Credits Assigned			
			TH	Pract	Tut	Total	TH	Pract	Tut	Total
IT 102	Engineering Mathematics II		3	2	-	5	3	1	-	4
		Examination Scheme	Internal Assessment			End Sem Exam		Term Work	Pract	Oral	Total Marks
			IA1	IA2	Avg	TH	Hrs				
			40	40	40	60	2	25	-	-	125

1. Course Objectives: The course is aimed to:

1. To develop the basic mathematical skills of differential equations of engineering students
2. To understand the linear differential equation with constant coefficients used in mathematical modelling.
3. To acquaint the students with the Beta, Gamma functions and set theory.
4. To learn different techniques to solve double integrations.
5. To learn the applications of integration in solving complex engineering problems.
6. To provide knowledge of numerical techniques using SCILAB software to handle Mathematical modelling.

2. Course Outcomes: On successful completion of course learner/student will be able to:

1. Apply the basic concept of linear differential equations to solve problems in engineering.
2. Apply the basic concept of applications of higher order differential equations in mathematical modelling to solve real life problems.
3. Apply the basic concepts of beta ,gamma and set theory to solve engineering problems.
4. Apply the concept of double integration in solving problems of engineering and technology.
5. Apply the concept of double integrations to find length,area and volume.
6. Apply the concept of differentiation and integration numerically for solving the engineering problems with the help of SCILAB software.

3. Detailed Theory Syllabus:

Module	Module	Detailed Contents of Module	Hrs.	CO
1	Differential Equations of First Order and First Degree	**Differential Equations of First Order and First Degree** 1.1 Exact differential Equations, Equations reducible to exact form by using integrating factors. 1.2 Linear differential equations , equations reducible to linear form. 1.3 Application of differential equations of first order and first degree in engineering.	6	1
2	Linear Differential Equations	**Linear Differential Equations With Constant Coefficients and Variable coefficients of higher order** 2.1 Linear Differential Equation with constant coefficient- complementary function, particular integrals of differential equation of the type f(D)y = X where X is e^{ax} , sin($ax + b$) , cos ($ax + b$), x^n, $e^{ax}V$, xV. 2.2 Cauchy Differential equation, Method of variation of parameters two variables	7	2
3	Beta and amma Function, Set theory	**Beta and Gamma Function, Set theory** 3.1 Beta and Gamma functions and its properties. 3.2 Basics of set theory and set operations,law of set, partition of set, Power set, cartesian product, Inclusion-Exclusion Principle	6	3
4	Double Integration	**Double Integration** **Prerequisite**:Tracing of curves 4.1 Double integration- Evaluation of Double Integrals.(Cartesian & Polar),Change of order of Integration and evaluation 4.2 Evaluation of integrals over the given region.(Cartesian & Polar) 4.3. Evaluation of double integrals by changing to polar coordinates.	7	4

5	Applications of integration	**Applications of integration** :- 5.1 Rectification of plane curves.(Cartesian and polar) 5.2. Application of double integrals to compute Area 5.3.Triple integration**:** Evaluation (Cartesian, cylindrical and spherical polar coordinates)	6	5
6	Numerical Techniques	**Numerical Techniques:-** 6.1. **Numerical solution of ordinary differential equation** (a) Euler's method (b) Modified Euler method, (c)Runge‑Kutta fourth order method 6.2. **Numerical integration**‑ (a) Trapezoidal (b) Simpson's 1/3rd (c) Simpson's 3/8th rule	3	6

4. Theory Assessment:

Internal Assessment: Two class tests of 40 marks each. The first class test is to be conducted when approx. 40% syllabus is completed and the second class test when an additional 35% syllabus is completed.

End Semester Theory Examination:

In question, paper weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.

1. Question paper will consist of 3 questions, each carrying 20 marks.
2. Question number 1 will be compulsory and based on maximum contents of the syllabus
3. Remaining questions will be mixed in nature (for example, if Q.2 has part (a) from module 3 then part (b) will be from other than module 3)
4. Total three questions need to be solved.

5. Practical Assessment: The final certification and acceptance of TW ensures the satisfactory performance of laboratory work and minimum passing in the TW.

Term Work: Term Work shall consist of practicals based on the above list. Also Term work Journal must include at least 2 assignments based on the topics mentioned in the syllabus.

Term Work Marks: 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance)

General Instructions:

1. Batch wise practicals are to be conducted. The number of students per batch should be as per norms.
2. Students must be encouraged to write SCILAB Programs in the laboratory. Each Student has to perform at least 4 SCILAB practicals and at least 6 assignments on the entire syllabus.
3. SCILAB Practicals will be based on (i) Euler's method (ii) Modified Euler method, (iii)Runge‑Kutta fourth order method (iv) Trapezoidal (v) Simpson's 1/3rd (vi) Simpson's 3/8th rule(vii) Differential equations (viii) Integratio.(At least four)

7. Books and References:

1. Higher Engineering Mathematics, Dr.B.S.Grewal, Khanna Publication
2. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley EasternLimited, 9thEd.
3. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Narosa publication,
4. Applied Numerical Methods with MATLAB for Engineers and Scientists by Steven Chapra, McGraw Hill.

Back to Scheme

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
IT 104	Engineering Physics II	Contact Hours	2	1	-	3
		Credits	2	0.5	-	2.5

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
IT 104	Engineering Physics II	30	30	30	45	25	–	--	100

1. Course Objectives:
The course is aimed to:

1. To impart knowledge of basic concepts in applied physics and founding principles of technology..
2. To provide the knowledge and methodology necessary for solving problems in the field of engineering.
3. To develop scientific temperament for scientific observations, recording, and inference drawing essential for technology studies.

2. Course Outcomes:
On successful completion of course learner/student will be able to:

1. Explain the functioning of lasers and their various applications.
2. Able to explain the working principle of optical fibres and their applications especially in the field of communication
3. To comprehend the basic concepts of semiconductor physics and apply the same to electronic devices.
4. To analyze digital logic processes and implement logical operations using various combinational logic circuits.
5. To analyze design and implement logical operations using various sequential logic circuits.
6. Interpret and explore basic sensing techniques for physical measurements in modern instrumentations.

3. Detailed Theory Syllabus:

Module No	Module	Detailed Contents of Module	Hrs.	CO Mapping
1	Lasers	Laser: spontaneous emission and stimulated emission; metastable state, population inversion, types of pumping, resonant cavity, Einstein's equations; Helium Neon laser; Nd:YAG laser; Semiconductor laser,Applications of laser-Holography (construction and reconstruction of holograms) and industrial applications(cutting, welding etc), Applications in the medical field.	4	1
2	Optical Fibres	Working Principle and structure ,Numerical Aperture for step index fibre; critical angle; angle of acceptance; V number; number of modes of propagation; types of optical fibres; (Applications :) Fibre optic communication system; sensors (Pressure, temperature, smoke, water level), applications in the medical field.	4	2

3	Semiconductor Physics	Splitting of energy levels for band formation; Classification of semiconductors(direct & indirect band gap, elemental and compound); Conductivity, mobility, current density (drift & diffusion) in semiconductors(n type and p type); Fermi Dirac distribution function; Fermi energy level in intrinsic & extrinsic semiconductors; effect of impurity concentration and temperature on fermi level; Fermi Level diagram for p-n junction(unbiased, forward bias, reverse bias); Breakdown mechanism (zener avalanche), Hall Effect Applications of semiconductors: Rectifier diode, LED, Zener diode, Photo diode, Photovoltaic cell, BJT, FET, SCR., MOSFET	7	3
4	Logic gates and combinational Logic circuits	Logic gates and combinational Logic circuits: Review of Binary,Octal and Hexadecimal Number systems and their interconversion, Difference between analog and digital signal, Logic levels, Digital logic gates,, Universal gates, Realization using NAND and NOR gates, Half adder and Full adder circuit, MUX - DEMUX, ENCODERS and DECODERS.	3	4
5	Sequential Logic Circuits	Sequential Logic Circuits: Flip Flops: R-S and J-K Flip Flops, Conversion of flip-flops to shift registers. Counters: Up/Down and BCD counter.	4	5
6	Physics of Sensors	Physics of Sensors: Temperature Sensor- Resistance Temperature Detectors(RTDs) (PT-100), LM 35 Temperature sensor Soil Moisture sensor, Gas sensor MQ135 Pressure Transducers- Capacitive pressure transducer, Inductive pressure transducer. Piezoelectric transducers: Concept of piezoelectricity, use of piezoelectric transducer as ultrasonic generator and application of ultrasonic transducer for distance measurement, liquid and air velocity measurement. Ultrasonic Hc04	3	6

4. Suggested Experiments:

1. Determination of wavelength using Diffraction grating. (Laser source)
2. Determination of angular divergence of laser beam.
3. Study of Hall Effect.
4. Determination of energy band gap of semiconductor.
5. Study of I-V characteristics of LED.
6. Determination of 'h' using Photocell.
7. Study of I-V characteristics of semiconductor photodiode and determination of its spectral response.
8. Study of I-V characteristics of a photovoltaic solar cell and finding the efficiency.
9. Design AND, OR, NOT, EXOR, EXNOR gates using Universal gates: NAND and NOR
10. Implement Half adder, Full adder, Half subtractor and Full subtractor circuits.
11. Verify the truth table of different types of flip flops.
12. Design asynchronous/synchronous MOD N counter using IC7490.
13. Zener Diode as a voltage regulator.
14. Determination of number of lines on the grating surface using LASER Source.
15. Determination of Numerical Aperture of an optical fibre.

5. Theory Assessment:

Internal Assessment: Two class tests of 30 marks each. The first class test is to be conducted when approx. 40% syllabus is completed and the second class test when an additional 35% syllabus is completed.

End Semester Theory Examination: In question, paper weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.

1. Question paper will consist of 3 questions, each carrying 15 marks.
2. Question number 1 will be compulsory and based on maximum contents of the syllabus
3. Remaining questions will be mixed in nature (for example, if Q.2 has part (a) from module 3 then part (b) will be from other than module 3)
4. Total three questions need to be solved.

6. Practical Assessment: The final certification and acceptance of TW ensures the satisfactory performance of laboratory work and minimum passing in the TW.

Term Work: Term Work shall consist of practicals based on the above list. Also Term work Journal must include at least 2 assignments based on the topics mentioned in the syllabus.

Term Work Marks: 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance)

7. Books and References:

1. A text book of Engineering Physics-Avadhanulu & Kshirsagar, S. Chand
2. A textbook of Optics - N. Subramanyam and Brijlal, S.Chand
3. Fundamentals of optics by Jenkins and White, McGrawHill
4. Modern Engineering Physics – Vasudeva, S.Chand
5. Concepts of Modern Physics- ArtherBeiser, Tata McGraw Hill
6. A TextBook of Engineering Physics, S. O. Pillai, New Age International Publishers.
7. Optics - Ajay Ghatak, Tata McGraw Hill
8. Solid State Electronic Devices- B. G. Streetman, Prentice Hall Publisher
9. R. P. Jain, “Modern Digital Electronics", Tata McGraw Hill Education, Fourth Edition (2010).
10. Handbook of Modern Sensors Physics design and application- Jacob Fraden, Springer, AIP press.
11. Physics for Engineers, M.R. Srinivasan, New Age International Publishers.

Back to Scheme

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
IT106	Engineering Chemistry II	Contact Hours	2	1	-	3
		Credits	2	0.5	-	2.5

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
IT106	Engineering Chemistry II	30	30	30	45	25	–	--	100

1. Course Objectives:
The course is aimed to:

1. With the knowledge of the basic chemistry, the student will be able to understand and explain scientifically the various chemistry related problems in the industry/engineering field.
2. The student will be able to understand the new developments and breakthroughs efficiently in engineering and technology.

2. Course Outcomes:
On successful completion of course learner/student will be able to:

1. To recognize the electrochemical processes and apply the concepts in electrochemistry.
2. To develop knowledge on electrochemical energy storage systems considering the operation and design of various battery technologies.
3. To identify various polymeric materials and their applications in engineering.
4. To acquire theoretical background of types of nanomaterials and their applications.
5. To describe the theoretical background of spectroscopic techniques such as NMR, IR, UV spectroscopy.
6. To identify DNA as a genetic material in the molecular basis of information transfer

3. Detailed Theory Syllabus:

Module No	Module	Detailed Contents of Module	Hrs.	CO Mapping
1	Engineering Electrochemistry	**Prerequisite:** Redox reaction, cell reaction, electrode and its type, salt bridge 1.1. Electrode potential, electrode reaction, derivation of Nernst equation for single electrode potential, numerical problems.. 1.2 Electrochemical cell -Weston standard Cadmium cell 1.3 Reference electrodes -Introduction, Construction, working of SHE, Calomel electrode.	3	1
2	Battery Technology	**Pre- requisite** : Electrochemical Reactions, Cell potential, Electrochemical series 2.1 Introduction, classification – primary, secondary and reserve batteries. Characteristics – Capacity, Electricity storage density, energy efficiency, cycle life and shelf life. 2.2 Construction, working and applications of Ni – Cd rechargeable batteries 2.3 Lithium batteries - Introduction, construction, working and applications of Li-MnO2	5	2

		2.4 Fuel Cells: Introduction, classification of fuel cells, limitations & advantages of fuel cells, Construction of Hydrogen oxygen alkaline fuel cells. 2.5 Electrochemical Sensors.		
3	Polymeric Materials	**Prerequisite** : Polymer, Monomer, Polymerization, Degree of polymerisation, Classification of Polymers, Mechanism of polymerisation. 3.1 Molecular weight of polymers: number average and weight average, numerical problems. , Polydispersity Index, 3.2 Polymer crystallinity - glass transition temperature and its significance 3.3 Thermoplastic & Thermosetting polymers- Characteristics 3.4 Preparation , properties and uses of PMMA, Urea-Formaldehyde, Phenol - formaldehyde 3.5 Conducting polymers – Types, Mechanism of conduction in polymers, Examples, and applications. 3.6 Polymer films in sensor applications.	5	3
4	Nanochemistry	**Prerequisite:** Concept of nano scale, definition of nanoparticles 4.1. Importance of nano size, Properties of nanomaterials – Size, optical properties, magnetic properties, electrical properties. 4.2 Nanoscale materials- fullerenes, nanotubes, nano wires, nanorods 4.3 Synthesis of Nano materials - Chemical vapor deposition (CVD) method and Laser Ablation Method 4.4 Application of Nanomaterials – for communication, data storage	5	4
5	Spectroscopic Techniques	**Pre-requisites :** Electromagnetic radiation, characteristics of electromagnetic radiation, electromagnetic spectrum. 5.1. Spectroscopy - Principle, Interaction of radiation with matter, Selection rules. 5.2 Types of spectroscopy,: IR, UV, NMR, Emission Spectroscopy, (Flame Photometry), 5.3 Fluorescence and Phosphorescence, Jablonski diagram 5.4 NMR and Magnetic Resonance Imaging	4	5
6	Biomolecules	Molecules of life – Cellulose, Amino acids , proteins, Nucleotides and DNA , DNA as genetic material, Concept of genetic code, Universality and degeneracy of genetic code. Molecular basis of Information transfer.	3	6

4. Suggested Experiments:

1. Determination of Cell potential of Zn- Cu system
2. Molecular weight determination of polymers by Oswald Viscometer
3. Preparation of Urea Formaldehyde / phenol formaldehyde
4. Preparation of biodegradable polymer using corn starch or potato starch.
5. Preparation of Magnetic Nanoparticles.
6. Synthesis of Biodiesel
7. Determination of electrical conductivity of unknown solution.
8. Preparation of Hand Sanitizer using ethyl alcohol

9. Determination of Caffeine in Tea
10. Determination of pH using glass electrode.

5. Theory Assessment:

Internal Assessment (IA): Two class tests of 30 marks each. The first class test is to be conducted when approx. 40% syllabus is completed and the second class test when an additional 35% syllabus is completed..

End Semester Theory Examination: In question, paper weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.

1. Question paper will consist of 3 questions, each carrying 15 marks.
2. Question number 1 will be compulsory and based on maximum contents of the syllabus
3. Remaining questions will be mixed in nature (for example, if Q.2 has part (a) from module 3 then part (b) will be from other than module 3)
4. Total three questions need to be solved.

6. Practical Assessment: The final certification and acceptance of TW ensures the satisfactory performance of laboratory work and minimum passing in the TW.

Term Work: Term Work shall consist of practicals based on the above list. Also Term work Journal must include at least 2 assignments based on the topics mentioned in the syllabus.

Term Work Marks: 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance).

Practical Assessment: An Practical exam will be held based on the above syllabus for 25 Marks.

7. Books and References:

1. Engineering Chemistry – P.C.Jain and Monika Jain, Dhanpat Rai Publications
2. A Textbook of Engineering Chemistry, - Shashi Chawla (DhanpatRai publications)
3. A textbook of Engineering Chemistry - S.S. Dara, S. Chand Publishing House
4. Engineering Chemistry – O.G. Palanna , Tata Mc Graw Hill
5. Molecular Genetics – Stent G.S and Calendar, R.W.H Freeman and Company
6. Fundamentals of Molecular Spectroscopy – C.N . Banwell, Tata Mc Graw Hill
7. Instrumental methods of chemical analysis – B.K.Sharma, Goel Publishing House
8. “Nanomaterials: Synthesis, Properties and Applications”, A. S. Edelstein and R. C. Cammarata- Institute of Physics Pub., 2001

Back to Scheme

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
IT 108	Engineering Mechanics and Graphics *	Contact Hours	3	2	-	5
		Credits	3	1	-	4

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
IT 108	Engineering Mechanics and Graphics *	40	40	40	60	25	25	--	150

1.Prerequisites: NA

2. Course Objectives: The course is aimed
1. To develop the capacity to predict the effects of force and motion and to acquaint the concept of static and dynamic equilibrium.
2. Ability to visualize physical configurations in terms of actual systems and it's constraints, and able to formulate the mathematical function of the system.
3. To study, analyse and formulate the motion of moving particles/bodies.
4. To impart and inculcate proper understanding of the theory of projection.
5. To impart the knowledge of reading a drawing
6. To improve the visualization skill.

3. Course Outcomes: On successful completion of course learner/student will be able to:
1. To verify the law of moments and draw a Free Body Diagram and label the reactions on it.
2. To Determine the centroid and MI of plane lamina.
3. To apply equilibrium equations in statics.
4. To Apply the basic principles of projections in Projection of Lines
5. To Apply the basic principles of projections in reading and converting 3D view to 2D drawing.
6. To Visualize an object from the given two views.

4. Detail Syllabus

Sr. No.	Module	Detail Syllabus	Hrs.	CO Mapping
1	Coplanar and Non-Coplanar Force System and Resultant:	System of Coplanar Forces: Classification of force systems, Principle of transmissibility, composition and resolution of forces. Resultant: Resultant of coplanar and non-coplanar force system (Concurrent forces, parallel forces and non-concurrent Non-parallel system of forces). Moment of force about a point, Couples, Varignon's Theorem. Force couple system. Distributed Forces in plane	6	1
2	Equilibrium of System of Coplanar Forces and Beams:	Conditions of equilibrium for concurrent forces, parallel forces and non-concurrent non- parallel general forces and Couples. Equilibrium of rigid bodies free body diagrams. Types of beams, simple and compound beams, type of supports and reaction. Determination of reactions at supports for various types of loads on beams. (Excluding problems on internal hinges)	6	2
3	Kinematics of	Motion of particle with variable acceleration. General curvilinear motion. Tangential & Normal component of	6	3

	Particle:	acceleration, Application of concepts of projectile motion and related numerical.		
4	Projection of Points and Lines:	Lines inclined to both the Reference Planes (Excluding Traces of lines) and simple application-based problems on Projection of lines.	6	4
5	Orthographic and Sectional Orthographic Projections:	Orthographic and Sectional Orthographic Projections: Fundamentals of orthographic projections. Different views of a simple machine part as per the first angle projection method recommended by I.S. Full or Half Sectional views of the Simple Machine parts.	6	5
6	Isometric Views:	Principles of Isometric projection – Isometric Scale, Isometric Views, Conversion of Orthographic Views to Isometric Views (Excluding Sphere).	6	6

5.Suggested List of Experiment:

Minimum three experiments from the following list (1-4) of which minimum one should from dynamics.

1. Verification of Polygon law of coplanar forces
2. Verification of Principle of Moments (Bell crank lever.)
3. Determination of support reactions of a Simply Supported Beam.
4. Kinematics of particles. (Uniform motion of a particle, Projectile motion, motion under gravity)
5. One sheet on Orthographic projection. (minimum 2 problem)
6. One sheet on Sectional Orthographic projection. (minimum 2 problem)
7. One sheet on Isometric drawing. (minimum 2 problems).

6. Theory Assessment:

Internal Assessment (IA): Two class tests of 40 marks each. The first class test is to be conducted when approx. 40% syllabus is completed and the second class test when an additional 35% syllabus is completed.

End Semester Theory Examination: In question, paper weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.

7. Practical Assessment: The final certification and acceptance of TW ensures the satisfactory performance of laboratory work and minimum passing in the TW.

Term Work: Term Work shall consist of practicals based on the above list. Also Term work Journal must include at least 2 assignments based on the topics mentioned in the syllabus.

8. Text Books / References:

1. Engineering Mechanics by Beer &Johnston, Tata McGrawHill
2. Engineering Mechanics (Statics) by Meriam and Kraige, WileyBools
3. Engineering Mechanics (Dynamics) by Meriam and Kraige, WileyBools
4. Engineering Mechanics by F. L. Singer, Harper& RawPublication
5. Engineering Mechanics by ShaumSeries
6. N.D. Bhatt, "Engineering Drawing (Plane and solid geometry)", Charotar Publishing House Pvt. Ltd.
7. N.D. Bhatt & V.M. Panchal, "Machine Drawing", Charotar Publishing House Pvt. Ltd.

Back to Scheme

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
IT 113	Java Programming	Contact Hours	3	2	-	5
		Credits	3	1	-	4

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
IT 113	Java Programming	40	40	40	60	25	25	--	150

1.Prerequisite: Basics of C/C++ Programming

2. Course Objectives:
The course is aimed to:
1. To understand the concepts of object-oriented paradigm in the Java programming language.
2. To understand the importance of Classes & objects along with constructors, Arrays ,Strings and vectors
3. To learn the principles of inheritance, interface and packages and demonstrate the concept of reusability for faster development
4. To recognize usage of Exception Handling, Multithreading, Input Output streams in various applications
5. To learn designing, implementing, testing, and debugging graphical user interfaces in Java using Swings and AWT components that can react to different user events.
6. To develop graphical user interfaces using JavaFX controls and connect to Database using JDBC.

3. Course Outcomes:
On successful completion of course learner/student will be able to:
1. Understand the fundamental concepts of Java Programming.
2. Use the concepts of classes, objects, members of a class and the relationships among them needed for finding the solution to specific problems.
3. Demonstrate how to extend java classes and achieve reusability using Inheritance, Interface and Packages.
4. Construct robust and faster programmed solutions to problems using concept of Multithreading, exceptions and file handling
5. Design and develop Graphical User Interface using Abstract Window Toolkit and Swings along with response to the events.
6. Develop Graphical User Interface by exploring JavaFX framework based on MVC architecture

4. Detailed Theory Syllabus:

Module	Module	Detailed Contents of Module	Hrs.	COs
1	Fundamentals of Java	Overview of procedure and object-oriented Programming, Java Designing Goals, Features of Java Language. Introduction to the principles of object-oriented programming: Classes, Objects, Abstraction, Encapsulation, Inheritance, Polymorphism. Keywords, Data types, Variables, Operators, Expressions, Types of variables, and methods. Control Statements: If Statement, If-else, Nested if, switch Statement, break, continue. Iteration Statements: for loop, while loop, and do-while loop.	04	CO1
2	Classes, Objects, Arrays and Strings, Java IO classes.	Classes & Objects: Class Fundamentals: Assigning Object Reference Variables, Passing parameters to Methods and Returning parameters from the methods, Nested and Inner Classes. Constructors: Parameterized Constructors, Method overloading, Constructors overloading, Recursion, Command-Line Arguments. Wrapper classes, Java.util.Scanner, Java.io.BufferedReader Java.io.DataInputStream, Java.io.DataOutputStream and String Buffer classes, and String functions. Arrays & Vectors: One Dimensional array, Two Dimensional arrays, Irregular arrays, dynamic arrays, Array List and Array of Object, finalize( ) Method.	07	CO1 CO2

3	Inheritance, Packages and Interfaces.	Inheritance Basics, Types of Inheritance in Java, Concept of Super and subclass, inheriting Data members and Methods, Role of Constructors in inheritance, Making methods and classes final, Method overriding, Dynamic Method Dispatch, Abstract classes, and methods. Defining an interface, extending interfaces, implementing interfaces, accessing implementations through interface references, Interfaces vs. Abstract classes. Packages – Steps for defining, creating, and accessing a Package, importing packages, Making JAR Files for Library Packages, java.util.Vector	06	CO1 CO3
4	Exception Handling, Multithreading,	Exception handling Mechanism: try, catch, throw, throws, and finally. Multithreading: Need of Multithreading, Java thread Model, thread Life-Cycle, thread class Methods, Implementing Runnable, Extending thread, Synchronizing threads, synchronized Statement, Critical Factor in Thread –Deadlock, Performing a read-write operation on Files.	07	CO1 CO3 CO4
5	AWT, Event Handling simple calculator using java AWT	Designing Graphical User Interfaces in Java, Components, and Containers, Basics of Components, Using Containers, Layout Managers, AWT Components, Adding a Menu to Window, Extending GUI Features, Event-Driven Programming in Java, Event Handling Process, Event-Handling Mechanism, Delegation Model of Event Handling, Event Classes, Event Sources, Event Listeners, Adapter Classes as Helper Classes in Event Handling.	08	CO1 CO4 CO5
6	Introduction to JavaFX and JDBC	Introducing JavaFX: AWT vs JavaFX, Components and Container, JavaFX UI controls : Label, Button, RadioButton, CheckBox, TextField, PasswordField, Menu, Slider, HyperLink, ToolTip, ScrollBar, JavaFX Layouts, JavaFX Event Handlers. Connecting Database to JavaFx application. Connecting Java Application to Database using JDBC.	04	CO1 CO5 CO6

5. Suggested Experiments: Software Requirements if any:

1. Windows or Linux Desktop OS
2. JDK 1.8 or higher
3. Notepad ++
4. JAVA IDEs like Netbeans or Eclipse

Hardware Requirements: PC With Following Configuration-

1. Intel PIV Processor
2. 2 GB RAM
3. 500 GB Hard Disk
4. Network interface card.

1. **Lab1**:Five Bikers Compete in a race such that they drive at a constant speed which may or may not be the same as the other. To qualify the race, the speed of a racer must be more than the average speed of all 5 racers. Write a Java program to take as input the speed of each racer and print back the speed of qualifying racers
2. **Lab2**:Implement a java program to calculate gross salary & net salary taking the following data. Input: empno, empname, basic Process: DA=70% of basic HRA=30% of basic CCA=Rs240/- PF=10% of basic PT= Rs100/-
3. **Lab3**:Write a Java program that prints all real solutions to the quadratic equation ax2+bx+c = 0. Read in a, b, c and use the quadratic formula. If the discriminant b2 -4ac is negative, display a message stating that there are no real solutions?
4. **Lab4**: Write a Menu driven program in java to implement a simple banking application. Application should read the customer name, account number, initial balance, rate of interest, contact number and address field etc. Application should have following methods. 1. createAccount() 2. deposit() 3. withdraw() 4. computeInterest() 5. displayBalance()
   (Perform any 2 programs that covers Classes, Methods, Control structures and Looping statements)
   Classes & Objects: Class Fundamentals: Assigning Object Reference Variables, Passing parameters to Methods and Returning parameters from the methods, Nested and Inner Classes. Constructors: Parameterized Constructors, Method overloading, Constructors overloading, Recursion, Command-Line Arguments. Wrapper classes, Java.util.Scanner, Java.io.BufferedReader Java.io.DataInputStream, Java.io.DataOutputStream and String Buffer classes and String functions. Arrays & Vectors: One

Dimensional arrays, Two Dimensional arrays, Irregular arrays, dynamic arrays, Array List and Array of Object, finalize( ) Method,.

5. **Lab 5**: Write a program to print the area of a rectangle by creating a class named 'Area' having two methods. First method named as 'setDim' takes length and breadth of the rectangle as parameters and the second method named as 'getArea' returns the area of the rectangle. Length and breadth of the rectangle are entered through the keyboard.
6. **Lab 6:** Write a Java program to illustrate Constructor Chaining
7. **Lab 7**: Write a java program to add n strings in a vector array. Input new string and check whether it is present in the vector. If it is present delete it otherwise add it to the vector.
8. **Lab 8:** Print Reverse Array list in java by writing our own function.
   Perform any 2 programs that covers Classes & objects, Constructors, Command Line Arguments, Arrays/Vectors,String function and recursions
   Inheritance Basics, , Types of Inheritance in Java, Concept of Super and subclass, inheriting Data members and Methods, Role of Constructors in inheritance, Making methods and classes final , Method overriding, Dynamic Method Dispatch, Abstract classes and methods. Defining an interface, extending interfaces , implementing interfaces, accessing implementations through interface references, Interfaces vs. Abstract classes. Packages – Steps for defining, creating and accessing a Package, importing packages,Making JAR Files for Library Packages, java.util.Vector
9. **Lab 9:** Create a class Book and define a display method to display book information. Inherit Reference_Book and Magazine classes from Book class and override display method of Book class in Reference_Book and Magazine classes. Make necessary assumptions required.
10. **Lab 10**: Create a class "Amount In Words" within a user defined package to convert the amount into words. (Consider the amount not to be more than 100000).
11. **Lab 11**: Create an interface vehicle and classes like bicycle, car, bike etc, having common functionalities and put all the common functionalities in the interface. Classes like Bicycle, Bike, car etc implement all these functionalities in their own class in their own way
12. **Lab 12**: Consider a hierarchy, where a sportsperson can either be an athlete or a hockey player. Every sportsperson has a unique name. An athlete is characterized by the event in which he/she participates; whereas a hockey player is characterised by the number of goals scored by him/her. Perform the following tasks using Java : (i)Create the class hierarchy with suitable instance variables and methods. (ii) Create a suitable constructor for each class. (iii) Create a method named display_all_info with suitable parameters. This method should display all the information about the object of a class. (iv) Write the main method that demonstrates polymorphism.
    Perform any 3 programs covering Inheritance, Interfaces and Packages
    Exception handling Mechanism: try, catch, throw, throws and finally. Multithreading: Need of Multithreading , Java thread Model, thread Life-Cycle, thread class Methods, Implementing Runnable, Extending thread, Synchronizing threads, synchronized Statement, Critical Factor in Thread –Deadlock, Performing read write operation on Files.
13. **Lab 13:** Write a java program where the user will enter login id and password as input. The password should be 8 digits containing one digit and one special symbol. If a user enters a valid password satisfying above criteria then show “Login Successful Message”. If the user enters invalid Password then create InvalidPasswordException stating Please enter valid password of length 8 containing one digit and one Special Symbol.
14. **Lab 14**: Assume that two brothers, Joe and John, share a common bank account. They both can, independently, read the balance, make a deposit, and withdraw some money. Implement java application demonstrate how the transaction in a bank can be carried out concurrently
15. **Lab 15:** You have been given the list of the names of the files in a directory. You have to select Java files from them. A file is a Java file if it’s name ends with “.java”. For e.g. File- “Names.java " is a Java file, “FileNames.java.pdf” is not. Input: test.java, ABC.doc, Demo.pdf, add.java, factorial.java, sum.txt Output: tset.java, add.java, factorial.java
    (Perform 3 programs that cover Exception Handling, Multithreading and I/O Streams
    Designing Graphical User Interfaces in Java, Components and Containers, Basics of Components, Using Containers, Layout Managers, AWT Components, Adding a Menu to Window, Extending GUI Features, Event-Driven Programming in Java, Event Handling Process, Event- Handling Mechanism, Delegation

Model of Event Handling, Event Classes, Event Sources, Event Listeners, Adapter Classes as Helper Classes in Event Handling.

16. **Lab 16:** Write a Java program to create elements. .Use a grid layout to arrange buttons for the digits and basic operation +, -, /, *. Add a text field to display the results
17. **Lab 17:** Write a program to create a window with four text fields for the name, street, city and pincode with suitable labels. Also windows contains a button MyInfo. When the user types the name, his street, city and pincode and then clicks the button, the type's details must appear in Arial Font with Size 32, Italics.
18. **Lab 18**: Write a Java Program to create a color palette. Declare a grid of Buttons to set the color names. Change the background color by clicking on the color button.
    Perform any 2 programs that contain AWT, Event handling to build GUI application
    Introducing JavaFX: AWT vs JavaFX, Components and Container, JavaFX UI controls : Label, Button, RadioButton, CheckBox, TextField, PasswordField, Menu, Slider, HyperLink, ToolTip, ScrollBar, JavaFX Layouts, JavaFX Event Handlers. Connecting Database to JavaFx application.
19. **Lab 19**: Write a Java program to design a Login Form using JavaFX Controls.
20. **Lab 20**: Write Java program to draw various shapes on Canvas using JavaFX
    Perform any 1 program that contains the concept of JavaFX

5. Theory Assessment:

Internal Assessment (IA): Two class tests of 40 marks each. The first class test is to be conducted when approx. 40% syllabus is completed and the second class test when an additional 35% syllabus is completed..

End Semester Theory Examination: In question, paper weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.

1. Question paper will consist of 3 questions, each carrying 20 marks.
2. Question number 1 will be compulsory and based on maximum contents of the syllabus
3. Remaining questions will be mixed in nature (for example, if Q.2 has part (a) from module 3 then part (b) will be from other than module 3)
4. Total three questions need to be solved.

6. Practical Assessment: An Practical / Oral exam will be held based on the above syllabus. The final certification and acceptance of TW ensures the satisfactory performance of laboratory work and minimum passing in the TW.

Term Work: Term Work shall consist of practicals based on the above list. Also Term work Journal must include at least 2 assignments based on the topics mentioned in the syllabus.

Term Work Marks: 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance)

7. Books and References:

A. Books:

1. Herbert Schildt, “Java-The Complete Reference”, Tenth Edition, Oracle Press, Tata McGraw Hill Education.
2. Anita Seth, B.L.Juneja, “ Java One Step Ahead”, oxford university press.
3. E. Balguruswamy, “Programming with Java A primer”, Fifth edition, Tata McGraw Hill Publication

B. References:

1. D.T. Editorial Services, “Java 8 Programming Black Book”, Dreamtech Press
2. Learn to Master Java by Star EDU Solutions
3. Yashvant Kanetkar, “Let Us Java” ,4th Edition ,BPB Publications.

Back to Scheme

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
IT 112	Professional Communication and Ethics I	Contact Hours	2	2	-	4
		Credits	2	1	-	3

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
IT 112	Professional Communication and Ethics I	20	20	20	30	25	–	--	75

1. Prerequisites: NA

2. Course Objectives:

The course is aimed

1. To understand, compare and demonstrate the importance and relevance of communication with specific emphasis on listening skill.
2. o promote practice in speaking skill and encourage learners to compose on the spot speeches for the purpose of developing and generating ideas.
3. To train learners in reading strategies that will enhance their global understanding of the text and help them to comprehend academic and business correspondence.
4. To illustrate effective writing skills in business, academic and technical areas.
5. To inculcate confident personality traits with grooming and social etiquette.
6. To train learners in producing words on the basis of contextual cues and reflect on errors in sentences.

3. Course Outcomes:

On successful completion of course learner/student will be able to:

1. Listen, comprehend and identify potential barriers in spoken discourse with ease and accuracy.
2. Develop confidence and fluency in speaking at social,academic and business situations as well as make effective professional presentations.
3. Implement reading strategies for systematic, logical understanding, that will enhance the skill of comprehension, summarisation and evaluation of texts.
4. Understand and demonstrate effective writing skills in drafting academic, business and technical documents.
5. Communicate effectively in academic as well as business settings, displaying refined grooming and social skills.
6. Anticipate the meaning of unfamiliar words with the help of contextual cues and construct grammatically correct sentences.

4. Detail syllabus

Module	Module Name	Details Syllabus	Hrs	COs
1	The Importance and Strategies of Effective Listening	Prerequisite: Able to listen, read, speak, write and comprehend the target language Introduction to communication 1.1 Importance and relevance of communication 1.2 Listening skill -ability to discriminate stress and intonation Comprehend meaning of audio text-graded on the basis of vocabulary, sentence construction and theme. -potential barriers	4	1

2	Developing Speaking Skills	2.1 Intensive Speaking- on the spot topics 2.2 Responsive speaking-answering a question 2.3 Interactive speaking-conversations 2.4 Extensive speaking-speech, oral presentations-specific emphasis on plagiarism check and generating the report	4	2
3	Strategies and Techniques to build Reading Skill	3.1 Global understanding of the text- inference, anticipation and deduction 3.2 Detailed understanding of text-scanning for specific information (special emphasis on reading comprehension exercises and summarisation)	2	3
4	Developing Professional Writing Skills	4.1 Effective introduction with emphasis on general statement, opposing statement and thesis statement 4.2 Critical response to a text with special reference to purpose, evaluation of the content, theme and style of a text 4.3 Organization of ideas, sentence construction and word choice, grammar and usage 4.4 Explanation and support of ideas (special reference to writing paragraphs and business letters- Sales and complain letters}	2	4
5	Etiquette and Grooming for Personality Development	5.1 Social Etiquette 5.2 Corporate etiquette 5.3 Confidence building and Personality development	1	5
6	Vocabulary and Grammar	6.1 Contextual vocabulary Development- Word Maps 6.2 Identifying errors in a sentence.	1	6

5. Suggested List of assignment:

1. Written record of listening activities-Listening practice tasks of 3 types (through audio recordings of (1) Monologues (2) Dialogues (3) Formal/Expert Talk or Lecture)
2. Transcription of the public speech along with a plagiarism report
3. Practice public speech
4. Summarization through graphic organisers (1. Text to graphic organizer 2. Graphic organizer to text)
5. Case studies on critical thinking
6. Business letters in complete block format
7. Documentation of case studies/Role play based on Module
8. Contextual Vocabulary Development
9. Aptitude Test

6. Internal Assessment Test:

Assessment consists of two class tests of 20 marks each. The first class test is to be conducted when approx. 40% syllabus is completed and the second class test when an additional 35% syllabus is completed.
(Note: Summarization should be a compulsory question in Test II and not in the End Semester Theory Examination.)

End Semester Examination: 30 marks

1. Question paper will consist of 5 questions, each carrying 10 marks.
2. Total 3 questions need to be solved.
3. Q.1 will be compulsory, based on the entire syllabus.
4. Remaining questions will be randomly selected from all the modules.

Weightage of marks should be proportional to the number of hours assigned to each module.

Term work:

Term Work shall consist of 8 Assignments .

The distribution of marks for term work shall be as follows:

Assignments	: 10 marks
Oral Exam/ Public Speaking	: 10 marks
Attendance (Theory and Tutorial)	: 05 marks

Books/References:

1. Raman Meenakshi & Sharma Sangeeta, Communication Skills, Oxford University Press
2. Kumar Sanjay & Lata Pushp, Communication Skills, Oxford University Press
3. Locker, Kitty O. Kaczmarek, Stephen Kyo. (2019). Business Communication:
4. Building Critical Skills. Place of publication not identified: Mcgraw-hill.
5. Murphy, H. (1999). Effective Business Communication. Place of publication not identified: Mcgraw-Hill.
6. Lewis, N. (2014). Word power made easy. Random House USA.

Back to Scheme

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
IT 114	Basic Workshop Practice II	Contact Hours	-	2	-	2
		Credits	-	1	-	1

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
IT 114	Basic Workshop Practice II	-	-	-	-	50	–	--	50

1.Course Objectives

1. To impart training to help the students develop engineering skill sets.
2. To inculcate respect for physical work and hard labor.
3. To get exposure to interdisciplinary engineering domain.

2. Course Outcomes:

Learners will be able to

1. Develop the necessary skill required to handle/use different carpentry tools.
2. Identify and understand the safe practices to adopt in the electrical environment.
3. Demonstrate the wiring practices for the connection of simple electrical load/ equipment.
4. Design, fabricate and assemble pcb.
5. Develop the necessary skill required to handle/use different masons tools.
6. Develop the necessary skill required to use different sheet metal and brazing tools.
7. Able to demonstrate the operation, forging with the help of a simple job.

3. Detailed Syllabus:

Trade	Detailed Content	Hrs.
Note: Trade 1 and 2 are compulsory. Select any ONE trade topics out of the topic trade 3 to 5. Demonstrations and hands on experience to be provided during the periods allotted for the same. Report on the demonstration including suitable sketches is also to be included in the term work CO-1 is related to Trade-1 CO-2 to CO-4 is related to Trade-2 CO-5 is related to Trade-3 CO-6 is related to Trade-4 CO-7 is related to Trade-5 CO evaluation is to be done according to the opted Trades in addition to Compulsory Trades.		
Trade-1	Carpentry(Compulsory) Use and setting of hand tools like hacksaws, jack planes, chisels and gauges for construction of various joints, wood tuning and modern wood turning methods. Term work to include one carpentry job involving a joint and report on demonstration of a job involving wood turning	10
Trade-2	Basic Electrical workshop:(Compulsory): Single phase and three phase wiring. Familiarization. of protection switchgears and their ratings (fuse, MCB, ELCB). Wiring standards, Electrical safety in the workplace safe work practices. Protective equipment, measures and tools. Layout drawing, layout transfer to PCB, etching and drilling and soldering technique	8
Trade-3	Masonry: Use of masons tools like trowels, hammer, spirit level, square, plumb line and pins etc. demonstration of mortar making, single and one and half brick	6

	masonry , English and Flemish bonds, block masonry, pointing and plastering.	
Trade-4	Sheet metal working and Brazing: Use of sheet metal, working hand tools, cutting , bending , spot welding	6
Trade-5	Forging (Smithy): At least one forging job to be demonstrated and a simple job to be made for Term Work in a group of 4 student	6

Internal Assessment: 50 marks

Term Work:

1. All the jobs mentioned above
2. Complete Work-Shop Book giving details of drawing of the job and time sheet

The distribution of marks for Term work shall be as follows:

Job Work : 30 marks
Workshop book : 10 marks
Attendance : 10 marks

Books/References:

1. Workshop Technology by H K Hajara Choudhary
2. Manufacturing Technology by R C Jain
3. Workshop Technology by R S Khurmi and J S Gupta
4. Workshop Technology by Chapman.

Back to Scheme

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
IT 201	Engineering Mathematics III	Contact Hours	3	-	1	4
		Credits	3	-	1	4

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
IT 201	Engineering Mathematics III	40	40	40	60	25	–	--	125

1.Prerequisite:

1. Engineering Mathematics I
2. Engineering Mathematics-II

2. Objectives: The course is introduced

1. To learn the Laplace Transform, Inverse Laplace Transform of various functions and its applications
2. To understand the concept of Fourier Series and enhance the problem-Solving skills.
3. To understand Matrix algebra for solving engineering problems.
4. To understand the concept of complex variables, C-R equations with applications.
5. To understand the concept of Relation and function
6. To understand the concept of coding theory

3.Outcomes: The learner will be able to

1. Apply the concept of Laplace transform and its application to solve the real integrals ,Understand the concept of inverse Laplace transform of various functions and its applications in engineering problems.
2. Expand the periodic function by using the Fourier series for real-life problems and complex engineering problems.
3. Apply the concepts of eigenvalues and eigenvectors in engineering problems.
4. Use complex variable theory, application of harmonic conjugate to get orthogonal trajectories and analytic functions.
5. Apply the concept of relation and function.
6. Use of groups and codes in Encoding-Decoding.

4. Theory Syllabus:

Sr. No.	Module	Detailed Content	Hrs	CO Mapping
1	Laplace Transform	Definition of Laplace transform and Laplace transform of standard functions, Properties of Laplace Transform: Linearity, First Shifting Theorem, change of scale Property, multiplication by t, Division by t, (Properties without proof). Inverse of Laplace Transform by partial fraction and convolution theorem.	7	CO1
2	Fourier Series , Fourier Transform	Dirichlet's conditions, Fourier series of periodic functions with period 2π and 2L, Fourier series for even and odd functions, half range sine and cosine Fourier series, Orthogonal and Ortho-normal functions, Fourier Integral Representation, Fourier Transform and Inverse Fourier transform of constant and exponential function.	6	CO2

3	Linear Algebra Matrix Theory	Eigenvalues and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, Functions of square matrix, Singular Value Decomposition	7	CO3
4	Complex Variables and conformal mappings	Function f(z)of complex variable, Introduction to Limit, Continuity and Differentiability of (z), Analytic function: Necessary and sufficient conditions for f(z) to be analytic, Cauchy-Riemann equations in Cartesian coordinates, Milne-Thomson method: Determine analytic function f(z)when real part(u), imaginary part (v) or its combination (u+v / u-v) is given, Conformal mapping, Linear and Bilinear mappings, cross ratio	6	CO4
5	Relation and Function	Partition of a Set, Relation, Diagram of a Relation, Matrix of A Relation, Digraph of a Relation, Types of Relation, Number of Binary Relations, Number of Reflexive Relations, Equivalence Relation, Relation of the Path, Operations on Relations, Closures, Warshall's Algorithm,	7	5
6	Algebraic Structures ,coding theory	Properties of Binary operations, Semigroup. Monoid, Group, Ring, Isomorphism, Homomorphism, Group Code, Decoding and Error Correction, Maximum Likelihood Technique	6	6

5. Theory Assessment:
Internal Assessment: 40 marks
Consisting of Two compulsory Test of 40 Marks each on 40% syllabus for each test. The final marks will be average of both the tests.
End Semester Examination: 60 Marks
Weightage of each module in the end semester examination will be proportional to the number of respective lecture hours mentioned in the curriculum.

6. Tutorial Assessment: The final certification and acceptance of TW ensures the satisfactory performance of assignment work and minimum passing in the TW.

Term Work: Term Work shall consist of assignment. Term work Journal must include at least 6 assignments based on the topics mentioned in the syllabus.
Term Work Marks: 25 Marks (Total marks) = 15 Marks (Tutorial) + 5 Marks (Assignment) + 5 Marks (Attendance)

7.Text Books & References:

1. Advanced Engineering Mathematics H.K. Das, S . Chand, Publications.
2. Higher Engineering Mathematics B. V. Ramana, Tata Mc-Graw Hill Publication
3. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Narosa publication

Back to Scheme

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
IT 202	Data Structure and Analysis of Algorithm	Contact Hours	3	2	-	5
		Credits	3	1	-	4

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
IT 202	Data Structure and Analysis of Algorithm	40	40	40	60	25	25	--	150

1.Prerequisite: C Programming Language.

2.Objectives:
The course is aimed:
1. To understand the need and significance of Data structures as a computer Professional.
2. To teach concept and implementation of linear and Nonlinear data structures.
3. To analyze various data structures and select the appropriate one to solve a specific real-world problem.
4. To introduce various techniques for representation of the data in the real world.
5. To explain different Non Linear Data Structures such as Graphs.
6. To teach various searching techniques.

3.Outcomes:
On successful completion of course learner/student will be able to:
1. Implement Linear and Non-Linear data structures.
2. Handle various operations like searching, insertion, deletion and traversals on various data structures.
3. Explain various data structures, related terminologies and its types.
4. Choose appropriate data structure and apply it to solve problems in various domains.
5. Analyze and Implement appropriate searching techniques for a given problem.
6. Demonstrate the ability to analyze, design, apply and use data structures to solve engineering problems and evaluate their solutions.

4. Detailed Theory Syllabus:

Module	Module	Detailed Content	Hrs.	COs
0	Prerequisite	**Prerequisite** Recursion in C programming	1	
1	Introduction to Data Structures and Analysis of Algorithm	Introduction to Data Structures, Concept of ADT, Types of Data Structures - Linear and Nonlinear, Operations on Data Structures, Introduction to Algorithm, Strategies of Algorithm - Divide and Conquer, Greedy Method, Backtracking, Analysis, Growth of functions.	5	CO1 CO2 CO3 CO6
2	Linear Data Structures - Stack, Queue	Introduction to Stack:LIFO structure, ADT of Stack , Operations on Stack, Array Implementation of Stack, Applications of Stack - Well form-ness of Parenthesis, Infix to Postfix Conversion and Postfix Evaluation, Recursion, Reversal of a string. Introduction to Queue : FIFO structure, ADT of Queue, Operations on Queue, Array Implementation of Linear Queue, Types of Queue - Circular Queue, Priority Queue, Double Ended Queue, Applications of Queue.	8	CO1 CO2 CO3 CO6
3	Linear Data Structure - Linked List	Introduction to Linked List, Representation of Linked List, Linked List v/s Array, Types of Linked List - Singly Linked List, Circular Linked List, Doubly Linked List, Operations on Singly Linked List and Doubly Linked List : Create, Insert Node (empty list, beginning,	8	CO1 CO2 CO3 CO6

		Middle, end), Delete Node (First, general case), Search, Retrieve a Node, Print List, Introduction to Circular Linked List, Singly Linked List Application - Polynomial Representation and Addition.		
4	Non Linear Data Structures - Trees	Introduction to Trees, Tree Terminologies, Binary Tree, Binary Tree Representation, Types of Binary Tree, Binary Tree Traversals, Binary Search Trees, Operations on Binary Search Tree : Insert, delete, search and traverse, AVL tree : Inserting, Searching and rotation: RR, LL, RL, LR in AVL tree, Expression Trees : Construction, Infix, Prefix, Postfix Traversals, Applications of trees : Huffman tree, Multi-way Trees :M-way search trees, B-Trees and B+ tree - Insertion, Traverse, Trie - Insertion, Deletion, Search, Traverse.	8	CO1 CO2 CO3 CO6
5	Non Linear Data Structures - Graphs	Introduction, Graph Terminologies, Representation of Graph - Adjacency Matrix, Adjacency List, Graph Traversals - Depth First Search (DFS) and Breadth First Search (BFS), Spanning Tree, Application of graphs - Dijkstra's algorithm, Bellman ford, MST : Prim's and Kruskal's algorithm.	5	CO1 CO2 CO3 CO6
6	Searching and Sorting	Linear Search, Binary Search, Hashing - Concept, Hash Functions, Collision Resolution Techniques and Analysis of Searching Techniques, Insertion Sort, Selection Sort, Merge Sort, Quick Sort and Analysis of Sorting Techniques.	4	CO4 CO5 CO6

5..Laboratory Syllabus:

Exercise	Details	Hours
1	Implementation of Stack using Array.	2
2	Implementation of Queue using Array.	2
3	Implementation of Linked List and Operations.	2
4	Implementation of Stack & Queue using Linked List.	2
5	Implementation of Binary Search Tree.	2
6	Implement Graph Traversal techniques: (a) Depth First Search (b) Breadth First Search.	2
7	Implementation of infix to postfix expression conversion & Evaluation of Postfix Expression.	2
8	Implementation of hashing functions with different collision resolution techniques-Linear Probing	2
9	Implementation of Insertion and Selection Sort.	2
10	Implement Merge Sort and Quick Sort	2

6. Theory Assessment:

Internal Assessment for 40 marks:

Consisting of Two compulsory Test of 40 Marks each on 40% syllabus for each test. The final marks will be average of both the tests.

End Semester Examination: 60 Marks

Weightage of each module in the end semester examination will be proportional to the number of respective lecture hours mentioned in the curriculum.

7. Laboratory Assessment:

Internal Assessment for 25 marks: Term Work shall consist of at least 10 to 12 practical's based on the above list. Also Term work Journal must include at least 2 assignments.

The distribution of marks for term work shall be as follows:

Experiments : 15 marks
Assignments : 05 marks
Attendance : 05 marks

The final certification and acceptance of TW ensures the satisfactory performance of laboratory work and minimum passing in the TW.
Practical/Viva Assessment: An Practical and Viva exam will be held based on the above syllabus for 25 marks.

8. Text/Reference Books:

1. Aaron M Tenenbaum, YedidyahLangsam, Moshe J Augenstein, "Data Structures Using C", Pearson Publication.
2. Richard F. Gilberg and Behrouz A. Forouzan, "Data Structures: A Pseudocode Approach with C", 2nd Edition, CENGAGE Learning.
3. Jean Paul Tremblay, P. G. Sorenson, "Introduction to Data Structure and Its Applications", McGraw-Hill Higher Education.
4. Data Structures Using C, ISRD Group, 2nd Edition, Tata McGraw-Hill.
5. Reema Thareja, "Data Structures using C", Oxford Press.
6. Prof. P. S. Deshpande, Prof. O. G. Kakde, "C and Data Structures", DreamTech press.
7. E. Balagurusamy, "Data Structure Using C", Tata McGraw-Hill Education India.
8. Rajesh K Shukla, "Data Structures using C and C++", Wiley-India
9. GAV PAI, "Data Structures", Schaum's Outlines.
10. Robert Kruse, C. L. Tondo, Bruce Leung, "Data Structures and Program Design in C", Pearson Edition

Back to Scheme

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
IT 203	Database Management System	Contact Hours	3	2	-	5
		Credits	3	1	-	4

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
IT 203	Database Management System	40	40	40	60	25	–	25	150

1. Prerequisite: NA

2. Course Objectives:
The course is aimed to:
1. Introduction about Database Management Systems.
2. Develop entity relationship data model and its mapping to relational model.
3. Give a good formal foundation on the relational model of data and usage of Relational Algebra.
4. Introduce the concepts of basic SQL, procedures, connectivity through JDBC.
5. Demonstrate Design Approach of Database through Normalization technique.
6. Provide an overview of physical design of a database system, by discussing Database indexing techniques and storage techniques.

3. Course Outcomes:
On successful completion of course learner/student will be able to:
1. Explain the features of database management systems.
2. Design conceptual models of a database using ER modeling for real life applications.
3. Construct relational models and relational algebra queries.
4. Retrieve any type of information from a database by formulating queries in SQL.
5. Analyze the existing design of a database schema and apply concepts of normalization to design an optimal database.
6. Build indexing mechanisms for efficient retrieval of information from a database.

4. Detailed Theory Syllabus:

Sr. No.	Module	Detailed Content	Hrs.	CO Mapping
1	Introduction to Database Concepts	**Introduction to Database Concepts** Introduction, Characteristics of databases, File system V/s Database system, Users of a Database system Data Models, Schemas, and Instances, Three-Schema Architecture and Data Independence, Database Administrator (DBA), Role of a DBA.	3	CO1
2	Entity–Relationship Data Model	**Entity–Relationship Data Model** Types of data Models, The Entity-Relationship (ER) Model, Entity Sets, Entity Types, Attributes, and Keys, Relationship Sets, Relationship Types, Weak Entity Types, Extended Entity-Relationship (EER) Model, Generalization, Specialization and Aggregation,	6	CO2

3	Relational Model and Relational Algebra	**Relational Model and Relational Algebra** Introduction to Relational Model, Relational Model Constraints and Relational Database Schemas, Concept of Keys: Primary Kay, Secondary key, Foreign Key, Mapping the ER and EER, Model to the Relational Model, Introduction to Relational Algebra, Relational Algebra expressions for Unary Relational Operations, Set Theory operations, Binary Relational operation Relational Algebra Queries	7	CO3
4	Structured Query Language (SQL)	**Structured Query Language (SQL)** Overview of SQL , Data Definition Commands, Set operations , aggregate function , null values, , Data Manipulation commands, Data Control commands , Views in SQL, Complex Queries using Group By, Recursive Queries, nested Queries ; Referential integrity in SQL. Event Condition Action (ECA) model (Triggers) in SQL; Database Programming with JDBC, Security and authorization in SQL Functions and Procedures in SQL and cursors.	9	CO4
5	Relational–Database Design	**Relational–Database Design** Design guidelines for relational schema, Decomposition, Functional Dependencies, Definition of Normal Forms- 1NF, 2NF, 3NF, BCNF, Converting Relational Schema to higher normal forms.	6	CO5
6	Storage and Indexing	**Storage and Indexing** Operation on Files; hashing Techniques; Types of Indexes: Single-Level Ordered Indexes; Multilevel Indexes; Overview of B-Trees and B+-Trees; Indexes on Multiple Keys.	7	CO6

5. Suggested Experiments:

1. Students are given assignments to construct detailed problem definitions for real life applications.
2. Construction of ER/EER diagrams for the given problems.
3. Assignment based on relational Algebra.
4. Basic SQL Queries-DDL and DML.
5. Construction of Database-Keys.
6. Complex Queries using group by, nested queries, recursive queries, joins, views, Triggers, Cursors.
7. Design and Implementation of a fully fledged Database with front end for a real life application (Using JDBC).
8. Assignment for conversion of relation to different normal forms.
9. Program for construction of index- B-Tree/ B+-Tree.

6. Theory Assessment:

Internal Assessment for 40 marks:
Consisting of Two compulsory Test of 40 Marks each on 40% syllabus for each test. The final marks will be average of both the tests.
End Semester Examination: 60 Marks
Weightage of each module in the end semester examination will be proportional to the number of respective lecture hours mentioned in the curriculum.

7. Laboratory Assessment:
Term work: Term Work shall consist of at least 10 to 12 practical's based on the above list. Also Term work Journal must include at least 2 assignments.
The distribution of marks for term work shall be as follows:

Experiments : 15 marks
Assignments : 05 marks
Attendance : 05 marks

The final certification and acceptance of TW ensures the satisfactory performance of laboratory work and minimum passing in the TW.

8. Practical/Viva Assessment: An oral viva examination will be held based on the above syllabus.

9. Books/References:

1. Korth, Slberchatz,Sudarshan, ”Database System Concepts”, 6th Edition, McGraw – Hill
2. Elmasri and Navathe, “ Fundamentals of Database Systems”, 6th Edition, PEARSON Education.
3. G. K. Gupta :”Database Management Systems”, McGraw – Hill.
4. Raghu Ramkrishnan and Johannes Gehrke, “ Database Management Systems”,TMH.
5. Dr. P.S. Deshpande, SQL and PL/SQL for Oracle 10g, Black Book, Dreamtech Press.
6. Complex Queries using group by, nested queries, recursive queries, joins, views, Triggers, Cursors.
7. Design and Implementation of a fully fledged Database with front end for a real life application (Using JDBC).
8. Assignment for conversion of relation to different normal forms.
9. Program for construction of index- B-Tree/ B+-Tree.

Back to Scheme

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
IT 204	Communication Engineering	Contact Hours	2	-	-	2
		Credits	2		-	2

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
IT 204	Communication Engineering	40	40	40	60	–	–	--	100

1. Prerequisite: Basic of electrical engineering

2. Course Objectives:

1. Study the basic of Analog and Digital Communication Systems
2. Describe the concept of Noise and Fourier Transform for analyzing communication systems
3. Acquire the knowledge of different modulation techniques such as AM, FM and study the block diagram of transmitter and receiver.
4. Study the Sampling theorem and Pulse Analog and digital modulation techniques
5. Learn the concept of multiplexing and digital bandpass modulation techniques
6. Gain the core idea of electromagnetic radiation and propagation of waves.

3. Course Outcomes:

1. Describe analog and digital communication systems.
2. Differentiate types of noise, analyze the Fourier transform of time and frequency domain.
3. Design transmitter and receiver of AM, DSB, SSB and FM.
4. Describe Sampling theorem and pulse modulation systems.
5. Explain multiplexing and digital modulation techniques.
6. Describe electromagnetic radiation and propagation of waves.

4. Detailed Syllabus:

Sr. No.	Module	Detailed Content	Hours	COs
0	Prerequisite	Terminologies in communication systems, analog and digital electronics	02	
1	Introduction	Basics of analog communication and digital communication systems, Types of Communication channels.	04	CO1
2	Noise and Representation of Signal	Types of Noise, Noise parameters –Signal to noise ratio, Noise factor, and Noise figure	06	CO2
3	Amplitude and Angle modulation Techniques.	Need for modulation, Amplitude Modulation Techniques: DSBFC AM, DSBSC-AM, SSB SC AM- block diagram spectrum, waveforms, bandwidth. AM Transmitter and Receivers – TRF receivers and Super heterodyne receiver. FM: Principle of FM- waveforms, spectrum, and bandwidth.	10	CO1, CO2, CO3
4	Pulse Analog Modulation and Digital Modulation	Sampling theorem, PAM, PWM and PPM generation and Degeneration. Quantization process, Pulse code modulation, Delta modulation, Adaptive delta modulation.	08	CO1, CO2, CO4

5	Multiplexing and Digital Modulation Techniques	Principle of Time Division Multiplexing, Frequency Division Multiplexing, and its applications. ASK, FSK, PSK generation and detection.	05	CO1, CO2, CO5
6	Radiation and Propagation of Waves	Electromagnetic radiation, fundamentals, types of propagation, ground wave, sky wave, space wave propagation.	04	CO6

5.Theory Assessment:

Internal Assessment for 40 marks:

Consisting of Two compulsory Test of **40 Marks each** on 40% syllabus for each test. The final marks will be average of both the tests.

End Semester Examination: 60 Marks

Weightage of each module in the end semester examination will be proportional to the number of respective lecture hours mentioned in the curriculum.

6. Text / References Books:

1. George Kennedy, Bernard Davis, SRM Prasanna, Electronic Communication Systems, Tata McGraw Hill, 5th Ed
2. Simon Haykin, Michael Moher, Introduction to Analog & Digital Communications, Wiley India Pvt. Ltd., 2nd Ed.
3. Wireless Communication and Networking, Vijay Garg Wayne Tomasi, Electronic Communications Systems, Pearson Publication, 5th Ed.
4. B P Lathi, Zhi Ding, Modern Digital and Analog Communication Systems, Oxford University
5. Herbert Taub, Donald L Schilling, Goutam Saha, Principles of Communication Systems, Tata McGraw Hill, 3rdEd.
6. K Sam Shanmugam, Digital and Analog Communication Systems, Wiley India Pvt. Ltd, 1st Ed.

Back to Scheme

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
IT 205	Professional Communication II	Contact Hours	-	2	1	3
		Credits	-	1	1	2

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
IT 205	Professional Communication II	--	--	--	--	50	--	--	50

1. Course Objectives: The course/instructor aims to

1. To enable learners to formulate professional documents in a structured manner that meets the corporate requirements.
2. To provide an appropriate environment, opportunity and scope to the learners to acquire skills such as collaboration, leadership qualities, assertiveness etc. necessary for group discussion and team building.
3. To promote the importance of having an impressive personality that will enhance self esteem, build self confidence and sensitize the learners in appropriate behavior.
4. To prepare the learners for campus placement, employability and competitive examination required for lifelong learning.
5. To inculcate the ethical code of conduct and corporate etiquettes.
6. To develop effective presentation, research and organizational and creative skills necessary for global and industrial set up.

2. Course Outcomes: On successful completion of this course, learner/student will be able to

1. Learners will be able to acquire the writing skills necessary for professional documents to meet the corporate requirement.
2. Learners will be able to demonstrate the skills required for self-improvement and effective communication.
3. Develop self-confidence and behave professionally.
4. Learners will be able to perform successfully in competitive exams like GRE, CET and TOEFL
5. Able to determine the importance of ethics and etiquettes in social and professional situations.
6. Able to illustrate effective presentation, research organizational and creative skills necessary for lifelong learning.

3. Prerequisite: Basic Language Skills

4. Detailed Syllabus:

SN	Detailed Content	Hrs	CO Map
I	**Structure, Style and Language of Report Writing** 1.1 Introducing the purpose , aim, objective and format of report 1.2 Literature review-ability to gather and analyze information from different sources and summarize. Specific emphasis on plagiarism, use of quotation marks appropriately. 1.3 Research Methodology 1.4 Presenting data-figures, diagrams and labeling 1.5 How and why to write discussion 1.6 Citing and referencing- IEEE format 1.7 Writing an abstract	6	CO1
II	**Writing Technical Proposals** 2.1 Format 2.2 Executive summary 2.3 Defining the problem and presenting the solution 2.4 Summarizing a technical proposal	4	CO1
III	**Oral Skills for Employability** 3.1 Group Discussion- with special reference to leadership qualities, assertiveness, analyzing the topic, developing different perspectives, introducing and concluding the discussion. 3.2 Interview-with special reference to introducing oneself and answering questions with confidence. 3.3 Presentation Skills-with special reference to preparing slides, dress code, non-verbal communication including paralinguistic features, introduction and conclusion.	4	CO2, CO4, CO6
IV	**Personality Development and Social Etiquettes** 4.1. Personality Development: Improving self-awareness-analyzing our own experiences, looking at ourselves through the eyes of others; Knowing and Building your own identity; Discovering and Developing your talents; Teamwork/ collaboration; 4.2. Social Etiquettes: Formal Dining Etiquettes; Cubicle Etiquettes; Responsibility in Using Social Media; Showing Empathy and Respect; Learning Accountability and Accepting Criticism; Demonstrating Flexibility and Cooperation; Selecting Effective Communication Channels	5	CO3, CO5
V	**Ethics and Ethical Codes of Conduct** 5.1 Writing Resume and statement of purpose 5.2 Business and corporate activities(special emphasis on business meetings) 5.3 Personal ethics, conflicting values, choosing a moral response, the process of making ethical decisions.	3	CO4, CO5
VI	**Content writing** 6.1 Research Skills 6.2 Organizational skills 6.3 Creative Writing- Blog posts, Web pages etc.	4	CO6

5. Details of Tutorial:

Tutorial Course Objectives: To provide practice in

1. Drafting effective written discourse with specific emphasis on report, proposal writing and documentation of business meetings.
2. Fluent speaking, developing confidence, positive approach, responsibility, empathy and presentation skills in social, academic and professional settings.
3. Writing a resume and statement of purpose for academic and professional development.
4. Fostering ethical decisions and behavior in academic and professional settings.
5. Skillful questioning, organizing information, learning to find credible sources and verifying information from several sources.
6. Using imagination and out of the box thinking to create something unique and extraordinary.

Tutorial Course Outcomes: Based on Bloom's Taxonomy

Learners will be able to

1. Write reports,technical proposals and document business meetings with ease and accuracy.
2. Speak fluently with confidence, have a positive approach, develop empathetic skills and make effective professional presentations.
3. Demonstrate their skills in resume writing and statement of purpose.
4. Conduct themselves with zest and zeal required in academic and professional situations.
5. Acquire research skills necessary for addressing problems and finding effective solutions to it.
6. Write blogs to express their opinion with ease and also connect to the audience.

SN	Details of Assignments	Details of Activities	Hrs	CO Map
I	Written assignment on Literature Review 20 page report on technical topic-(to be included as part of term work)	Sample IEEE papers to be shared with students and train them to identify contributions of each author. These contributions can then be written in the format required in journals.	4	CO1, CO5
II	Written assignment on summarizing a technical proposal 4 page technical proposal (to be included as part of term work)	Example of summarizing techniques to be demonstrated.	4	CO1, CO5
III	Oral Skills for Employability- to be included in term work.	Role play and mock interviews Mock group discussion Mock presentation	2 2 2	CO2, CO3, CO4
IV	Written Assignment on Documentation of Business Meeting	Mock meetings	2	CO1, CO4
V	Written Assignment on Resume writing/Statement of Purpose.	NA	2	CO3
VI	Written Assignment on Blog Posts	NA	2	CO6

6. Term Work Assessment:

1. Assignments: 10 marks
2. Group Discussion: 10 marks
3. Interviews: 5 marks
4. Report: 5 marks
5. Technical Proposal: 5 marks
6. Attendance: 5 marks
7. Presentation: 10 marks

7. References:

1. Raman Meenakshi & Sharma Sangeeta, *Communication Skills,* Oxford University Press
2. Kumar Sanjay & Lata Pushp, *Communication Skills*, Oxford University Press
3. Virendra Singh Nirban, Krishna Mohan, RC Sharma, *Business Correspondence and Report Writing*

Back to Scheme

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
IT 206	Human Values and Social Ethics	Contact Hours	2	-	-	2
		Credits	2	-	-	2

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
IT 206	Human Values and Social Ethics	-	-	-	-	50	–	-	50

1. Course Objectives: The course/instructor aims to

1. To enable learners to understand the core values that shape the ethical behaviour of a professional.
2. To develop an awareness of the different ethical dilemmas at the workplace and society.
3. To inculcate the ethical code of conduct in writing technical articles and technology development.
4. To internalize ethical principles and code of conduct of a good human being at home, society and at work place.

2. Course Outcomes: After successful completion of the course students will be able to

1. Learners will be able to recognize the relation between ethics and values pertinent for an engineering professional.
2. Learners will be able to exercise the responsibility for establishing fair and just processes for participation and group decision making
3. Learners will be able to demonstrate an awareness of self-held beliefs and values and how they are altered in interactions with others.
4. Learners will be able to acquire the writing skills necessary to analyse data from research and attribute the source with proper citation.
5. Learners will be competent to incorporate values and ethical principles in social and professional situations.

3. Detailed Lab syllabus:

SN	Details	Hours
1	**Ethics and Values** : Meaning & Concept of Ethics Difference between Ethics and Values Ethical code of conduct	03
2	**Professional Ethics** : Professional Ethics vs Personal ethics Components of professional ethics Professional values and its importance	05

3	**Ethics and Society** : Relevance of values and ethics in social work Ethical dilemmas Values and ethical principles of social work · Service · Dignity and worth of a person · Importance of Human relationships · Integrity · Competence · Social Justice	04
4	**Ethics in Technical writing** : Documenting sources Presentation of Information Ethics & Plagiarism	07
5	**Ethics and Technology Development** : Risk management and Individual rights Moral issues in development and application of technology Privacy/confidentiality of information Managing Technology to ensure fair practices	07

4. Term Work Assessment:

1. Assignments: 10 marks
2. Group Discussion: 10 marks
3. Interviews: 5 marks
4. Report: 5 marks
5. Technical Proposal: 5 marks
6. Attendance: 5 marks
7. Presentation: 10 marks

5. **Reference Books:**

1. Martin Cohen, *101 Ethical Dilemmas* Routledge, 2nd edition, 2007.
2. M. Govindarajan, S. Natarajan & V.S. Senthilkumar, *Professional Ethics and Human Values,* Prentice Hall India Learning Private Limited, 2013.
3. Mike W. Martin, *Ethics in Engineering*, McGraw Hill Education; Fourth edition, 2017.

Back to Scheme

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
IT 207	Programming Lab I (Python)	Contact Hours	-	2+2#	-	4
		Credits	-	2	-	2

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
IT 207	Programming Lab I (Python)	-	-	-	-	25	25	—	50

1. Prerequisite: Python IDE installation and environment setup.

2. Lab Objectives:

This course will help the students to Learn

1. Basics of python including data types, operator, conditional statements, looping statements input and output functions in Python
2. List, tuple, set, dictionary, string, array
3. Functions, Concepts of modules, packages
4. Object Oriented Programming concepts in python
5. Concept of exception handling and File handling operations
6. Graphical User Interface, SQLite Database, Basics of Django Framework

3. Lab Outcomes:

Students will be able

1. To understand the structure, syntax of the Python language
2. To interpret varied data types in python
3. To implement functions, modules and packages
4. To illustrate the concepts of object-oriented programming as used in Python
5. To gain proficiency in exception handling mechanisms and File Handling
6. To create GUI with database connectivity in python and implement Django framework

4. Detailed Syllabus:

Module No	Module	Detailed Content	Hrs	LOs
0	**Prerequisite**	Python IDE installation and environment setup.		
1	**Basics of Python**	Introduction, Features, Python building blocks – Identifiers, Keywords, Indention, Variables and Comments, Numeric, Boolean, Compound data types Operators: Arithmetic, comparison, relational, assignment, logical, bitwise, membership, identity operators, operator precedence Control flow statements: Conditional statements (if, if…else, nested if) Looping in Python (while loop, for loop, nested loops) Loop manipulation using continue, pass, break. Input/output Functions	06	LO 1
2	**Data types**	Lists: a) Defining lists, accessing values in list, deleting values in list, updating lists b) Basic list operations c) Built-in list functions	08	LO 1 LO 2

		Tuples: a)Accessing values in Tuples, deleting values in Tuples, and updating Tuples b)Basic Tuple operations c) Built-in Tuple functions Dictionaries: a)Accessing values in Dictionary, deleting values in Dictionary, and updating Dictionary b)Basic Dictionary operations c) Built-in Dictionary functions Sets: a) Accessing values in Set, deleting values in Set, updating Sets b) Basic Set operations, c)Built-in Set functions Strings: a) String initialization, Indexing, Slicing, Concatenation, Membership & Immutability b) Built-in String functions Arrays: a) Working with Single dimensional Arrays: Creating, importing, Indexing, Slicing, copying and processing array arrays. b) Working with Multi-dimensional Arrays		
3	**Functions, modules and packages**	Functions: a) Built-in functions in python b) Defining function, calling function, returning values, types of parameters c) Nested and Recursive functions d) Anonymous Functions (Lambda, Map, Reduce, Filter) e) List Comprehension Modules: Writing modules, importing objects from modules, Python built-in modules (e.g. Numeric and Mathematical module, Functional Programming module, Regular Expression module), Namespace and Scoping. Packages: creating user defined packages and importing packages.	06	LO 1 LO 3
4	**Object Oriented Programming**	Overview of Object oriented programming, Creating Classes and Objects, Self-Variable, Constructors	04	LO 1 LO 4
5	**Exception handling and File handling**	Exception handling: Compile time errors, Runtime errors, exceptions, types of exception, try, block, except block, final block, raise statement, Assert statement, User-Defined Exceptions. File Handling: Opening file in different modes, closing a file, Writing to a file, accessing file contents using standard library functions, Reading from a file – read(), readline(), readlines(), Renaming and Deleting a file, File Exceptions, Directories.	04	LO 1 LO 5
6	**GUI, SQLite and Django**	Graphical user interface (GUI): Overview of different GUI tools in python (Tkinter, PyQt, Kivy etc.), Working with Widgets (Button, Label, Text, etc.) Connecting GUI with SQLite database. Django Framework: Introduction to Django, Setting Up Django, Django Models, Django Views, Django Templates, Django URLs and Routing, Django Forms, Django Admin Interface, Django ORM (Object-Relational Mapping), Static Files and Media, User Authentication and Authorization.	10	LO 1 LO 6

5. Practical assessment

Term Work:

Term Work shall consist of at least 5 practical based on the above list and a Mini Project

The Mini Project should be based on real world applications which cover concepts from more than one module of syllabus.

The distribution of marks for term work shall be as follows:

Experiments : 10 marks
Mini Project : 10 marks
Attendance : 05 marks

The final certification and acceptance of TW ensures the satisfactory performance of laboratory work and minimum passing in the TW.

Practical & Oral Exam: An Oral exam will be held based on the above syllabus for 25 marks .

6. Text /References Books:

1. Dr. R. Nageswara Rao, ”Core Python Programming” , Dreamtech Press, Wiley Publication
2. M. T. Savaliya , R. K. Maurya, “Programming through Python”, StarEdu Solutions.
3. E Balagurusamy, “Introduction to computing and problem solving using python”, McGraw Hill Publication.
4. Zed A. Shaw, “Learn Python 3 the Hard Way”, Zed Shaw's Hard Way Series.
5. Martin C. Brown,” Python: The Complete Reference”, McGraw-Hill Publication.
6. Paul Barry,” Head First Python”, 2nd Edition, O'Reilly Media, Inc.
7. Daniel Roy and Audrey Greenfeld, “A Wedge of Django”.

Web resources:

1. https://tutorial.djangogirls.org/en/
2. https://docs.scipy.org/doc/numpy/user/quickstart.html
3. https://matplotlib.org/tutorials/
4. https://pandas.pydata.org/docs/getting_started/
5. https://www.geeksforgeeks.org/python-build-a-rest-api-using-flask/

Back to Scheme

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
IT 208	Engineering Mathematics IV	Contact Hours	3	-	1	4
		Credits	3	-	1	4

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
IT 208	Engineering Mathematics IV	40	40	40	60	25	–	--	125

1. Prerequisite: Engineering Mathematics I, Engineering Mathematics-II,Engineering Mathematics-III

2. Course Objectives: The course is aimed to:

1. To understand the basic techniques of statistics like correlation, regression, and curve fitting for data analysis, Machine learning, and AI.
2. To acquaint yourself with the concepts of probability, random variables with their distributions and expectations.
3. To understand the concepts of vector spaces used in the field of machine learning and engineering problems
4. To Introduce students to Lattice theory, recurrence relations.
5. To learn the sampling theory and Number theory
6. To Introduce students to graphs, and trees.

3. Course Outcomes:

On successful completion of course learner/student will be able to:

1. Apply the concept of Correlation and Regression to the engineering problems in data science, machine learning, and AI.
2. Illustrate understanding of the concepts of probability and expectation for getting the spread of the data and distribution of probabilities.
3. Apply the concept of vector spaces and orthogonalization process in Engineering Problems.
4. Express recursive functions of other subjects like Data Structures as recurrence relation.
5. Use the concept of sampling theory and Number theory to engineering problems.
6. Understand use of functions, graphs and trees in programming applications.

4. Detailed Syllabus:

SN	Module	Detailed Content	Hrs	COs
0	Prerequisite	**Comment (Prerequisite syllabus should not be considered for paper setting)** Engineering Mathematics I, Engineering Mathematics-II, Engineering Mathematics-III.		
I	Correlation,Regression and Curve Fitting,	Karl Pearson's Coefficient of correlation (r),Spearman's Rank correlation coefficient (R) ,Lines of regression, Fitting of first and second degree curves.	6	1
II	Probability,Probability Distributions,	Conditional probability, Total Probability and Bayes Theorem,Discrete and Continuous random variables, Probability mass and density function,Probability distribution for random variables, Expectation, Variance, Binomial distribution ,Poisson distribution,Normal distribution	6	2
III	Linear Algebra: Vector Spaces and	Vectors in n-dimensional vector space, norm, dot product, The Cauchy Schwarz inequality, Unit vector ; Linear combinations, linear	6	3

	Nonlinear Programming (NLPP)	Dependence and Independence, Orthogonal projection, Orthonormal basis, Gram-Schmidt process for vectors; Vector spaces over real field, subspaces. NLPP with one equality constraint (two or three variables) using the method of Lagrange's multipliers, NLPP with two equality constraints, NLLP with inequality constraint: Kuhn-Tucker Conditions.		
IV	Lattice Theory & Recurrence relation,	Poset,Hasse Diagram,Isomorphism,Extremal Elements of Posets,Lattices,Special Types of Lattices,Solving Recurrence relation,Linear Homogeneous Recurrence relation with constant coefficients,Non-Homogeneous Recurrence relation	7	4
V	Sampling Theory,Number Theory,	Small Sample test, Large Sample test, chi-square test,Euler's,Fermat's Little Theorem,Congruences,Computing Inverse in Congruences,Chinese Remainder Theorem,Euclid's algorithm,Testing for primality	8	5
VI	Graphs and Trees:	Types of Graphs,Homomorphism And Isomorphism Of Graphs,Subgraphs,Types of Graphs,Complement of Graph,Connected Graphs,Eulerian And Hamiltonian Graphs,Trees,Binary Trees,Minimum Spanning Tree,Kruskal's Algorithm	6	6

5. Theory Assessments:

Internal Assessment (IA): Two class tests of 40 marks each. The first class test is to be conducted when approx. 40% syllabus is completed and the second class test when an additional 35% syllabus is completed. Duration of each test shall be one hour.

End Semester Theory Examination: In question, paper weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.

6. Tutorial Assessment: The final certification and acceptance of TW ensures the satisfactory performance of assignment work and minimum passing in the TW.

Term Work: Term Work shall consist of assignment. Term work Journal must include at least 6 assignments based on the topics mentioned in the syllabus.

Term Work Marks: 25 Marks (Total marks) = 15 Marks (Tutorial) + 5 Marks (Assignment) + 5 Marks (Attendance)

7. Text Books & References:

1. Advanced Engineering Mathematics H.K. Das, S . Chand, Publications.
2. Higher Engineering Mathematics B. V. Ramana, Tata Mc-Graw Hill Publication
3. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Narosa publication
4. Advanced Engineering Mathematics Wylie and Barret, Tata Mc-Graw Hill.
5. Beginning Linear Algebra Seymour Lipschutz Schaum's outline series, Mc-Graw Hill Publication
6. Higher Engineering Mathematics, Dr. B. S. Grewal, Khanna Publication
7. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons.
8. Discrete and Combinatorial Mathematics Ralph P. Grimaldi, B. V. Ramana, Pearson Education
9. Discrete Mathematical Structures D. S. Malik and M. K. Sen ,Course Technology Inc (19 June 2004)
10. Discrete Mathematics and its Applications Kenneth H. Rosen, "", Tata McGrawHill.

Back to Scheme

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
IT 209	Automata Theory and System Software	Contact Hours	3	-	1	4
		Credits	3	-	1	4

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
IT 209	Automata Theory and System Software	40	40	40	60	25	—	--	125

1. Prerequisite: Basic Mathematical Fundamentals: Sets, Logic, Relations, Functions.

2. Course Objectives:
The course is aimed:
1. To learn fundamentals of Regular and Context Free Grammars and Languages.
2. To understand the relation between Regular Language and Finite Automata and machines.
3. To learn how to design Automata's and machines as Acceptors, Verifiers and Translators.
4. To understand the relation between Contexts free Languages, PDA and TM.
5. To learn how to design PDA as acceptor and TM as Calculators.
6. To learn applications of Automata Theory.

3. Course Outcomes:
On successful completion of course learner/student will be able to:
1. Understand, design, construct, analyze and interpret Regular languages, Expression andGrammars.
2. Design different types of Finite Automata and Machines as Acceptor, Verifier and Translator.
3. Understand, design, analyze and interpret Context Free languages, Expression and Grammars.
4. Design different types of Push down Automata as Simple Parser.
5. Design different types of Turing Machines as Acceptor, Verifier, Translator and Basic computing machine.
6. Compare, understand and analyze different languages, grammars, Automata and Machines and appreciate their power and convert Automata to Programs and Functions.

4. Detailed Theory Syllabus:

Sr. No.	Module	Detailed Content	Hrs.	CO Mapping
0	Prerequisite	**Prerequisite** Basic Mathematical Fundamentals: Sets, Logic, Relations, Functions	02	-
1	Introduction and Regular Languages	**Introduction and Regular Languages** Languages: Alphabets and Strings. Regular Languages: Regular Expressions, Regular Languages, Regular Grammars, RL and LL grammars, Closure properties.	05	CO1
2	Finite Automata and machines	**Finite Automata and machines** Finite Automata: FA as language acceptor or verifier, NFA (with and without ε) , DFA, RE to NFA, NFA to DFA, Reduced DFA , NFA-DFA equivalence, FA to RE. Finite State Machines: m/c with output Moore and Mealy machines. M/c as translators. Melay and Moore m/c conversion.	09	CO2

3	Context Free Grammars	**Context Free Grammars** Context Free Languages: CFG, Leftmost and Rightmost derivations, Ambiguity, Simplification and Normalization (CNF and GNF) and Chomsky Hierarchy (Types 0 to 3)	05	CO3
4	Push Down Automata	**Push Down Automata** Push Down Automata: Deterministic (single stack PDA), Equivalence between PDA and CFG.	04	CO4
5	Turing Machine	**Turing Machine** Turing Machine: Deterministic TM , Multi-track and Multi-tape TMs, concept of UTM and idea of system program. Issue and concept of Halting Problem	05	CO5
6	Applications of Automata	**Applications of Automata** Power and Limitations of Regular and Context Free Grammars and Machines, Introduction to Compiler & Its phases	04	CO6

5. Theory Assessments:

Internal Assessment (IA): Two class tests of 40 marks each. The first class test is to be conducted when approx. 40% syllabus is completed and the second class test when an additional 35% syllabus is completed. Duration of each test shall be one hour.

End Semester Theory Examination: In question, paper weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.

1. Question paper will consist of 3 questions, each carrying 20 marks.
2. Question number 1 will be compulsory and based on maximum contents of the syllabus
3. Remaining questions will be mixed in nature (for example, if Q.2 has part (a) from module 3 then part (b) will be from other than module 3)
4. Total three questions need to be solved.

6. Tutorial Assessment: The final certification and acceptance of TW ensures the satisfactory performance of assignment work and minimum passing in the TW.

Term Work: Term Work shall consist of assignment. Term work Journal must include at least 6 assignments based on the topics mentioned in the syllabus.

Term Work Marks: 25 Marks (Total marks) = 20 Marks (Assignments) + 5 Marks (Attendance)

7. Books and References:

Text Books:

1. J.C.Martin, “Introduction to languages and the Theory of Computation”, TMH.
2. Kavi Mahesh, “Theory of Computation A Problem Solving Approach”, Wiley India

References:

1. John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, “Introduction to Automata Theory, Languages and Computation”, Pearson Education.
2. Daniel I.A. Cohen, “Introduction to Computer Theory”, John Wiley & Sons.
3. Theory of Computation - By Vivek Kulkarni from Oxford University.
4. N. Chandrashekhar & K.L.P. Mishra, “Theory of Computer Science, Automata Languages & Computations”, PHI publications.

Back to Scheme

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
IT 210	Operating Systems	Contact Hours	3	2	-	5
		Credits	3	1	-	4

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
IT 210	Operating Systems	40	40	40	60	25	–	25	150

1. Prerequisite: Basic knowledge of Data structures and Computer architecture, Any programming language.

2. Course Objectives: The course is aimed:

1. To introduce basic concepts and functions of operating systems
2. To introduce the concept of a process, thread and its management .
3. To introduce the basic concepts of Inter-process communication (IPC) and to understand concepts of process synchronization and deadlock.
4. To understand the concepts and implementation of memory management policies and virtual memory.
5. To understand functions of Operating Systems for file management and device management learn Unix commands for process management.
6. To study different file systems of OS like Linux, Windows and overview of RTOS.

3. Course Outcomes: On successful completion of course learner/student will be able to:

1. Understand the basic concepts related to Operating Systems, installation of Unix Operating System and Unix general purpose commands and programming in the Unix editor environment
2. Describe the process management policies and illustrate scheduling of processes by CPU and implement Unix commands for process management .
3. Explain and apply synchronization primitives and evaluate deadlock conditions as handled by the Operating System.
4. Describe and analyze the memory allocation and management functions of the operating System and implement the Unix commands for memory management.
5. Analyze and evaluate the services provided by the Operating System for storage management and implement the Unix commands for user and file management.
6. Analyze and Compare the functions of various special purpose Operating Systems and implement advanced script using grep, sed, etc. commands for performing various tasks and d script using awk command & perl languages

4. Detailed Theory Syllabus:

SN	Module	Detailed Content	Hrs	COs
1	Introduction to Operating System	**Introduction to Operating System** Introduction to Operating Systems; Operating System Structure and Operations; Functions of Operating Systems; Operating System Services and Interface; System Calls and its Types; Operating System Structure; System Boot.	03	CO1
2	Process Management	**Process Management** Basic Concepts of Process; Operation on Process; Process State Model and Transition; Process Control Block; Context Switching; Basic Concepts of Scheduling; Types of Schedulers; Scheduling Criteria; Scheduling Algorithms, Introduction to Threads; Types of Threads, Thread Models;	07	CO2

3	Process Synchronization and Deadlocks	**Process Synchronization and Deadlocks** Basic Concepts of Inter-process Communication and Synchronization; Race Condition; Critical Region and Problem; Peterson's Solution; Synchronization Hardware and Semaphores; Classic Problems of Synchronization; Message Passing; Introduction to Deadlocks; System Model, Deadlock Characterization; Deadlock Prevention; Deadlock Avoidance; Deadlock Detection and Recovery. Dining Philosophers Problem.	09	CO3
4	Memory Management	**Memory Management** Basic Concepts of Memory Management; Swapping; Contiguous Memory Allocation Techniques; Paging; TLB; Segmentation; Basic Concepts of Virtual Memory; Demand Paging, Copy-on Write; Page Replacement Algorithms; Thrashing.	10	CO4
5	Input/Output and File Management	**Input/Output and File Management** I/O Devices, Organization of the I/O Function, Operating System Design Issues, I/O Buffering, Disk Scheduling and disk scheduling algorithms, Overview, File Organization and Access; Free Space management	06	CO5
6	Special purpose Operating Systems	**Special purpose Operating Systems** Introduction to RTOS, Real -time Scheduling, Compare functions of Multimedia OS, RTOS, Mobile OS	04	CO6

5. Suggested Experiments:

1. Basic UNIX Commands
    a) Execution of Unix General Purpose Utility Commands like echo, clear, exit, date, time, uptime, cal, cat, tty, man, which, history, id, pwd, whoami, cancel, mail, etc.
    b) Working with Editor Vi/other editor
2. Commands for File System Management and User Management
    a) Study of Unix file system (tree structure), file and directory permissions, single and multiuser environment.
    b) Execution of File System Management Commands like ls, cd, pwd, cat, mkdir, rmdir, rm, cp, mv, chmod, wc, piping and redirection, grep, tr, echo, sort, head, tail, diff, comm, less, more, file, type, wc, split, cmp, tar, find, vim, gzip, bzip2, unzip, locate, etc.
    c) Execution of User Management Commands like who, whoami, su, sudo, login, logout, exit, passwd, useradd/adduser, usermod, userdel, groupadd, groupmod, groupdel, gpasswd, chown, chage, chgrp, chfn, etc.
3. Commands for Process Management and Memory Management
    a) Execution of Process Management Commands like ps, pstree, nice, kill, pkill, killall, xkill, fg, bg, pgrep, renice, etc.
    b) Execution of Memory Management Commands like free, /proc/meminfo, top, htop, df, du, vmstat, demidecode, sar, pagesize, etc.
4. Basic Scripts
    a) Study of Shell, Types of Shell, Variables andOperatorsb)
    b) Execute the following Scripts (at least 6):
        i) Write a shell script to perform arithmetic operations.
        ii) Write a shell script to calculate simple interest.
        iii) Write a shell script to determine the largest among three integer numbers.
        iv) Write a shell script to determine whether a given year is a leap year or not.
        v) Write a shell script to print the multiplication table of given numbers using a while statement.
        vi) Write a shell script to search whether an element is present in the list or not.
        vii) Write a shell script to compare two strings.
        viii) Write a shell script to read and check if the directory / file exists or not, if not make the directory / file.
        ix) Write a shell script to implement a menu-driven calculator using a case statement.

x) Write a shell script to print following pattern:

```
*
**
***
* * * *
```

xi) Write a shell script to perform operations on a directory like: display name of current directory; display list of directory contents; create another directory, write contents on that and copy it to a suitable location in your home directory; etc.

5. Grep and Sed Commands
   a) Write a script using grep command to find the number of words character, words and lines in a file.
   b) Write a script using egrep command to display a list of specific types of files in the directory.
   c) Write a script using sed command to replace all occurrences of a particular word in a given file.
   d) Write a script using sed command to print duplicate lines in input.
6. AWK Command and Perl
   a) Write an awk script to print all even numbers in a given range.
   b) Write an awk script to develop a Fibonacci series (take user input for a number of terms).
   c) Write a perl script to sort elements of an array.
   d) Write a perl script to check if a number is prime or not.

6. Theory Assessment

Internal Assessment for 40 marks:

Consisting of Two compulsory Test Consisting of **40 Marks each** on 40% syllabus for each test. The final marks will be average of both the tests.

End Semester Examination: 60 Marks

Weightage of each module in the end semester examination will be proportional to the number of respective lecture hours mentioned in the curriculum.

7. Practical Assessment:

Term Work: Term Work shall consist of practicals based on the above list. Also Term work Journal must include at least 2 assignments based on the topics mentioned in the syllabus.

Term Work Marks: 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance)

An Oral viva exam will be held based on the above syllabus. The final certification and acceptance of TW ensures the satisfactory performance of laboratory work and minimum passing in the TW.

8. Books and References:

Text Books:

1. Modern Operating Systems, Tanenbaum, IIIrdEdition, PHI
2. Operating System-Internal & Design Principles, VIthEdition, William Stallings, Pearson
3. Operating Systems Concepts, Silberschatz A., Galvin P., Gagne G, VIIIthEdition Wiley.

References:

1. Operating System Programming and Operating Systems, D M Dhamdhere, IIndRevised Edition, Tata McGraw.
2. Principles of Operating Systems, Naresh Chauhan, First Edition , Oxford university press.
3. Achyut Godbole and Atul Kahate, Operating Systems, McGraw Hill Education, 3rdEdition

Back to Scheme

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
IT 211	Computer Architecture and Logic Design	Contact Hours	3	-	-	3
		Credits	3	-	-	3

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
IT 211	Computer Architecture and Logic Design	40	40	40	60	–	–	–	100

1. Prerequisite: NA

2. Course Objectives:

1. To introduce the concept of digital and binary systems,Analyze and Design combinational and sequential logic circuits.
2. To acquaint students with the basic concepts of fundamental component, architecture, register organization and performance metrics of a computer
3. To familiarize with implementation of fixed point and floating-point arithmetic operations
4. To understand the concept of various memories and interfacing
5. To study the design of data path unit and control unit for processor
6. To explore various alternate techniques for improving the performance of a processor

3. Course Outcomes:

Understand Boolean algebra and illustrate logic minimization, Design combinational logic circuits including arithmetic logic, selection logic and code conversion ,Design sequential logic circuits including counters, shift registers and pipeline data path circuits

1. Understand the basics of digital logic circuits.
2. Differentiate Von Neumann, Harvard, and CISC and RISC architectures. Analyze the performance of machines with different capabilities.
3. Illustrate binary format for numerical and characters. Validate efficient algorithm for arithmetic operations
4. Understand the basics structure of computers, operations and instructions and design control unit
5. Understand the design of various memory systems and I/O communication
6. Understand pipelined execution and design control unit

4. Detailed Theory Syllabus:

Module No	Module	Detailed Content	Hrs	COs
1	Fundamentals of Digital Logic	Boolean Algebra, Logic Gates, Simplification of Logic Circuits: Algebraic Simplification, Karnaugh Maps.Combinational Circuits: Adders, Mux, De-Mux, Sequential Circuits : Flip-Flops (SR, JK & D)	9	CO1
2	Introduction and overview of computer architecture	Introduction to computer systems - Overview of Organization and Architecture -Functional components of a computer -Registers and register files-Interconnection of components.Organization of the von Neumann machine and Harvard architecture-Performance of processor	2	CO2
3	Data Representation and Computer Arithmetic	Fixed point representation of numbers-algorithms for arithmetic operations: multiplication (Booths, Modified Booths) - division (restoring and non-restoring) - Floating point representation with IEEE standards and algorithms for common arithmetic operations	6	CO3

4	Memory System Organization	**Computer Memory System Overview:**Characteristics of Memory Systems,The Memory Hierarchy, **Cache Memory Principles**:Elements of Cache Design-Cache Addresses,Cache Size,Mapping Function,Replacement Algorithms, Write Policy,Line Size,Number of caches,Pentium 4 Cache Organization, ARM Cache Organization,	8	CO4
5	Central processing Unit and control unit	Processor Organization ,Register Organization ,Architecture of 8086 Family,Instruction sets,Addressing modes,Instruction formats, Instruction Cycle, Instruction Pipelining . Control Unit Operation - Micro-operations,Control of the Processor , Hardwired Implementation Microprogrammed Control-Basic Concepts-Microinstruction Sequencing, Microinstruction Execution	10	CO5
6	Performance Enhancements and recent trends	Classification of models - Flynn's taxonomy of parallel machine models (SISD, SIMD, MISD, MIMD)- Introduction to Pipelining- Pipelined data path-Introduction to hazards. **Input/Output** :External Devices I/O Modules, Programmed I/O , Interrupt-Driven I/O ,Direct Memory Access Multiprocessor architecture: Overview of Shared Memory architecture, Distributed architecture	4	CO6

5. Suggested Experiments:

1. Realization of basic gates using universal gates
2. Implementation of Logic Circuits by verification of Boolean laws
3. Implementation of Logic Circuits by verification of Demorgan's law
4. Implementation of Half-Adder and Full-Adder
5. Implementation of Half-Subtractor and Full-Subtractor
6. Design of Decoder and Encoder
7. Design of Multiplexer and Demultiplexer
8. Design of Counters
9. Design of shift register
10. Study of Flip Flops
11. Realization of Karnaugh Map
12. Design of Arithmetic Logic Unit
13. To simulate a direct mapping cache
14. Associative cache Design

7. Theory Assessments:

Internal Assessment: Two Internal assessments will be conducted for 40 marks each with average marks of both assessments as final score.

End Sem Theory Examination:

Weightage of each module in the end semester examination will be proportional to the number of respective lecture hours mentioned in the curriculum.

8. Text Books:

1. M. Morris Mano: Computer System Architecture, Latest Edition
2. William Stalling: Computer organization and architecture, Latest Edition
3. John P. Hayes: Computer Architecture and Organization, Latest Edition

9. References Book

1. V.P. Heuring, H.F. Jordan: Computer System design and architecture, Latest Edition
2. V. Carl Hamacher, Zvonko G. Varanesic and Safat G. Zaky, ―Computer Organization―, Fifth edition, McGraw-Hill Education India Pvt Ltd, 2014.
3. Govindarajalu, ―Computer Architecture and Organization, Design Principles and Applications", Second edition, McGraw-Hill Education India Pvt Ltd, 2014.

Back to Scheme

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
IT 212	Personal Finance Management	Contact Hours	2	-	-	2
		Credits	2	-	-	2

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
IT 212	Personal Finance Management	20	20	20	40	-	-	--	60

1. Course Objectives: The course or instructor aims

1. To introduce the basic concepts of finance and their practical application .
2. To demonstrate the process of drafting a financial budget.
3. To explain investment avenues and planning of personal finance.
4. To develop portfolio strategies for individual and institutional investor
5. To discuss various components of insurance and tax management.
6. To introduce financial frauds , measures to avoid frauds and resources of frauds .

2. Course Outcomes: On successful completion of course learner/student will be able:

1. To know basic concepts of finance and interpret current business positions by reading books of accounts .
2. To analyze investment avenues and plan personal finance to develop portfolio strategies for individuals .
3. To Develop skills to interpret current market position.
4. To Create analytical approach for financial decisions.
5. To learn and understand Tax and Insurance management.
6. To identify financial frauds and understand the level of financial aspects .

3. Prerequisite : NA

4. Detailed Theory Syllabus:

SN	Module	Detailed Contents of Module	Hrs
1	Introduction to Personal Financial Planning	Financial Planning Process: Goal, Vision and mission, Components of Personal Financial Plan, Advantages of developing personal financial plan.	3
2	Financial Budget	Meaning and Process of Drafting Financial Budget,Components of Financial Budget, Drafting Financial Budget.	3
3	Investment Management	Meaning of Investment, Concept of Risk and Return and Time Value of Money, Investment Avenues, Portfolio Creation and Management.	6
4	Insurance and Spending Management	Components of Insurance: Life Insurance, Health Insurance, Property Insurance, Spending Management.	3
5	Tax Management	Introduction to Tax Regime and Tax Returns,Introduction to Income Tax and its impact on Incomes ,Tax on property: Revenue and Capital Incomes,Tax Management, Tax Saving, Tax Avoidance	3
6	Financial Frauds	Meaning and Types of Fraud,Investment Frauds, Online Payment Frauds, Identity Theft, Mass Marketing Fraud ,Measures to avoid frauds,Recourse from frauds,Cases of Frauds	6

5. Theory Assessment:

Internal Assessment: 20 marks
Consisting of Two compulsory internal assessments 20 Marks each. The final marks will be the average score of both the assessments.

End Semester Examination: 40 Marks
Weightage of each module in the end semester examination will be proportional to the number of respective lecture hours mentioned in the curriculum.

6. Books and References:

1. Financial Management: I M Pandey, Vikas Publishing House.
2. Financial Management: M.Y. Khan, P.K. Jain, Tata McGraw Hill.
3. Financial Management: Prassana Chandra, Prentice Hall.
4. Investment Analysis & Portfolio Management- Prasanna Chandra, Tata McGrawHill
5. Wealth Management- Dun & Bradstreet, Tata McGrawHill
6. Wealth Management- S.K .Bagachi, Jaico publishing house

Back to Scheme

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
IT 214	Programming Lab II (Web)	Contact Hours	-	2	-	2
		Credits	-	1	-	1

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
IT 214	Programming Lab II (Web)	-	-	-	-	25	–	25	50

1.Prerequisite: Basic Java Programming and Python Programming.

2.Course Objectives: The course/instructor aims to

1. To get familiar with the basics of website designing using HTML5
2. To get familiar with the basics of website designing using CSS3.
3. To acquire knowledge and skills for creation of dynamic web pages using JavaScript.
4. To be familiarized with Dynamic website creation using PHP Programming.
5. To explore Dynamic web applications development using PHP web framework.
6. To explore Dynamic web applications development using Django web framework.

3.Course Outcomes: On successful completion of this course, learner/student will be able to

1. Implement interactive web pages using HTML5,CSS3.
2. Implement interactive web pages using CSS3.
3. Implement dynamic web pages using JavaScript.
4. Build Dynamic web site using server side PHP Programming.
5. Build Dynamic web application using PHP web framework.
6. Build Dynamic web application using Django web framework.

4. Detailed Topics:

SN	Topics	Detailed Content	Hrs.	COs
I	Client Side Programming :HTML5	Web System architecture, URL, domain name system, overview of HTTP and FTP, HTMLFormatting and Fonts, Anchors, images, lists, tables, forms. HTML5: New HTML5 tags, Semantics Elements, Audio and Video, Geo-location.	6	CO 1
2	Client Side Programming :CSS3	Introduction to CSS: Syntax of CSS, CSS Selectors, Inserting CSS in an HTML Document. CSS3: CSS3 Selectors, CSS3 Box Model, Backgrounds, Text Effects, Gradient, Shadow, Media Queries, CSS Flexbox, CSS3 Transitions, Transformations and Animations .User Interface (UI) and User Experience (UX)	6	CO 2
3	Client Side Programming JavaScript	JavaScript language constructs, Objects in JavaScript- Built in, Browser objects and DOM objects, event handling, form validation and cookies. Introduction to JSON. Introduction to AJAX.	6	CO 3

4	Server Side Programming: PHP Basics	Introduction and basic syntax of PHP, decision and looping with examples, PHP and HTML, Arrays, Functions, Browser control and detection, string, Form processing, Files Uploading	6	CO 4
5	Server Side Programming: Advanced PHP	Cookies and Sessions, Object Oriented Programming with PHP, PHP and Mysql database connectivity. REST API using PHP. Introduction to Lumen framework (Routing, Middleware, Controllers, Requests, Responses, Authentication, Authorization, Database) Comparison with other PHP Frameworks: Laravel, Symfony, CodeIgniter, CakePHP, Yii, Zend, Phalcon.	8	CO 5
6	Server Side Programming: Django	Introduction to Django, Django Architecture, Django Apps, Hello, World! in Django, Django Admin.	5	CO 6

5.Suggested Lab Experiments:

Software Requirements:

1. Windows or Linux Desktop OS
2. HTML5 compatible web browsers(Chrome, Opera, Firefox, Safari etc)
3. HTML,CSS editors like Dreamweaver, Notepad++ etc.
4. Netbeans or Eclipse IDE
5. XAMPP

Hardware Requirements: PC With following Configuration:

1. Intel Core i5/i7 Processor
2. 8 GB RAM
3. 500 GB Hard Disk

Guidelines for Mini Project:

1. The mini project work is to be conducted by a group of three students.
2. The students may visit different websites to identify their website topic for the mini project.
3. Mini Project should includes following points:

- Project Requirements
- Design Wireframe
- Design Login and Register Page
- Apply CSS in different ways in different pages
- Design Landing Page and Home Page
- Design Responsive pages using media queries
- Apply parallax effect in web page
- Embedding Maps in web page
- Apply HTML5 based form validation
- Add video using video tag
- Apply Javascript form validation
- Design dynamic web page using PHP
- PHP form validation
- Implement PHP MySQL database operation
- Demonstrate PHP Rest API
- Web Hosting

6. Practical Assessment

Term Work: Term Work shall consist of Mini projects based on the above syllabus and as per the guidelines given. The final certification and acceptance of TW ensures the satisfactory performance of laboratory work and minimum passing in the TW. Also Term work Journal must include at least 2 assignments based on the topics mentioned in the syllabus.

Term Work Marks: 25 Marks (Total marks) = 15 Marks (Experiment/Mini Project) + 5 Marks (Assignments) + 5 Marks (Attendance)

An Oral viva exam will be held based on the above syllabus.

8. Books and References:

A.Text Books:

1. HTML 5 Black Book: Kogent Learning solutions
2. “Learning PHP 5”, David Sklar, O’Reilly Publication
3. Rich Internet Application AJAX and Beyond WROX press
4. Responsive Web Design with HTML5 and CSS3, Ben Frain, PACKT Publication.
5. Responsive Web Design by Example Beginner's Guide by Thoriq Firdaus, PACKT

B.References:

1. “Web Technologies: Black Book”, Dreamtech publication.
2. HTML5 Cookbook, By Christopher Schmitt, Kyle Simpson, O'Reilly Media.
3. Core Python Applications Programming by Wesley J Chun Third edition Pearson Publication.
4. Advanced Internet Technologies (includes practicals), Deven Shah, Dreamtech publication.
5. Laravel: Up and Running, By Matt Stauffer O'Reilly Media.
6. Django By Example By Antonio Melé, Pakt Publication.

Back to Scheme

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
IT 301	Computer Network and Security	Contact Hours	3	2	-	5
		Credits	3	1	-	4

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
IT 301	Computer Network and Security	40	40	40	60	25	—-	25	150

1. Prerequisite: NA

2. Course Objectives:
The course is aimed:

1. Describe how computer networks are organized with the concept of layered approach.Analyze the contents in a given data link layer packet, based on the layer concept.
2. Analyze the contents in a given data link layer packet, based on the layer concept.
3. Explain routers, IP and Routing Algorithms in network layer
4. To assess the strengths and weaknesses of various transport layer and various application layer protocols.
5. Use theoretical and practical knowledge in securing data transfer and authentication

3. Course Outcomes:
On successful completion of course learner/student will be able to:

1. Demonstrate the concepts of data communication at physical layer and compare ISO - OSI model with TCP/IP model.
2. Demonstrate the knowledge of networking protocols at the data link layer.
3. Design the network using IP addressing and subnetting / supernetting schemes.Analyze various routing algorithms and protocols at the network layer.Analyze transport layer protocols and congestion control algorithms.
4. Explore protocols at the application layer.
5. Understand the necessity of firewalls,authentication and its protocol

4. Detail Syllabus:

Sr. No.	Module	Detailed Content	Hrs.	CO Mapping
1	Introduction to Computer Network and Physical Layer Specifications	**Introduction to Computer Network and Physical Layer Specifications** Overview of OSI Model, Overview of TCP/IP Protocol Suite, Applications of Computer Networks, Transmission Media, Network devices, Physical Layer Coding.	6	CO1, CO2
2	Data Link Layer	**Framing and Channel Allocation, Error Control** Bits stuffing, Byte Stuffing, Character Coding, HDLC, PPP, CRC, Checksum, ARQ, Dynamic Channel Allocation (CSMA/CD, CSMA/CA)	7	CO3
3	Network Layer	**IP addressing(IP v4, IPv6)** Classful, classless addressing, Subnetting, IPV4, IPV6, Migration from IPv4 to IPV6, subnet design using IPv4, IPv6 addressing.Types of Routing, Routing Algorithm:	6	CO4

		Distance Vector Routing, Link state Routing, Path vector Routing		
4	Transport Layer	**TCP and UDP services, Socket Programming** UDP header,TCP header, 3-way connection Establishment, TCP services: Error Control, Flow control, Congestion Control, TCP timers,.	6	CO5
5	Application Layer	Application Layer Services, HTTP, FTP, SNMP, POP3, IMAP4, DNS, DHCP.	6	CO6
6	Network Security	The Need for Firewalls,Firewall Characteristics,Types of Firewalls, Firewall Basing,Firewall Location and Configurations,Authentication and Remote Access-The Remote Access Process, IEEE 802.1X,RADIUS, TACACS+, Authentication Protocols, FTP/FTPS/SFTP,VPNs,IPsec,Vulnerabilities of Remote Access Methods	8	CO6

5. Suggested Experiments:

1. Use basic networking commands in Linux (ping, tracert, nslookup, netstat, ARP, RARP, ip,ifconfig, dig, route).
2. Setup a network and configure IP addressing, subnetting, masking. (Eg. CISCO Packet Tracer, Student Ed.)
3. Build a simple network topology and configure it for static routing protocol using packet tracer.
4. Design VPN using Packet tracer.
5. Configure RIP/OSPF using Packet tracer.
6. Perform File Transfer and Access using FTP
7. Use Wire shark to understand the operation of TCP/IP layers:
    a. Ethernet Layer: Frame header, Frame size etc.
    b. Data Link Layer: MAC address, ARP (IP and MAC address binding)
    c. Network Layer: IP Packet (header, fragmentation), ICMP (Query and Echo)
    d. Transport Layer: TCP Ports, TCP handshake segments etc.
    e. Application Layer: DHCP, FTP, HTTP header formats
8. Study and Installation of Network Simulator (NS3) .
9. Implement Socket programming using TCP or UDP.
10. Set up multiple IP addresses on a single LAN.
    a. b. Using netstat and route commands of Linux, do the following:
    b. View current routing table
    c. Add and delete routes
    d. Change default gateway
    e. Perform packet filtering by enabling IP forwarding using IPtables in Linux
11. Exploring Router security, access list using packet tracer-
12. Exploring VPN security using Packet tracer
13. Exploring Authentication and access control using RADIUS, TACACS and TACACS+
14. Perform network discovery using discovery tools (eg. Nmap, mrtg)

6. Theory Assessment:

Internal Assessment: 40 marks

Consisting of Two compulsory Test Consisting of 40 Marks each on 40% syllabus for each test. The final marks will be average of both the tests.

End Semester Examination: 60 Marks

Weightage of each module in the end semester examination will be proportional to the number of respective lecture hours mentioned in the curriculum.

7. Practical Assessment

An Oral viva exam will be held based on the above syllabus. The final certification and acceptance of TW ensures the satisfactory performance of laboratory work and minimum passing in the TW.

Term Work: Term Work shall consist of 8 to 10 practicals based on the above list. Also Term work Journal must include at least 2 assignments based on the topics mentioned in the syllabus.

Term Work Marks: 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance)

8. Books and References:

1. Computer Networks, Fifth Edition, Andrew S. Tanenbaum.
2. Cryptography and Network Security: Principles and Practices by W.Stallings, Prentice Hall, 5thEdition, ISBN-10: 0136097049
3. Data Communications And Networking,Behrouz A. Forouzan.
4. Computer Network Simulation in NS2 Basic Concepts and Protocol Implementation.-Prof Neeraj
5. Bhargava,Pramod Singh Rathore, Dr.Ritu Bhargava, Dr.Abhishek Kumar, First Edition. BPB Publication.
6. TCP/IP Protocol Suite 4th Edition by Behrouz A. Forouzan
7. CISCO Packet Tracer Manual
8. Data And Computer Communications Eighth Edition William Stallings.
9. NS2.34 Manual

Back to Scheme

Course Code	Course Name	Teaching Scheme	Contact Hours				Credits Assigned			
			TH	Pract	Tut	Total	TH	Pract	Tut	Total
IT 302	Machine Intelligence		3	2	-	5	3	1	-	4
		Examination Scheme	Internal Assessment			End Sem Exam		Term Work	Pract	Oral	Total Marks
			IA1	IA2	Avg	TH	Hrs				
			40	40	40	60	2	25	-	-	125

1.Prerequisite: Knowledge of any one programming language, Data structures and Algorithms, Probability.

2..Course Objectives: The course/instructor aims to

1. To introduce the concepts of a Rational Intelligent Agent and the different types of Agents that can be designed to solve problem**s.**
2. To impart basic proficiency in representing difficult real life problems in a state space representation so as to solve them using AI techniques like searching and game playing.
3. To create an understanding of the basic issues of knowledge representation and Logic and Logic so as to build inference engines and blind and heuristic search, as well as an understanding of other topics such as minimal, resolution, etc. that play an important role in AI programs.
4. To create appreciation and understanding of both the achievements of AI and the theory underlying those achievements.
5. To review the different stages of development of the AI field from human-like behavior to Rational Agents.
6. To introduce advanced topics of AI such as planning, Bayes networks,machine learning and neural networks.

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3.Course Outcomes: On successful completion of this course, learner/student will be able to

1. Demonstrate knowledge and design the building blocks of AI as presented in terms of intelligent agents using PEAS representation. .
2. Analyze and formalize the problem as a state space, graph, design heuristics and select amongst different search or game based techniques to solve them.
3. Develop intelligent algorithms for constraint satisfaction problems and also design intelligent systems for Game Playing.
4. Attain the capability to represent various real life problem domains using logic based techniques and use this to perform inference or planning.
5. Formulate and solve problems with uncertain information using Bayesian approaches.
6. Apply the concepts of machine learning and understand neural networks.

4. Detailed Theory Syllabus

SN	Module	Detailed Content	Hrs	CO Mapping
I	Introduction	**Introduction to AI:** Techniques, Applications and AI Problems. Intelligent Agents: Structure, Types, Agent Environments, Understanding PEAS in AI. Problem Formulation and State Space Representation. **Introduction to ML:** ML Techniques, Introduction to NN, AI vs ML, Applications.	04	CO 1
II	Problem Solving Agents	**Uninformed Search:** DFS, BFS, Uniform cost search, Depth Limited Search, Iterative Deepening. **Informed Search**: Heuristic functions, Best First Search, A* search, Constraint Satisfaction Problem: CryptoArithmetic, Map Coloring, N-Queens. **Adversarial Search:** Game Playing, Min-Max Search, Alpha Beta Pruning.	08	CO 2 CO 3
III	Knowledge, Reasoning and Planning	Knowledge Based Agent, Overview of Propositional Logic. **First Order Predicate Logic:** Inference, Forward and Backward Chaining, Resolution. **Planning:** Planning with State Space Search, Partial Ordered planning, Hierarchical Planning, Conditional Planning.	08	CO 4
IV	Supervised ML Techniques	**Machine Learning:** Supervised vs Unsupervised, Reinforcement Learning, Steps in designing ML system and applications, Linear Regression, Support Vector Machine, Bayesian Belief Network, Decision Tree using Gini Index. **Performance Metrics:** Confusion Matrix, Accuracy, Precision, Recall, F-Score, Sensitivity.	07	CO 5
V	Unsupervised ML Techniques	**Clustering**: Types of Clustering, K-Means, K-medoid, Hierarchical, Agglomerative and Divisive clustering, Density based clustering: DBSCAN.	07	CO 6
VI	Artificial Neural Networks	Biological Neuron, NN Architecture and Types, MP Neuron Model, Hebb Net, Learning Rule: Perceptron, Delta, Backpropagation. Self-Organizing Map.	05	CO 6

5.Suggested Experiments: Machine Intelligence Lab (Credit-01)

Software Requirements: Java/Python

Hardware Requirements: PC i3 or above configuration.

SUGGESTED LIST OF EXPERIMENTS :

Sr. No.	Module Name	Detailed Lab Description	Hrs
1	I and II	Tutorial exercise for Lab1:Design of Intelligent Systems using PEAS. Lab 2:Problem Definition with State Space Representation	04
2	III	Implementation of Uninformed and Informed Search Algorithms. Lab3: Implementation of uninformed search strategies like BFS & DFS Lab 4:Implementation of informed Search Algorithms like A* Lab 5:Implementation of hill climbing algorithm	06
3	III	Lab 6:Implementation of CSP and Lab7:Game playing algorithms	04
4	IV	Lab 8:Assignment on Predicate Logic, for forward and backward reasoning and resolution. Lab 9: Design of a Planning system using STRIPS.	04
5	V	Lab 10: Implementation of Bayes' Belief Network.	02
6	V	Mini Project based on machine learning (Applications can include : Movie price prediction,stock prediction, flower classification etc.)	06

6. Theory Assessment:

A. Internal Assessment (IA): Two class tests of 40 marks each. The first class test is to be conducted when approx. 40% syllabus is completed and the second class test when an additional 35% syllabus is completed. Duration of each test shall be one hour.

B. End Semester Theory Examination: In question, paper weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.

1. Question paper will consist of 4 questions, each carrying 20 marks.
2. Question number 1 will be compulsory and based on maximum contents of the syllabus
3. Remaining questions will be mixed in nature (for example, if Q.2 has part (a) from module 3 then part (b) will be from other than module 3)
4. Total three questions need to be solved.

7. Termwork Assessment: The Termwork will be based on the above syllabus. The final certification and acceptance of TW ensures the satisfactory performance of laboratory work and minimum passing in the TW.

A. **Term Work:** Term Work shall consist of practicals based on the above list. Also Term work Journal must include at least 2 assignments based on the topics mentioned in the syllabus.

B. **Term Work Marks:** 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance)

8. Books and References:

A.Books

1. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, 2nd Edition, Pearson Education.
2. Elaine Rich, Kevin Knight, Shivshankar B Nair, Artificial Intelligence, McGraw Hill, 3rd Edition.
3. Judith S. Hurwitz, Marcia Kaufman, Adrian Bowles, Cognitive Computing and Big Data Analytics, Wiley India.

4. Tom M. Mitchell. "Machine Learning" McGraw-Hill, 1997.
5. Ethem Alpaydin "Introduction to machine learning" 2nd ed. The MIT Press, 2010

B. References:

1. George Lugar, .AI-Structures and Strategies for Complex Problem Solving., 4/e, 2002, Pearson Education.
2. Nils J. Nilsson, Principles of Artificial Intelligence, Narosa Publication.
3. Patrick H. Winston, Artificial Intelligence, 3rd edition, Pearson Education.
4. Deepak Khemani, A First Course in Artificial Intelligence, McGraw Hill Publication.
5. John Kelly , Steve Hamm, Smart Machines - IBM′s Watson and the Era of Cognitive Computing, Columbia Business School Publishing.
6. Davis E.Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y., 1989
7. “Machine learning with R” by Brett Lantz.

Back to Scheme

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
IT 303	Microprocessor and Microcontroller	Contact Hours	3	-	-	3
		Credits	3	-	-	3

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
IT 303	Microprocessor and Microcontroller	40	40	40	60	–	–	--	100

1.Prerequisite: Microcomputer system terminologies, High level, Machine level and Assembly level programming language, difference between microprocessor and microcontroller

2.Course Objectives: The course/instructor aims to

1. Describe the concepts and architecture of embedded systems
2. Explain the basics of microcontroller 8051.
3. Explain concepts of microcontroller interface.
4. Give details of the architecture of ARM.
5. Impart knowledge about the concepts of a real-time operating system.
6. Differentiate design platforms used for an embedded systems application.

3.Course Outcomes: On successful completion of this course, learner/student will be able to

1. Explain the embedded system concepts and architecture of embedded systems.
2. Describe the architecture of 8051 microcontroller and write embedded programs for 8051 microcontroller.
3. Design the interfacing for 8051 microcontroller.
4. Understand the concepts of ARM architecture.
5. Demonstrate the open source RTOS and solve the design issues for the same.
6. Select elements for an embedded systems tool.

4.Detailed Theory Syllabus:

SN	Module	Detailed Content	Hrs	CO Mapping
I	Introduction to Embedded Systems	Overview of Embedded System Architecture, Recent application areas with example. Categories of embedded systems, specialties of embedded systems. Recent trends in embedded systems. Embedded microcontroller cores CISC and RISC.	5	CO1
II	Microcontroller 8051	Introduction to 8051 Microcontroller, Architecture, Counter and Timers, Serial communication, Interrupts. Instruction set, Addressing modes, Assembler Directives, Programming based on Arithmetic & Logical Operations, I/O parallel and serial ports, Timers & Counters. Interfacing of ADC and DAC.	12	CO1, CO2

III	ARM Architecture	Architectural inheritance, Detailed study of Programmer's model, ARM Development tools, Instruction set: Data processing, DataTransfer, Control flow. Addressing modes. Writing simple assembly language programs.	06	CO1, CO4
IV	RTOS	Basics of RTOS: Real-time concepts, Hard Real time and Soft Real-time, differences between general purpose OS & RTOS, scheduling systems, inter-process communication, memory management, file systems, I/O systems.	09	CO1, CO5
V	Embedded Target Boards	Introduction to Architecture of Arduino, Raspberry Pi, Basic Arduino/Raspberry Pi programming.	04	CO1, CO6
VI	Interfacing of Embedded Target Boards	Arduino, Raspberry Pi Interfacing: Temperature, Pressure and Humidity Sensors.	03	Co1, CO6

5. Theory Assessment:

A. Internal Assessment (IA): Two class tests of 40 marks each. The first class test is to be conducted when approx. 40% syllabus is completed and the second class test when an additional 35% syllabus is completed. Duration of each test shall be one hour.

B. End Semester Theory Examination: In question, paper weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.

1. Question paper will consist of 4 questions, each carrying 20 marks.
2. Question number 1 will be compulsory and based on maximum contents of the syllabus
3. Remaining questions will be mixed in nature (for example, if Q.2 has part (a) from module 3 then part (b) will be from other than module 3)
4. Total three questions need to be solved.

6.Books and References:

A.Books:

1. M. A. Mazidi, J. G. Mazidi, R. D., McKinlay ,"The 8051 microcontroller & Embedded systems Using Assembly and C", Pearson, 3rd edition
2. Embedded / real –time systems: concepts, design & programming, Black Book, Dr. K.V. K. K. Prasad, Dreamtech press, Reprint edition 2013
3. Shibu K. V., "Introduction to embedded systems", McGraw Hill

B.References:

1. Lyla B. Das, "Embedded systems an integrated approach", Pearson, Third impression, 2013
2. Steve Furber, "ARM System on chip Architecture", Pearson, edition second.
3. Michael Margolis, "Arduino Cookbook", O'reilly Publications.
4. Simon Monk," Raspberry Pi Cookbook", O'reilly Publications.
5. Massimo Banzi, "Getting Started with Arduino: The Open Source Electronics Prototyping Platform (Make)", O'Reilly Media.

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Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
IT 304	Programming Lab II (Android)	Contact Hours	-	2+2#	-	4
		Credits	-	2	-	2

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
IT 304	Programming Lab II (Android)	-	-	-	-	25	–	25	50

1. Prerequisite: Java Programming, Internet Programming

2. Lab Objectives:

1. To gain knowledge of installing Android Studio and Cross Platform Integrated Development Environment.
2. To learn designing of User Interface and Layouts for Android App.
3. To learn how to use intents to broadcast data within and between Applications.
4. To use Content providers and Handle Databases using SQLite.
5. To introduce Android APIs for Camera and Location Based Service.
6. To discuss various security issues with Android Platform.

3. Lab Outcomes: Learners will be able to…

1. Experiment on Integrated Development Environment for Android Application Development.
2. Design and Implement User Interfaces and Layouts of Android App.
3. Use Intents for activity and broadcasting data in Android App.
4. Design and Implement Database Application and Content Providers.
5. Experiment with Camera and Location Based service.
6. Develop Android App with Security features.

4. Detail Syllabus:

SN	Module Name	Detailed Lab Description	Hrs	LOs
0	Prerequisite	Basics of HTML5,CSS3 & XML	02	--
1	Introduction to Android and Architecture of Android	Lab1: Create Basic app and generating APK file Lab2: Use Layouts Lab3: Use Intents	04	LO1
2	Applications, Activities and Building User Interface	Lab4: Use Activity Lab5: Use SQLite	04	LO2
3	Intents, Broadcast receiver and Internet Resources	Lab6: Use intents	02	LO3
4	Fragments, and Content Providers	Lab7 : Using Fragments Lab8: Content providers	04	LO4
5	Audio, Video ,Camera, Maps, Geocoding and Location Based services	Lab9: Location API Lab10: Use Camera	04	LO5
6	Securing and Publishing Android Application	Lab11: Study of Security Mechanism Lab12: Generate APK file	04	LO6

5.Suggested Experiments:

1. Basics of HTML5,CSS3 & XML
2. Use of Layouts
3. Use of Intents
4. Use of Activity
5. Use of SQLite
6. Data persistence
7. Content providers
8. Location API
9. Use Camera
10. Study of Security Mechanism
11. Generate APK file

6. Guidelines for Android MiniProject:

1. The mini project work is to be conducted by a group of three students.
2. Each group will be associated with a subject Incharge/ mini project mentor. The group should meet with the concerned faculty during Laboratory hours and the progress of work discussed must be documented.
3. The students may do surveys for different applications which they can create Apps using Android.
4. Students will do Installation, configuration of Android Studio & to create AVD and also try for Cross platform Integrated Development Environment (Any Open Source Tool).
5. Students will try to Design and implement the following points in their Mini Project (Android Apps) for Android phones.
   a. Use Layouts
   b. Use Intents
   c. Use Activity
   d. Use SQLite
   e Use Camera
   f. Use Location API
   g. Generate APK file
1. Each group along with the concerned faculty shall identify a potential problem statement for Apps development, on which the study and implementation is to be conducted.
2. Each group may present their work in various project competitions and paper presentations.
3. A detailed report is to be prepared as per guidelines given by the concerned faculty.

7. Lab Assessments:

Termwork Assessment: Term Work shall consist of at least 5 practical based on the above list and a Mini Project.

Distribution of Term Work Marks:

Mini Project : 10 Marks
Experiment : 10 Marks
Attendance : 05 Marks

8. Practical/Viva Assessment: Viva exam will be held based on the above syllabus for 25 marks.

9. Text Books:

1. Professional Android 4 Application Development,Retomeier, by Wrox publication.
2. Android Security –attack and defenses, Abhishek Dubey and Anmol Misra by CRC Press.
3. Beginning Android Application Development, Wei-meng lee, by Wrox publication.

References:

1. Android Application Development For Dummies, 2nd Edition by Michael Burton, DonnFelker.
2. Android Cookbook by O'reilly.

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Department Level Optional Courses (DLOC):

DLOC - I and ILOC-1

Sem- V DLOC	1. AI and Robotics	2. IoT and Data Analytics	3. Information Security and Forensics	4. Bioinformatics
DLOC I	**IT 311**	**IT 312**	**IT 313**	**IT 314**
	Image and Video Processing	Wireless Technology and 5G	Cryptography and Security	Fundamentals of Computational Biology

Sem- V ILOC	1. Business and Entrepreneurship	2. Bio-Engineering	3. Engineering Design	4. Art and Humanities	5. Applied Science	6. Life Skills, Repair, Maintenance and Safety
ILOC I	**IL**	**IL**	**IL**	**IL**	**IL**	**IL**
	IPR and Patenting	Introduction to Bioengineering	Product Design	Visual Art	Computational Physics	Vehicle Safety

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
IT 311	Image and Video Processing	Contact Hours	3	2	-	5
		Credits	3	1	-	4

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
IT 311	Image and Video Processing	40	40	40	60	25	–	25	150

1.Prerequisite: Fundamentals of Matrix, Matrix Operations.

2. Course Objectives: The course/instructor aims to

1. Define image and list application of image processing and discuss major research domains in this field.
2. Describe point, mask and histogram based enhancement techniques for improving the quality of an image, and discuss the forward and reverse discrete image transforms and discuss the usefulness in enhancement, compression, representation and description.
3. List and explain how the lossy and lossless image compression techniques are useful for storage and retrieval.
4. Demonstrate how the image object can be described using image representation techniques and illustrate how to shape and reshape a given object in an image using morphological techniques.
5. Explain formation of video and list application of video processing and discuss major research domains in this field.
6. Show motion estimation using pixel, mesh, and region technique and discuss video matching algorithms and introduce the video coding standards.

3.Course Outcomes: On successful completion of this course, learner/student will be able to

1. List application, define image and explain formation of image, and recall its types and calculate image parameters by reading images using a programming language.
2. Differentiate point, mask and histogram processing techniques and choose suitable techniques for enhancing images required for an application and identify discrete image transforms and apply to calculate transformed coefficients and use it for enhancement, compression and representation.
3. Classify and distinguish between lossy and lossless compression techniques and recall ratio and fidelity criteria to evaluate and compare method efficiency.
4. Apply the segmentation techniques to segment RoI and represent objects using chain code and shape number and apply morphological operations to find a suitable shape for an object in the image.
5. Define video and explain formation of video, classify I, P, B Frames and enhance video.
6. Estimate motion using pixel, mesh, and region technique and perform video matching and know the video coding standards.

4. DETAILED THEORY SYLLABUS:

SN	Module	Detailed Content	Hrs	CO Mapping
I	Image Processing Fundamentals	Fundamental Steps in Digital Image Processing, Components of an Image Processing System, Sampling and Quantization, Image Resolution, Basic Relationships between Pixels, Color Models (RGB, CMYK, YIQ, YCbCr).	5	CO1
II	Image Transforms and Image Enhancement	**2D Transforms:** Discrete Fourier Transform, Discrete Cosine Transform, Haar Transform, KLT (Hotelling Transform). **Image Enhancement:** Point Processing, Histogram Processing, Filtering in Spatial Domain and Frequency Domain.	10	CO2
III	Image Segmentation and Image Morphology	**Image Segmentation:** Point, Line and Edge detections, Hough Transform, Thresholding, Region Based Segmentation. **Image Morphology:** Dilation, Erosion, Opening, Closing, Hit or Miss Transform, Boundary Extraction, Thinning. Skeletonization.	8	CO3
IV	Image Compression	**Image compression:** Redundancy, Compression Ratio, Fidelity Criteria. **Lossless Compression:** Run-Length Coding, Huffman Coding, Arithmetic Coding, LZW Coding, Bit-Plane Coding. **Lossy Compression:** Predictive Coding, Transform Coding, JPEG Compression Standard.	8	CO4
V	Video Processing Fundamentals	Analog Video, Digital Video, 3D Motion Models, Geometric Image Formation, Photometric Image Formation, Sampling of Video Signals, Frame Classification (I, P, B Frames), Smoothing and Sharpening of Video.	4	CO5
VI	2D Motion Estimation and Coding	**Motion Estimation:** Optical Flow, Pixel, Mesh, and Region Based Motion Estimation, Multi-Resolution Motion Estimation. **Coding:** Video Encoder and Decoder, Block Matching Algorithm, Video Coding Standards – MPEG and H.26X.	5	CO6

5. Suggested Experiments: Software Requirements: Python/ Matlab/ Scilab

SN	Module Name	Detailed Lab Description	Hrs
I	Image Processing Fundamentals	i) Read Image and find attributes of the given image.	2
II	Image Transforms and Image Enhancement	i)Implementation of Histogram Processing ii)Implementation of Image Smoothing/ Sharpening iii)Implementation of Discrete Fourier Transform iv)Implementation of Discrete Cosine Transform (Forward and Inverse Transform)	2,2, 2,2
III	Image Segmentation and Image Morphology	i)Implementation of Horizontal and Vertical Line Detection ii)Implementation of Edge Detection using Sobel, Prewitt, Robert and Canny operators iii)Implementation of Opening followed by closing iv)Implementation of Hit or Miss Transform	2,2
IV	Image Compression	i)Implementation of Huffman Coding	2,2, 2,2

V	Video Processing Fundamentals	i) Extraction of frames from video ii) Enhance video quality	2,2
VI	2D Motion Estimation and Coding	i) Implement motion estimation techniques. ii) Apply Block Matching Algorithm	2,2

6. Theory Assessment:

A. Internal Assessment (IA): Two class tests of 40 marks each. The first class test is to be conducted when approx. 40% syllabus is completed and the second class test when an additional 35% syllabus is completed. Duration of each test shall be one hour.

B. End Semester Theory Examination: In question, paper weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.

1. Question paper will consist of 4 questions, each carrying 20 marks.
2. Question number 1 will be compulsory and based on maximum contents of the syllabus
3. Remaining questions will be mixed in nature (for example, if Q.2 has part (a) from module 3 then part (b) will be from other than module 3)
4. Total three questions need to be solved.

7. Practical Assessment: An Practical / Oral exam will be held based on the above syllabus. The final certification and acceptance of TW ensures the satisfactory performance of laboratory work and minimum passing in the TW.

A. **Term Work:** Term Work shall consist of practicals based on the above list. Also Term work Journal must include at least 2 assignments based on the topics mentioned in the syllabus.

B. **Term Work Marks:** 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance)

8. Books and References:

A.Text Books:

1. Rafel C. Gonzalez and Richard E. Woods, ‘Digital Image Processing’, 3ed, Pearson Education Asia.
2. S. Jayaraman, E.Esakkirajan and T. Veerakumar, “Digital Image Processing” TMH Education Private Ltd.
3. S. Sridhar, “Digital Image Processing”, 2ed, Oxford University Press.
4. Yao Wang, Joem Ostarmann and Ya – Quin Zhang, ”Video processing and communication," 1e, PHI.
5. A. Bovik, Handbook of Image & Video Processing, Academic Press

B.References:

1. Anil K. Jain, “Fundamentals and Digital Image Processing”, PHI Private Ltd, Third Edition.
2. B. Chandra and D.Dutta Majumder, “Digital Image Processing and Analysis”, PHI Private Ltd.
3. A. M. Tekalp, “Digital Video Processing,” Prentice-Hall.

Back to Scheme

Course Code	Course Name	Teaching Scheme	Contact Hours				Credits Assigned			
			TH	Pract	Tut	Total	TH	Pract	Tut	Total
IT 312	Wireless Technology and 5G		3	2	-	5	3	1	-	4
		Examination Scheme	Internal Assessment			End Sem Exam		Term Work	Pract	Oral	Total Marks
			IA1	IA2	Avg	TH	Hrs				
			40	40	40	60	2	25	-	25	150

1. Prerequisite: Computer Networks.

2.Course Objectives: The course / instructor aims

1. To describe the fundamentals of wireless networks,analyze and learn different wireless networks.
2. To provide various evolutions in wireless technologies.
3. To study the types of wireless networks.
4. Understand and evaluate emerging wireless technologies and standards.
5. Learn and analyze and evaluate the security threats and related security standards.
6. To understand the various recent developments in wireless technology.

3.Course Outcomes: On successful completion of course learner/student will be able to:

1. Explain the basic concepts of wireless network and wireless generations.
2. Demonstrate the different wireless technologies such as CDMA, GSM, GPRS etc
3. Appraise the importance of Ad-hoc networks such as MANET and VANET and WSN.
4. Describe and judge the emerging wireless technologies standards such as WLL, WLAN, WPAN, WMAN.
5. Differentiate and support the security measures, standards. Services and layer wise securities considerations.
6. Explain the basic concepts of recent wireless technologies and its applications.

4. DETAILED THEORY SYLLABUS:

SN	Module	Detailed Content	Hrs	COs
0	**Prerequisite**	Modulation and Demodulation Techniques, PSTN	00	
I	**Fundamentals Wireless Communication**	Fundamentals of Wireless Communication, Advantages, limitations and application, wireless media, DSSS and FHSS, Frequency Spectrum: Radio and Infrared; Wireless generations: 1G: Cellular, 2G: Mobile Radio, 3G: UMTS	06	CO1
II	**Evolution of Wireless Technologies**	Wireless Technologies: GSM, GPRS, EDGE,CDMA, UMTS	06	CO1, CO2
III	**Types of Wireless Networks**	Ad-hoc: MANET & VANET, Application, Advantage and limitations; WSN: Application, advantages and limitations	07	CO1 CO3
IV	**Emerging Wireless Technologies and standards**	WLL, WLAN-802.11 (Wi-Fi), WPAN-802.15.1/3/4 (Bluetooth, Zigbee), WMAN-802.16a (Wi-max) , Wi-max and LTE /3GPP	07	CO1 CO2 CO4
V	**Wireless Network Security**	The need, attacks, security serviced, WEP, Mobile IP, VPN (PPTP, LLTP, IPSec), Network Layer Security	04	CO1, CO3, CO4 CO5

VI	**Evolution of LTE, VoLTE and 5G**	LTE System Overview Architecture, Voice over LTE (VoLTE), Introduction to 5G	06	CO1, CO2 CO3, CO6

5. Suggested Experiments:

Wireless Technology Lab (Credit - 01):

Lab Prerequisite: Computer Networks, Linux OS

Software Requirements: Linux OS, Java/Python, J2ME, android, PHP, wireshark, PacketTracer

Hardware Requirements: PC i3 or above configuration,high internet connectivity.

SUGGESTED LIST OF EXPERIMENTS :

Sr. No.	Module Name	Detailed Lab Description	Hrs
I	I	Lab1: To implement Transmission range of a wireless node in NS2. Lab2: Implementation of SDP for Mobile Node Discovery (Bluetooth) Lab 3: To implement OBEX Protocol to exchange data.	06
II	II	Lab4: To study different WSN opensource simulators like contiki cooja,cupbarbon. Lab5: Installation of contiki cooja and To perform "Hello World" program in contiki cooja. Lab 6: To simulate Broadcasting, RPL, LED using cooja.	04
III	III	Lab7: Installation of cupcarbon and to perform "Hello World" program in cupcarbon. Lab 8: To write a program for blinking LED using cupcarbon and run it on Arduino	04
IV	IV	**MINI PROJECT** Project to be connected with websites/Apps using wireless devices (Bluetooth/Zigbee/Wifi etc.) using PHP/Python etc.	06
V	V	Lab13: Configuration of wireless client adaptors Lab 14: Finding Selfish Behavior in Wireless Networks	02
VI	VI	Lab 15: Unauthorized Access in Wireless Networks 15.1 Hacking MAC filtering 15.2 Cracking the WEP encryption 15.3 Breaking WPA2-Personal Passwords	04

6.Theory Assessment:

A. **Internal Assessment (IA):** Two class tests of 40 marks each. The first class test is to be conducted when approx. 40% syllabus is completed and the second class test when an additional 35% syllabus is completed. Duration of each test shall be one hour.

B. **End Semester Theory Examination:** In question, paper weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.

1. Question paper will consist of 3 questions, each carrying 20 marks.
2. Question number 1 will be compulsory and based on maximum contents of the syllabus
3. Remaining questions will be mixed in nature (for example, if Q.2 has part (a) from module 3 then part (b) will be from other than module 3)
4. Total three questions need to be solved.

7. Practical Assessment: An Practical / Oral exam will be held based on the above syllabus. The final certification and acceptance of TW ensures the satisfactory performance of laboratory work and minimum passing in the TW.

A. **Term Work:** Term Work shall consist of practicals based on the above list. Also Term work Journal must include at least 2 assignments based on the topics mentioned in the syllabus.

B. **Term Work Marks:** 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance)

8. Books and References:

A.Text Books:

1. Cellular Communications: A Comprehensive and Practical Guide, Nishith Tripathi, Jeffery H Reed, Wiley.
2. Wireless Mobile Internet Security, 2nd Edition, Man, Young Rhee, Wiley- IEEE press.
3. Designing for Cisco Internetwork Solutions (DESIGN), 2nd Edition, CCDA, Diane Teare, Cisco Press.
4. Fundamentals of Sensor Network Programming: Applications and Technology, By S. Sitharama Iyengar, Nandan Parameshwaran, Vir V. Phoha, N. Balakrishnan, Chuka D. Okoye, Wiley publication.
5. Contiki Cooja User Guide

B.References:

1. Introduction to Digital mobile communication, 2nd Edition, Yoshihiko Akaiwa.
2. “Wireless Communications and networks", William Stallings, Pearson / Prentice Hall.
3. Wireless communication and networking, Vijay Garg.
4. Internet of Things (A Hands-on-Approach) , Vijay Madisetti , Arshdeep Bahga.
5. A comparative review of wireless sensor network mote technologies, IEEE paper 2009.

Back to Scheme

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
IT 313	Cryptography and Security	Contact Hours	3	2	-	5
		Credits	3	1	-	4

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
IT 313	Cryptography and Security	40	40	40	60	25	–	25	150

1.Prerequisite: Computer Networks, ISO OSI Layered Protocols, TCP/IP protocol suite.

2.Course Objectives: The course/instructor aims to

1. The concepts of classical encryption techniques and concepts of finite fields and number theory.
2. To explore the working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, and public key algorithms.
3. To explore the design issues and working principles of various authentication protocols, PKI standards.
4. To explore various secure communication standards including Kerberos, IPsec, and SSL/TLS and email.
5. The ability to use existing cryptographic utilities to build programs for secure communication.
6. The concepts of cryptographic utilities and network security protocols to design secure applications.

3.Course Outcomes: On successful completion of this course, learner/student will be able to

1. To Identify information security goals, classical encryption techniques and acquire fundamental knowledge on the concepts of finite fields and number theory.
2. To Understand, compare and apply different encryption and decryption techniques to solve problems related to confidentiality and authentication.
3. Apply the knowledge of cryptographic checksums and evaluate the performance of different message digest algorithms for verifying the integrity of varying message sizes.
4. Apply different digital signature algorithms to achieve authentication and create secure applications.
5. Apply network security basics, analyze different attacks on networks and evaluate the performance of firewalls.
6. Apply the knowledge of cryptographic utilities and security protocols like SSL, IPSec, and PGPs to design secure applications.

4. Detailed Theory syllabus

SN	Module	Detailed Content	Hrs.	CO Mapping
I	Introduction to Cryptography	**Introduction to Cryptography** Cryptography, Security Goals, Services, Mechanisms and attacks-the OSI security architecture - Network security model- Classical Encryption techniques (Symmetric cipher	9	CO1

		model, mono alphabetic and poly-alphabetic substitution techniques: Vigenere cipher, playfair cipher, Hill cipher, transposition techniques: keyed and keyless transposition ciphers, Cryptanalysis, Steganography. Modular Arithmetic and Number Theory:- Euclid‘s algorithm, Prime numbers, Fermat‘s & Euler‘s theorem - Testing for primality.		
II	Block Ciphers & Asymmetric Key Cryptography	**Block Ciphers & Asymmetric Key Cryptography** Data Encryption Standard-Block cipher principles-block cipher modes of operation- Advanced Encryption Standard (AES)-Triple DES-RC4 algorithm. Public key cryptography: Principles of public key cryptosystems-The RSA algorithm, The knapsack algorithm, Key management – Diffie Hellman Key exchange.	8	CO2
III	Cryptographic Hashes, MessageDigests and Digital Certificates	**Cryptographic Hashes, MessageDigests and Digital Certificates** MAC –Hash function – Security of hash function and MAC –MD5 – SHA – HMAC – CMAC. Digital Certificate: X.509, PKI.	4	CO3
IV	Digital signature schemes and authentication Protocols	**Digital signature schemes and authentication Protocols** Digital signature Digital Signature Schemes – RSA, EI Gamal and DSS. Authentication requirement – Authentication function , Types of Authentication, Authentication protocols: Needham Schroeder Authentication protocol and Kerberos.	5	CO4
V	Network Security	**Network Security** Network security basics: TCP/IP vulnerabilities (Layer wise), Packet Sniffing, ARP spoofing, port scanning, IP spoofing, TCP syn flood, DNS Spoofing. Denial of Service: Classic DOS attacks, Source Address spoofing, ICMP flood, SYN flood,UDP flood, Distributed Denial of Service,Defenses against Denial of Service Attacks. Firewalls, Intrusion Detection Systems: Host Based and Network Based IDS	8	CO5
VI	Network Security Protocols	**Network Security Protocols** Internet Security Protocols: SSL, IPSEC:AH, ESP, Secure Email: PGP.	5	CO6

5. Suggested Experiments:

Lab Prerequisite: Computer Networks, Operating System, Basics of Java and Python Programming

Hardware Requirements: PC With following Configuration

1. Intel Core i3/i5/i7 Processor
2. 4 GB RAM
3. 500 GB Hard Disk

Software Requirements:

1. Windows or Linux Desktop OS or kali Linux
2. wireshark
3. ARPWATCH
4. Kismet, NetStumbler
5. NESSUS

SUGGESTED LIST OF EXPERIMENTS :

SN	Module	Detailed Content	Hrs
I	Simple Symmetric Cipher	Design and Implementation of a product cipher using Substitution and Transposition ciphers	2
II	Public Key Cryptosystem, Hashing Algorithm and Digital Signature	Implementation and analysis of RSA cryptosystem and Digital signature scheme using RSA a) Implementation of Diffie Hellman Key exchange algorithm b) For varying message sizes, test integrity of message using MD-5, SHA-1, and analyze the performance of the two protocols.	6
III	Network reconnaissance tool	a) Study the use of network reconnaissance tools like WHOIS, dig,traceroute, nslookup to gather information about networks and domain registrars. b)Study of packet sniffer tools wireshark, :- 1. Observer performance in promiscuous as well as non-promiscuous mode. 2. Show the packets can be traced based on different filters. 3. Download and install nmap. Use it with different options to scan open ports, perform OS fingerprinting, do a ping scan, tcp port scan, udp port scan, etc.	4
IV	Simulation of Attacks	a) Detect ARP spoofing using nmap and/or open source tool ARPWATCH and wireshark. b) Simulate DOS attack using Hping and other tools	4
V	Wireless Security Tools	Exploring wireless security tools like Kismet, NetStumbler etc. Use the NESSUS/ISO Kali Linux tool to scan the network for vulnerabilities.	4
VI	Firewall, IDS, and E mail Security Protocols	Set up IPSEC under LINUX. Set up Snort and study the logs. Explore the GPG tool of linux to implement email security	6

6. Theory Assessment:

A. **Internal Assessment (IA):** Two class tests of 40 marks each. The first class test is to be conducted when approx. 40% syllabus is completed and the second class test when an additional 35% syllabus is completed. Duration of each test shall be one hour.

B. **End Semester Theory Examination:** In question, paper weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.

1. Question paper will consist of 4 questions, each carrying 20 marks.
2. Question number 1 will be compulsory and based on maximum contents of the syllabus
3. Remaining questions will be mixed in nature (for example, if Q.2 has part (a) from module 3 then part (b) will be from other than module 3)
4. Total three questions need to be solved.

7. Practical Assessment: An Practical / Oral exam will be held based on the above syllabus. The final certification and acceptance of TW ensures the satisfactory performance of laboratory work and minimum passing in the TW.

A. **Term Work:** Term Work shall consist of practicals based on the above list. Also Term work Journal must include at least 2 assignments based on the topics mentioned in the syllabus.

B. **Term Work Marks:** 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance)

8. Books and References:

A.Text Books:

1. Mark Stamp's Information Security Principles and Practice, Wiley
2. William Stallings, Cryptography and Network Security, Principles and Practice, 6th Edition, Pearson Education, March 2013
3. Behrouz A. Ferouzan, "Cryptography & Network Security", Tata Mc Graw Hill
4. Bernard Menezes, "Cryptography & Network Security", Cengage Learning
5. Build your own Security Lab, Michael Gregg, Wiley India
6. CCNA Security, Study Guide, TIm Boyles, Sybex

B.**References:**

1. Applied Cryptography, Protocols Algorithms and Source Code in C, Bruce Schneier, Wiley.
2. Cryptography and Network Security, Atul Kahate, Tata Mc Graw Hill.
3. Network Security Bible, Eric Cole, Wiley India

Back to Scheme

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
IT 305	Software Engineering and Project Management	Contact Hours	3	2	-	5
		Credits	3	1	-	4

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
IT 305	Software Engineering and Project Management	40	40	40	60	25	–	25	150

1. Course Objectives: The course/instructor aims to

1. To understand the nature of software development and software life cycle process models, agile software development, SCRUM and other agile practices.
2. To Explain methods of capturing, specifying, visualizing ,analyzing software requirements and learn basic concepts of UML.
3. To understand concepts and principles of software design and user-centric approach and principles of effective user interfaces.Also to understand how to apply the UML to solve a number of common modeling problems..
4. To know the basics of testing and understanding the concept of software quality assurance and software configuration management process.
5. To understand the need of project management and project management life cycle.
6. To understand project scheduling concepts, risk management associated with various types of projects and Understand the software development process using tools.

2. Course Outcomes: On successful completion of this course, learner/student will be able to

1. Define various software application domains and remember different process models used in software development and examine estimation about schedule and cost for project development.
2. Explain needs for software specifications also they can classify different types of software requirements , gathering techniques and select project development tools.
3. Convert the requirements model into the design model using UML and demonstrate use of software and user-interface design principles.
4. After SQA do classify different testing strategies and tactics and compare them.
5. Justify the role of SDLC in Software Project Development and they can evaluate the importance of Software Engineering in PLC.
6. Generate project schedule and can construct, design and develop network diagrams for different types of Projects. They can also organize different activities of the project as per Risk impact factor.

3. DETAILED SYLLABUS :

SN	Module	Detailed Content	Hrs.	CO Mapping
I	Introduction to Software Engineering and Process Models	Software Engineering Fundamentals: Nature of Software, Software Engineering Principles,Software Myths. Process Models :A Generic Process Model, Prescriptive Process Models: The Waterfall, Incremental Process(RAD), Evolutionary Process, Concurrent. Agile software development: Agile process model: Extreme Programming (XP), Scrum, Kanban .	06	CO1
II	Software Requirements Analysis,Design and Cost Estimation	Requirement, Types of Requirements, Requirement gathering, Requirement Engineering Task, Identifying Stakeholders, Multiple viewpoints, SRS (Software Requirement Specification) Project Estimation, LOC based, FP based and Cohesion and Coupling, Architectural design	06	CO2
III	Software Quality & Configuration Management	McCall's Quality Factor.Quality Concepts and Software Quality assurance Metrics, Formal Technical Reviews, Software Reliability. Software Configuration Management (SCM) ,Version Control and Change Control	06	CO3
IV	Software Testing	Introduction to Software Testing, Principles and objectives of Testing, Testing Fundamentals, Test Case Design, White Box Testing and Black Box Testing, testing strategies, Verification & Validation, Defect Management:Definition of Defects, Defect Management Process, Defect Reporting, Metrics Related to Defects, Using Defects for Process Improvement.Maintenance & Reengineering.	08	CO4
V	Project Management:	Project Management Concepts: The Management Spectrum, People, Product, Process, Project, The W5HH Principle,Project Life cycle and ITPM, Project Feasibility, RFP, PMBOK Knowledge areas, Business Case, Project Planning, Project Charter and Project Scope.	07	CO5
VI	Risk Management and Project Scheduling	WBS, Developing the Project Schedule, Network Diagrams (AON, AOA), CPM and PERT, Gantt Chart, Project Risk Management : Risk Analysis & Management: Reactive versus Proactive Risk Strategies, Software Risks, Risk Identification, Risk Projection, Risk Refinement,Risk Identification, Risk Projection and RMMM	06	CO6

4.Detailed Practical Syllabus:

Software Engineering and Project Management Lab (Credit-01):

Software Requirements: IBM Rational Rose Modeler, Dia, StarUML (Any One) Orange Scrum, Xampp, GitHub
Hardware Requirements:PC i3 or above.

Suggested List of Experiments:

1. Students shall take one case study as a mini project work which is to be conducted by a group of three students.
2. Orangescrum DEMO
3. To study SRS
4. To study Use case diagram
5. To study class diagrams and Object diagrams.
6. To study Sequence and Collaboration diagrams.
7. To study Activity and statechart diagrams
8. To conduct FP point estimation for the project.
9. To Conduct COCOMO estimation for the project
10. To generate project scheduling for the project
11. Risk management
12. Software testing

5. Theory Assessments:

1. **Internal Assessment**: Two Internal assessments will be conducted for 40 marks each with average marks of both assessments as final score.
2. **End Sem Theory Examination:**
    - Question paper will consist of 4 questions, each carrying 20 marks.
    - Total 3 questions need to be solved.
    - Q.1 will be compulsory, based on the entire syllabus.
    - Remaining questions will be randomly selected from all the modules.
    - Weightage of marks should be proportional to the number of hours assigned to each module.

6. Practical Assessments:

1. **Termwork Assessment:** Term Work shall consist of at least 10 to 12 practical's based on the above list. Also Term work Journal must include at least 2 assignments. Term Work Marks: 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance).
2. An oral Examination will be conducted on the basis of the above syllabus.

7. Books and references:

A. Text Books:

1. Roger S Pressman Software Engineering : A Practitioner's Approach 7th Edition Mcgraw-Hill ISBN:0073375977
2. Jack T. Marchewka, Information Technology Project Management 4th Edition ,Wiley India
3. "The Unified Modeling Language User Guide" by Grady Booch, James Rumbaugh, Ivar Jacobson, Pearson Publication,ISBN 978-81-7758-372-4

B. References:

1. Software Engineering : A Precise Approach Pankaj Jalote , Wiley India
2. Ian Sommerville Software Engineering 9th edition Pearson Education SBN-13: 978-0- 13703515-1, ISBN-10: 0-13-703515-2
3. John M. Nicholas, Project Management for Business and Technology, 3rd edition, Pearson Education.
4. Software Project management by Bob Hughes, Mike Cotterell , Rajib Mall
5. UML – Tutorial "www.tutorialspoints.com/uml/"
6. "An Introduction to Object-Oriented Analysis: Objects and UML in plain English" by Davis William Brown, Wiley, Second Edition

7. “Fundamentals of Object-Oriented Design in UML”, Meilir Page-Jones, Pearson Education
8. UML in 24 Hours
9. UML Basics— an Introduction to the Unified Modeling Language – IBM “www.ibm.com › Learn › Rational

Back to Scheme

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
IT 306	Data Mining and Business Intelligence	Contact Hours	3	-	-	3
		Credits	3	-	-	3

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
IT 306	Data Mining and Business Intelligence	40	40	40	60	–	–	–	100

1.Prerequisite: Database Management System

2.Course Objectives: The course/instructor aims to

1. Introduce students to the basic concepts of Data Mining
2. Learn about characteristics and potential problems of a data set .
3. Make students well versed in all data mining algorithms, methods of evaluation.
4. Impart knowledge of different tools used for data mining.
5. Provide knowledge on how to gather and analyse large sets of data to gain useful business understanding
6. Impart skills that can enable students to approach business problems analytically by identifying opportunities to derive business value from data and compare the performance of business

3. Course Outcomes: On successful completion of this course, learner/student will be able to

1. Demonstrate an understanding of the importance, issues and functionalities of data mining.
2. Perform exploratory analysis, organize and preprocess the data to be used for mining.
3. Implement the appropriate data mining methods like classification, clustering / Frequent Pattern mining on large data sets
4. Describe and demonstrate basic data mining algorithms, methods, and tools.
5. Define and apply metrics to measure the performance of various data mining algorithms.
6. Apply BI to solve practical problems : Analyze the problem domain, use the data collected in enterprise, apply the appropriate data mining technique, interpret and visualize the results and provide decision support, also evaluate and compare performance of some available BI packages.

4. Detailed Theory syllabus:

SN	Module	Detailed Content	Hrs.	CO Mapping
0	Prerequisite	Knowledge of databases, and Data warehousing, OLAP operations.	0	
I	Data Mining	Data Mining: Mining patterns; Technologies used; Issues in Data Mining, Definition & Functionalities, Classification of DM systems, DM task primitives.	3	CO 1
II	Data Exploration and Data Preprocessing	Types of Attributes; Statistical Description of Data; Data Visualization ; Measuring similarity and dissimilarity. Data Preprocessing : Data Cleaning; Data Integration;	9	CO 2

		Data Reduction: Attribute subset selection, Histograms, Clustering and Sampling; Data Transformation & Data Discretization :Normalization, Binning, Histogram Analysis and Concept hierarchy generation for numerical and categorical data.		
III	Supervised Learning	Basic Concepts; Classification methods: 1. Decision Tree Induction: Attribute Selection Measures, Tree pruning. 2. Bayesian Classification: Naïve Bayes‟ Classifier. Prediction: Structure of regression models; Simple linear regression, Multiple linear regression, logistic regression **,** Lasso regression**,** Accuracy and Error measures, Precision, Recall, Holdout, Random Sampling, Cross Validation.	9	CO 3, CO 4 CO5
IV	Unsupervised Learning	Clustering, Partition Method: K means, Fuzzy K means, Hierarchical Methods: Agglomerative, Divisive, BIRCH; Density-Based Methods: DBSCAN, OPTICS. Outliers, Types of Outliers, Outlier Detection Methods: Supervised, Semi- Supervised, Unsupervised, Proximity based, Clustering Based. Association Rule Mining, Market basket analysis.	9	CO 3, CO 4
V	Decision Support System in Business Intelligence	Business intelligence, architectures, Development of a business intelligence system; Representation of the decision-making process, Decision support system: Components, Characteristics and applications. .	6	CO 6
VI	BI Applications	Pattern Analysis for BI in real world, Sales Intelligence, Visualization, Reporting, Performance management, banking & finance CRM	3	CO 6

5. Detailed Practical syllabus:

Pattern Analysis and Business Intelligence Lab (Credit-01) :

Lab Prerequisite: Object oriented Concept, Java programming language.

Software Requirements: Open source data mining and BI tools like WEKA, Rapid Miner, Pentaho.

Hardware Requirements: PC i3 or above.

Suggested List of Experiments :

Sr. No.	Module Name	Detailed Lab Description	Hours	CO Mapping
1	II	Solving exercises in Data Exploration	2	CO1, CO2
2	II	Solving exercises in Data preprocessing	2	CO1, CO2
3	III	Using open source tools Implement Classifier	2	CO3, CO4 , CO5

4	IV	Using open source tools Implement Clustering Algorithm	2	CO3, CO4
5	IV	Using open source tools Implement Association Mining Algorithm	2	CO3, CO4
6	III	Implementation of any one classifier using languages like JAVA/ python/R	2,2	CO3, CO4 , CO5
7	IV	Implementation of any one clustering algorithm using languages like JAVA/python	2,2	CO3, CO4
8	IV	Implementation of any one association mining algorithm using languages like JAVA/ python	2,2	CO3, CO4
9	V	Detailed case study of any one BI tool (Paper Assignment ,open source tools like BIRT, Tableau, Pentaho)	2	CO5
10	VI	Business Intelligence Mini Project: Each group will be assigned one new case study. BI report must be prepared outlining the following steps: a) Problem definition, Identifying which data mining task is needed b) Identify and use a standard data mining dataset available for the problem.(Some links for data mining datasets are:WEKA site, UCI Machine Learning Repository, KDD site, KDD Cup etc.). c) Implement the data mining algorithm of choice. d) Interpret and visualize the results. e) Provide clearly the BI decision that is to be taken as a result of mining.	6	CO5, CO6

6.Theory Assessment:

Internal Assessment: Two Internal assessments will be conducted for 40 marks each with average marks of both assessments as final score.

1. **End Sem Theory Examination:**
   - Question paper will consist of 4 questions, each carrying 20 marks.
   - Total 3 questions need to be solved.
   - Q.1 will be compulsory, based on the entire syllabus.
   - Remaining questions will be randomly selected from all the modules.
   - Weightage of marks should be proportional to the number of hours assigned to each module.

7. Practical Assessment:

Termwork Assessment: Term Work shall consist of at least 10 to 12 practical's based on the above list. Also Term work Journal must include at least 2 assignments. Term Work Marks: 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance).

8. Books and References:

A. Text Books:

1. Han, Kamber, "Data Mining Concepts and Techniques", Morgan Kaufmann 3nd Edition.
2. P. N. Tan, M. Steinbach, Vipin Kumar, "Introduction to Data Mining", Pearson Education.

3.Business Intelligence: Data Mining and Optimization for Decision Making by Carlo Vercellis,Wiley India Publications.
4. G. Shmueli, N.R. Patel, P.C. Bruce, “Data Mining for Business Intelligence: Concepts, Techniques, and Applications in Microsoft Office Excel with XLMiner”, 2nd Edition, Wiley India.

B. References:

1. Michael Berry and Gordon Linoff “Data Mining Techniques”, 2nd Edition Wiley Publications.
2. Michael Berry and Gordon Linoff “Mastering Data Mining- Art & science of CRM”, Wiley Student Edition.
3. Vikram Pudi & Radha Krishna, “Data Mining”, Oxford Higher Education.
4. P. N. Tan, M. Steinbach, Vipin Kumar, “Introduction to Data Mining”, Pearson Education.
5. WEKA, RapidMiner Pentaho resources from the Web.

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Sem-VI Specialization	1. AI and Robotics	2. IoT and Data Analytics	3. Information Security and Forensics	4. Bioinformatics
DLOC II	IT 321	IT 322	IT 323	IT 324
	Genetic Algorithms and Fuzzy Systems	Internet of Everything	Cyber Security	Introduction to Bioinformatics
DLOC III	IT 331	IT 332	IT 333	IT 334
	Deep Learning	Big Data Analytics	Penetration Testing	Computational Genomics

Sem- VI ILOC	1. Business and Entrepreneurship	2. Bio-Engineering	3. Engineering Design	4. Art and Humanities	5. Applied Science	6. Life Skills, Repair, Maintenance and Safety
ILOC II	IL	IL	IL	IL	IL	IL
	e- Commerce and e-Business	Medical Image Processing	Technologies for Rural Development	Economics	GIS and Remote Sensing	Maintenance of Electronics and Mechanical Equipment

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
IT 321	Genetic Algorithms and Fuzzy Systems	Contact Hours	3	2	-	5
		Credits	3	1	-	4

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
IT 321	Genetic Algorithms and Fuzzy Systems	40	40	40	60	25	–	25	150

1. **Prerequisite:** Algorithm Concept And Fundamental of Computing

2. Course Objectives: The course/instructor aims to

1. To Understand of core Evolutionary Computing (EC) concepts and Evolutionary Algorithm(EA) mechanisms
2. To identify (real-world) and formulate problems for which EC is appropriate
3. To Understand and Configure Genetic Algorithms.
4. To Understand and configure selection schemes and search strategies and to perform statistical analysis on stochastic algorithms such as EAs
5. To Understand the basic concept of Fuzzy Logic
6. To Understand advanced Fuzzy Logic Operation and its application

3. Course Outcomes: On successful completion of this course, learner/student will be able to

1. Understanding of core Evolutionary Computing (EC) concepts and Evolutionary Algorithm(EA) mechanisms
2. Identifying (real-world) problems for which EC is appropriate
3. Understanding and configure Genetic Algorithm,
4. Understanding and configuring selection schemes and search strategies.
5. Understanding the basic concept of Fuzzy Logic
6. Understanding advanced Fuzzy Logic Operation and its application

4. DETAILED THEORY SYLLABUS:

SN	Module	Detailed Content	Hrs	COs
I	Introduction	**Introduction:** Biological Evolution and Artificial Evolution, Principles of Evolutionary Computing. **Types of Evolutionary Computing Algorithm:** Genetic Algorithms, Genetic Programming, Evolutionary Programming, Evolutionary Strategies, Hybrid Methods. Applications of Evolutionary Algorithms.	5	CO1,CO 2
II	Representation and Selection Techniques	**Introduction to Representations Techniques:** Binary String Representation, Real Valued Vectors, Permutations, Finite-State Representations, Parse Trees.	8	CO3

		Selection Schemes: Roulette Wheel Selection, Proportional Selection, Tournament Selection, Rank-based Selection, Boltzmann Selection, Generation Gap Method, Selection Pressure. Comparison of Selection Schemes.		
III	Genetic Algorithms	**Introduction:** Generation, Chromosomes, Offspring, Fitness Score, Population Size, Types of Operators: Selection, Crossover, Mutation. **Crossover Operators:** Single Point, Two Point, Multi-point crossover, Partially Mapped Crossover, Cyclic Crossover. **Mutation Operators:** Bit Flip Mutation, Random Resetting, Swap Mutation, Scramble Mutation, Inversion Mutation, Insert Mutation.	6	CO3, CO4
IV	Fuzzy Logic	**Fuzzy Sets:** Classical set versus fuzzy set, operations, properties, Fuzzy Relations: Types and Operations. **Fuzzy Inference System:** Propositional Logic, Predicate Logic, Inference in Predicate Logic, Evaluation of FIS. **Fuzzy Logic Architecture:** Membership Function, Fuzzy quantifiers, Fuzzy Logic Principles, Fuzzy Inference, Fuzzy Rule Based Systems, fuzzification and Defuzzification.	8	CO4
V	Fuzzy Logic Control System	**Fuzzy Logic Control (FLC) Design:** Architecture of Fuzzy Logic Control, Components of FLC, Steps in Designing FLC, Advantages and Disadvantages of Fuzzy Logic Control. **Approaches of FLC:** Mamdani, Takagi and Sugeno.	6	CO5
VI	Applications	**Genetic Algorithm:** Traveling Salesman Problem (TSP), N-Queens, Job Shop Scheduling. **Fuzzy Logic Control System:** Steam Turbine System, Washing Machine, Refrigeration Systems.	6	CO6

5. DETAILED PRACTICAL SYLLABUS:

Lab Prerequisite: Basic computer algorithms and data structures and at least one high level programming language

Software Requirements: One high level programming language.

Hardware Requirements: Basic computing facility.

Suggested List of Experiments :

SN	Detailed Lab Description	Hrs	LO Mapping
0	Students must have a good understanding of basic computer algorithms and data structures and at least one high level programming language	02	--
I	Lab1: The graph k-coloring problem Lab2: The minimum vertex cover problem	04	LO1
II	Lab3: The N-queens problem generalizes Lab4: The Traveling-salesperson problem	04	LO2
III	Lab5 Implementation of Simple Genetic Application Lab6: Consider a genetic algorithm to solve vector of integer representation	04	LO3
IV	Lab 7: Consider a genetic algorithm using permutation representation	02	LO4
V	Lab8: Implementation of Fuzzy Relations (Max-min Composition)	02	LO5

VI	Lab 9:Implementation of Fuzzy Controller (Washing Machine)	04	LO6

6. Theory Assessments:

1. **Internal Assessment:** Two Internal assessments will be conducted for 40 marks each with average marks of both assessments as final score.
2. **End Sem Theory Examination:**
   - Question paper will consist of 5 questions, each carrying 20 marks.
   - Total 3 questions need to be solved.
   - Q.1 will be compulsory, based on the entire syllabus.
   - Remaining questions will be randomly selected from all the modules.
   - Weightage of marks should be proportional to the number of hours assigned to each module.

7. Practical Assessments:

Termwork Assessment: Term Work shall consist of at least 10 to 12 practical's based on the above list. Also Term work Journal must include at least 2 assignments. Term Work Marks: 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance).

Oral/Viva Assessment: An oral exam will be held based on the above syllabus.

8. Books and references:

A. Text Books:

1. Jacob, C., 2001. Illustrating Evolutionary Computation with Mathematica. Morgan Kaufmann
2. Rajasekaran. S.. Vijayalakshmi Pai. G.A. "Neural Networks, Fuzzy Logic and Genetic Algorithms", Prentice Hall of India Private Limited, 2003
3. "Introduction to Evolutionary Computing", Eiben and Smith. Springer-Verlag

B. References:

1. Bäck, T, 2000. Evolutionary Computation 1: Basic Algorithms and Operators. Institute of Physics Publishing, Bristol.
2. Klir.G, Yuan B.B. "Fuzzy sets and Fuzzy Logic Prentice Hall of India private limited, 1997.
3. An Introduction to Genetic Algorithms", Melanie Mitchell. MIT Press, 1996

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Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
IT 322	Internet of Everything	Contact Hours	3	2	-	5
		Credits	3	1	-	4

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
IT 322	Internet of Everything	40	40	40	60	25	–	25	150

1. **Prerequisite:** Computer Network, Microcontroller, Wireless Technology

2. **Course Objectives: The course/instructor aims to**
   1. To learn the concepts of IoT.
   2. To identify the different technologies.
   3. To learn different applications in IoT.
   4. To learn different protocols used in IoT.
   5. To learn and design hardware for smart city applications in IoT.
   6. To learn how to analyze and evaluate data collected in IoT.

3. **Course Outcomes: On successful completion of this course, learner/student will be able to**
   1. Describe the basic concepts of IoT
   2. Design architecture for an IoT application
   3. Apply IOT to different applications.
   4. Analysis and evaluate protocols used in IoT.
   5. Design and develop smart cities in IoT.
   6. Analysis and evaluate the data received through sensors in IoT.

4. DETAILED THEORY SYLLABUS:

SN	Module	Detailed Content	Hrs	COs
I	Introduction to IoT	Basics of Internet of Things,Smart Objects, Smart Environments, Machine to Machine Communications, Industrial Internet of Things,Who Works on the Internet of Things?, Internet of Things Framework	04	CO 1
II	Architecture of IoT	Characteristics of IoT,Physical & Logical Design of IoT. Architecture and Reference Models of IoT, Introduction to Industrial IoT (IIoT).	07	CO 2
III	RFID Technology	Introduction, Principle, Components and Architecture of RFID, RFID middleware, Issues in RFID, IPv6 Addressing Schemes and Electronic Product Code, RFID Applications and case studies, Hardware issues.	08	CO 2

IV	Communication Protocols	Introduction to Wireless Sensor Network, Protocols: MQTT, CoAP, REST Transferring data, Basic Difference between Protocols, Security IoT Protocols and Technology: CoAP and DTLS.	05	CO 2 CO 3 CO 4
V	Network Localization and Mobility	Localization, mobility management, localization and handover management, technology considerations,simulation setup, performance evaluation and results. Identification of IoT.	10	CO 4 CO 5
VI	Data Analytics for IoE	Big Data Analytics, Cloud and Fog Computing in the Internet of Things: IoT System Requirements, Cloud Computing in IoT ,Advantages of Using the Cloud for IoT, Examples of Cloud - Based IoT	05	CO 5 CO 6

5. Detailed Practical syllabus:

Lab Prerequisite: Wireless Technology Lab , Python, Java.
Software Requirements: Arduino IDE, Tinkercad,
Hardware requirement: Arduino/Raspberry Pi, Sensors

SN	Module	Title	Hrs
I	Mini Project	Create a Problem statement based on Survey identifying the Hardware and software requirement for their mini project problem statement.	4
II	Mini Project	Study of IoT architecture with respect to your mini project. Identify and design the required hardware and sensors for your circuit board configuration. Use suitable software and an emulator for coding the input devices and sensors.	4
III	Mini Project	Create a Web/ Mobile Application with features required for the mini project	4
IV	Mini Project	Interface hardware with Web to publish or remotely access the data on the Internet.	4
V	Mini Project	Analyze the readings obtained in the project and identify its future scope	2
VI	Presentation	Documentation (PPT + Report) of mini-project and technical paper writing.	2

6. Theory Assessments:

1. **Internal Assessment:** Two Internal assessments will be conducted for 40 marks each with average marks of both assessments as final score.
2. **End Sem Theory Examination:**
   a. Question paper will consist of 4 questions, each carrying 20 marks.
   b. Total 3 questions need to be solved.
   c. Q.1 will be compulsory, based on the entire syllabus.
   d. Remaining questions will be randomly selected from all the modules.
   e. Weightage of marks should be proportional to the number of hours assigned to each module.

7. Practical Assessments:

1. Termwork Assessment: Term Work shall consist of Mini Projects based on the above syllabus. Also Term work Journal must include at least 2 assignments. Term Work Marks: 25 Marks (Total marks) = 15 Marks (Mini Project) + 5 Marks (Assignments) + 5 Marks (Attendance).

2. Oral/Viva Assessment: An oral exam will be held based on the Mini Project.

8. **Textbooks and reference:**

A. Text Books:

1. Hassan, Q. F, "Internet of things A to Z: technologies and applications",Wiley; IEEE Press, 2018
2. Internet of Things connecting objects to the web, by Hakima Chaouchi, Wiley.
3. Internet of Things (A Hands-on-Approach) by Arshdeep Bhaga and Vijay Madisetti.

B. References:

1. The Internet of Things (MIT Press) by Samuel Greengard.
2. The Internet of Things (Connecting objects to the web) by Hakima Chaouchi, Wiley Publications.
3. RFID and the Internet of Things, by Herve Chabanne, Wiley Publications.

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Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
IT 323	Cyber Security	Contact Hours	3	2	-	5
		Credits	3	1	-	4

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
IT 323	Cyber Security	40	40	40	60	25	–	25	150

1. Course Objectives: The course/instructor aims to
    1. Exhibit knowledge of Cyber Security , Information security, threats, vulnerabilities.
    2. Understand the types of cyber crime.
    3. To explore various stages of cyber kill Chain
    4. To study various tools and techniques used to identify cyber crime.
    5. Understand key terms and concepts in Cyber Security Act , Governance and Compliance
    6. Understand key terms and concepts in Cyber Space and Cyber Law

2. Course Outcomes: On successful completion of this course, learner/student will be able to
    1. Students will be able to define and understand Cyber Security , Information security, threats, vulnerabilities.
    2. Students will be able to Understand the types of cyber crime.
    3. Students will be able to explore various stages of cyber kill Chain
    4. Students will be able to explore tools and techniques used to identify cyber crime.
    5. Students will be able to understand key terms and concepts in Cyber Security Act , Governance and Compliance
    6. Students will be able to understand key terms and concepts in Cyber Space and Cyber Law

3. DETAILED THEORY SYLLABUS:

SN	Module	Detailed Content	Hrs	Cs
	Prerequisites	Computer Network, Cloud Computing, Cryptography	1	
I	Introduction to cyber security	Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy	5	CO1
II	Cyber Offenses:How criminals plan	The 7 stages of a cyber kill chain ,Reconnaissance, Weaponization, Delivery, Exploitation, Installation, Command and control, Action	8	CO2

III	Tools and Method used in cybercrime	Introduction , Proxy servers and anonymizers, Phishing, Password Cracking, keyloggers and spywares, buffer overflow, Attacks on wireless networks. Phishing and Identity theft	7	CO2 and CO3
IV	Securing network and Web application	Application, Services and Servers Introduction, Basic security for HTTP Applications and Services, Basic Security for SOAP Services, Identity Management and Web Services, Authorization Patterns, Security Considerations, Challenges.	8	CO4
V	Cyber Act	Cyber crime and legal landscape around the world, IT Act,2000 and its amendments. Limitations of IT Act, 2000. Cyber crime and punishments, Cyber Laws and Legal and ethical aspects related to new technologies- AI/ML, IoT, Blockchain, Darknet and Social media, Cyber Laws of other countries, Case Studies Cyber Security Compliance (GDPR, HIPAA, SOX)	6	CO5
VI	Cyberspace and the Law	Fundamentals of Cyber Law,The INDIAN Cyberspace, National Cyber Security Policy 2013.Introduction to Cyber Forensics, Handling,Preliminary Investigations, Controlling an Investigation, Conducting disk-based analysis, vestigating Information-hiding, Scrutinizing E-mail, Validating E-mail header information, Tracing Internet access, Tracing memory in real-time	5	CO6 , CO1

4. DETAILED PRACTICAL SYLLABUS:

Lab Prerequisite: Rootkits

Suggested List of Experiments:

Sr. No.	Module Name	Detailed Lab Description	Hours
I	Introduction to cyber security	Implement the following Attack: a) Dictionary Attack b) Brute Force Attack	02
II	Cyber Offenses:How criminals plan	Demonstrate intrusion detection system using any tool (snort or any other s/w).	02
III	Tools and Method used in cybercrime	Installation of rootkits and study about the variety of options.	02
IV	Tools and Method used in cybercrime	To brute-force FakeBank's website to find hidden directories and pages using GoBuster	02
V	Securing network and Web application	To study the endpoint Logging and monitoring in windows	02
VI	Securing network and Web application	To study the endpoint Log analysis (tryhackme)	02
VII	Securing network and Web application	To analyze and defend against phishing emails. Investigate real-world phishing attempts using a variety of techniques.	02
VIII	Cyber Act	Case study on Cyber Crime	02

5. Theory Assessments:

1. **Internal Assessment:** Two Internal assessments will be conducted for 40 marks each with average marks of both assessments as final score.
2. **End Sem Theory Examination:**
   a. Question paper will consist of 4 questions, each carrying 20 marks.
   b. Total 3 questions need to be solved.
   c. Q.1 will be compulsory, based on the entire syllabus.
   d. Remaining questions will be randomly selected from all the modules.
   e. Weightage of marks should be proportional to the number of hours assigned to each module.

6. Practical Assessments:

1. Termwork Assessment: Term Work shall consist of at least 8 experiments based on the above syllabus. Also Term work Journal must include at least 2 assignments. Term Work Marks: 25 Marks (Total marks) = 15 Marks (Mini Project) + 5 Marks (Assignments) + 5 Marks (Attendance).
2. Oral/Viva Assessment: An oral exam will be held based on the above syllabus of Theory as well as practical.

7. Textbooks and references

A. **Text Books:**

1. Cyber Security: Understanding cyber crimes, Nina Godbole, Sunit Belapure, Wiley publication.
2. Wu, Chwan-Hwa John, and J. David Irwin. *Introduction to computer networks and cybersecurity*. CRC Press, 2016.
3. Gupta Sarika, "Information and Cyber Security", Khanna Publishing House, Delhi.
4. Erickson, Jon. *Hacking: the art of exploitation*. No starch press, 2008.
5. Brooks, Charles J., et al. *Cybersecurity essentials*. John Wiley & Sons, 2018.

B. References:

1. Andreasson, Kim J. *Cybersecurity: public sector threats and responses*. Taylor & Francis, 2011
2. Sumeet Dua and Xian Du , Data Mining and Machine Learning in Cybersecurity, Auerbach Publications, 2011

C. Lab Resources:

1. https://tryhackme.com
2. https://www.hackthebox.com

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Course Code	Course Name	Teaching Scheme	Contact Hours				Credits Assigned			
			TH	Pract	Tut	Total	TH	Pract	Tut	Total
IT 331	Deep Learning		3	2	-	5	3	1	-	4
		Examination Scheme	Internal Assessment			End Sem Exam		Term Work	Pract	Oral	Total Marks
			IA1	IA2	Avg	TH	Hrs				
			40	40	40	60	2	25	-	25	150

1. **Prerequisite:** Fundamentals of Neural Networks, Basics of Statistics.

2. Course Objectives: The course / instructor aims to

1. Define fundamentals of NN concepts, DL and compare ML with DL algorithms.
2. Describe how the deep learning models are evaluated, improved and optimized.
3. Explain how supervised deep learning CNN is used in image classification and compare with other models.
4. Give insight into the supervised deep learning RNN model and compare CNN with RNN.
5. Show how unsupervised deep learning GAN and autoencoder is applied and compare the performance of GAN and autoencoders.
6. Describe how DL algorithms are used in image classification, image captioning, image generation, text summarization and video to Text operation.

3. Course Outcomes: On successful completion of this course, learner/ student will be able to:

1. Understand fundamentals concepts of NN, DL and compare ML with DL algorithms.
2. Know how the deep learning models are evaluated, improved and optimized.
3. Apply supervised deep learning CNN for image classification and compare with other models.
4. Apply supervised deep learning RNN and compare performance of RNN model.
5. Apply unsupervised deep learning GAN and autoencoder and compare the performance of GAN and autoencoders.
6. Demonstrate how deep learning algorithms are used for image classification, image captioning, image generation, text summarization and video to Text operations.

4. Detailed Theory Syllabus

SN	Module	Detailed Content	Hrs	COs
I	Introduction	**Introduction to NN:** Biological Neuron. McCulloch Pitts NN, Linear Separability, Perceptron Algorithm: Neural Representation of AND, OR, NOT, XOR and XNOR Logic Gates. **Introduction to Deep Learning:** ML vs DL approach, Types of DL Algorithms, Hyperparameters, Loss functions, Data augmentation, Activation functions: Sigmoid, Tanh, ReLU, Softmax.	05	CO1
II	Model Evaluation	**Model Evaluation:** Epochs, Bias and Variance, Underfitting, Overfitting, Regularization: Lasso, Ridge, Elastic. Confusion Matrix. **Model Improvement:** Ensemble methods, Sparse and convex functions, Bagging to avoid overfitting, Boosting to avoid underfitting, Stacking to avoid underfitting. **Optimizers:** Gradient Descent (GD), Types of GD, Vanishing Gradient Problem, Exploding Gradient Problem, Frobenius norm regularization, Early stopping, Adam optimizer.	08	CO1, CO2
III	Supervised Deep Learning: CNN	**Introduction:** Edge Detection Filters, Filter Size, Convolutions, Padding, Stride, Compare CNN and ANN, Limitations of CNN. **Architecture:** CNN architecture, Layers: Pooling, Convolutions. Transfer learning, Compare DL architecture: LeNET vs AlexNET.	07	CO3
IV	Supervised Deep Learning: RNN	**Introduction:** Recurrent neuron, RNN model, RNN types, Gradients in RNN, Back propagation, Compare CNN and RNN. **Architecture:** Gated recurrent units (GRUs), Long short term memory (LSTM).	07	CO4, CO5
V	Unsupervised Deep Learning	**Generative Adversarial Network:** Discriminative vs. Generative Modeling, Architecture of GAN, Types of GANs: Conditional GAN, CycleGAN, CycleGAN Model Architecture, Applications. **Autoencoders:** Types, Linear autoencoder, Undercomplete vs Overcomplete autoencoders, Regularized autoencoders: Denoising and Sparse autoencoder. Contractive autoencoder, Convolutional autoencoder. Compare GANs and Autoencoders.	07	CO4, CO5
VI	Applications	Image classification, Image Captioning, Image generation, Text summarization, Video to Text using LSTM, CycleGAN for Image Translation.	05	CO6

5. DETAILED PRACTICAL SYLLABUS:

Lab Prerequisite: Knowledge of Machine learning algorithms beneficial, Python Programming.

Suggested List of Experiments:

- Implementation of Linear Regression
- Implementing Logic Gates using Neural Networks
- Implementation of MNIST Sampler
- Implementation of MNIST Classifier
- Implementation of CNN MNIST Classifier
- Implementation of CNN MNIST Classifier using Functional API

- Implementation of RNN MNIST Classifier
- Implementation of LSTM MNIST Classifier
- Implementation of Transformer MNIST Classifier
- Implementation of MLP on MNIST with L2
- Implementation of MLP on MNIST with Data Augmentation
- Implementation of AutoEncoder and Colorization AutoEncoder
- Implementation of VAE MLP
- Implementation of VAE CNN
- Implementation of CVAE

6. Theory Assessments:

1. **Internal Assessment:** Two Internal assessments will be conducted for 40 marks each with average marks of both assessments as final score.
2. **End Sem Theory Examination:**
   - Question paper will consist of 5 questions, each carrying 20 marks.
   - Total 3 questions need to be solved.
   - Q.1 will be compulsory, based on the entire syllabus.
   - Remaining questions will be randomly selected from all the modules.
   - Weightage of marks should be proportional to the number of hours assigned to each **module.**

7. Practical Assessments:

1. **Termwork Assessment:** Term Work shall consist of at least 10 to 12 practical's based on the above list. Also Term work Journal must include at least 2 assignments. Term Work Marks: 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance).
2. **Oral/Viva Assessment:** An oral exam will be held based on the above syllabus.

8. **Text Books:**

1. Satish Kumar, "Neural Networks: A Classroom Approach", McGraw Hill Education; 2ed, 2017.
2. Jacek M. Zurada, "Introduction to Artificial Neural Systems", West Publishing Company, 1092.
3. Ian Goodfellow, Yoshua Bengio and Aaron Courville, "Deep Learning", MIT Press Ltd, 2016
4. Li Deng and Dong Yu, "Deep Learning Methods and Applications", Now Publishers Inc., 2014.
5. Mykel J. Kochenderfer and Tim A. Wheeler, "Algorithms for Optimization", The MIT Press, Cambridge, Massachusetts London.

9. References:

- Simon Haykin, "Neural Network - A Comprehensive Foundation", 2ed, Pearson Education, 2005.
- S.N. Sivanandam and S.N. Deepa, "Principles of soft computing", Wiley India
- François Chollet, "Deep learning with Python," New York: Manning, Vol. 361. 2018.
- Douwe Osinga, "Deep Learning Cookbook", O'Reilly; 1st edition, 2018, SPD Publishers.

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Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
IT 332	Big Data Analytics	Contact Hours	3	2	-	5
		Credits	3	1	-	4

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
IT 332	Big Data Analytics	40	40	40	60	25	–	25	150

1. **Prerequisite: :** Database Management System.

2. **Course Objectives: The course/instructor aims to**
   1. To provide an overview of an exciting growing field of Big Data analytics.
   2. To discuss the challenges traditional data mining algorithms face when analyzing Big Data.
   3. To introduce the tools required to manage and analyze big data like Hadoop, NoSql MapReduce.
   4. To teach the fundamental techniques and principles in achieving big data analytics with scalability and streaming capability.
   5. To introduce to the students several types of big data like social media, web graphs and data streams.
   6. To enable students to have skills that will help them to solve complex real-world problems in decision support.

3. Course Outcomes: On successful completion of this course, learner/student will be able to
   1. Explain the motivation for big data systems and identify the main sources of Big Data in the real world.
   2. Demonstrate an ability to use frameworks like Hadoop, NOSQL to efficiently store, retrieve and process Big Data for Analytics.
   3. Implement several Data Intensive tasks using the Map Reduce Paradigm
   4. Apply several newer algorithms for Clustering Classifying and finding associations in Big Data
   5. Design algorithms to analyze Big data like streams, Web Graphs and Social Media data.
   6. Design and implement successful Recommendation engines for enterprises.

4 .DETAILED THEORY SYLLABUS:

SN	Module	Detailed Content	Hrs	CO Mapping
0	Prerequisite	Data Mining, database Systems, Algorithms	0	
I	Introduction to Big Data	Data Introduction to Big Data, Big Data characteristics, types of Big Data, Traditional vs. Big Data business approach, Big Data Challenges, Examples of Big Data in Real Life, Big Data Applications	03	CO1
II	Introduction to Big Data Frameworks: Hadoop, NOSQL	What is Hadoop? Core Hadoop Components; Hadoop Ecosystem; Overview of : Apache Spark, Pig, Hive, Hbase, Sqoop What is NoSQL? NoSQL data architecture patterns:	08	CO2

		Key-value stores, Graph stores, Column family (Bigtable) stores, Document stores, MongoDB		
III	MapReduce Paradigm	MapReduce: The Map Tasks, Grouping by Key, The Reduce Tasks, Combiners, Details of MapReduce Execution, Coping With Node Failures. Algorithms Using MapReduce: Matrix-Vector Multiplication by MapReduce , Relational-Algebra Operations, Computing Selections by MapReduce, Computing Projections by MapReduce, Union, Intersection, and Difference by MapReduce, Computing Natural Join by MapReduce, Grouping and Aggregation by MapReduce, Matrix Multiplication, Matrix Multiplication with One MapReduce Step . Illustrating use of MapReduce with use of real life databases and applications.	07	CO3
IV	Mining Big Data Streams	The Stream Data Model: A DataStream-Management System, Examples of Stream Sources, Stream Queries, Issues in Stream Processing. Sampling Data in a Stream : Sampling Techniques. Filtering Streams: The Bloom Filter Counting Distinct Elements in a Stream : The Count-Distinct Problem, The Flajolet-Martin Algorithm, Combining Estimates, Space Requirements . Counting Ones in a Window: The Cost of Exact Counts, The Datar-Gionis-IndykMotwani Algorithm, Query	06	CO5
V	Big Data Mining Algorithms	Frequent Pattern Mining : Handling Larger Datasets in Main Memory Basic Algorithm of Park, Chen, and Yu. The SON Algorithm and MapReduce. Clustering Algorithms: CURE Algorithm. Canopy Clustering, Clustering with MapReduce Classification Algorithms: Parallel Decision trees, Overview SVM classifiers, Parallel SVM, KNearest Neighbor classifications for Big Data, One Nearest Neighbour.	07	CO4
VI	Big Data Analytics Applications	Link Analysis : PageRank Definition, Structure of the web, dead ends, Using Page rank in a search engine, Efficient computation of Page Rank: PageRank Iteration Using MapReduce, Topic sensitive Page Rank, link Spam, Hubs and Authorities, HITS Algorithm. Mining Social- Network Graphs : Social Networks as Graphs, Types , Clustering of Social Network Graphs, Direct Discovery of Communities, Counting triangles using Map-Reduce. Recommendation Engines: A Model for Recommendation Systems, Content-Based Recommendations, Collaborative Filtering.	08	CO4 CO6

5. DETAILED PRACTICAL SYLLABUS:

Lab Prerequisite: Java, Python

Software Requirements: Virtual Machine, Hadoop Framework, NOSQL and MongoDb Compilers

Hardware Requirements: PC i3 or above, 8 GB RAM

Suggested List of Experiments :

1. Assignment on Study of Hadoop ecosystem
2. Programming exercises on Hadoop Using Hive, Pig, Hbase Sqoop NOSQL, MongoDB

3. Implementing simple algorithms in MapReduce Matrix multiplication, Aggregates, joins, sorting, searching etc.
4. Implementing Algorithms using MapReduce (Any 2)
5. Implementing Frequent Itemset Mining
6. Implementing Clustering algorithms Implementing Classification Algorithms
7. Big Data Applications (Any 2)
    a. Implementing Analytics on data streams
    b. Implementing Social Network Analysis Algorithms
    c. Implementing Web Graph Algorithms Implementing recommendation Engines
8. Mini Project: One real life large data application to be implemented (Use standard Datasets available on the web) a) Twitter data analysis b) Fraud Detection c) Text Mining d) Recommendation Engines (list of datasets also given in the textbook)

6. Theory Assessments:

1. **Internal Assessment:** Two Internal assessments will be conducted for 40 marks each with average marks of both assessments as final score.
2. **End Sem Theory Examination:**
    - Question paper will consist of 4 questions, each carrying 20 marks.
    - Total 3 questions need to be solved.
    - Q.1 will be compulsory, based on the entire syllabus.
    - Remaining questions will be randomly selected from all the modules.
    - Weightage of marks should be proportional to the number of hours assigned to each module.

7. Practical Assessments:

1. **Termwork Assessment:** Term Work shall consist of at least 10 to 12 practical's based on the above list. Also Term work Journal must include at least 2 assignments. Term Work Marks: 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance).
2. **Oral/Viva Assessment:** An oral exam will be held based on the above syllabus.

8. Books and References:

A. Text Books:

1. Radha Shankarmani, M Vijayalakshmi, "Big Data Analytics", Wiley Publications,
2. Anand Rajaraman and Jeff Ullman "Mining of Massive Datasets", Cambridge University Press.
3. Alex Holmes "Hadoop in Practice", Manning Press, Dreamtech Press.
4. Professional NoSQL Paperback, by Shashank Tiwari, Dreamtech Press
5. MongoDB: The Definitive Guide Paperback, Kristina Chodorow (Author), Michael Dirolf, O'Reilly Publications

B. References:

1. Analytics in a Big Data World: The Essential Guide to Data Science and its Applications, Bart Baesens , WILEY Big Data Series.
2. Big Data Analytics with R and Hadoop by Vignesh Prajapati Paperback, Packt Publishing Limited
3. Hadoop: The Definitive Guide by Tom White, O'Reilly Publications

Back to Scheme

Course Code	Course Name	Teaching Scheme	Contact Hours				Credits Assigned			
			TH	Pract	Tut	Total	TH	Pract	Tut	Total
IT 333	Penetration Testing		3	2	-	5	3	1	-	4
		Examination Scheme	Internal Assessment			End Sem Exam		Term Work	Pract	Oral	Total Marks
			IA1	IA2	Avg	TH	Hrs				
			40	40	40	60	2	25	-	25	150

1. Course Objectives:

1. To learn the tools that can be used to perform information gathering
2. To identify various attacks in various domains of cyber space.
3. To detect vulnerabilities by port scanning.
4. To learn how Metasploit and Meterpreter are used to automate the attacks and penetration testing techniques.
5. To learn the web application attacks starting from information gathering to exploitation phases
6. To learn about exploits in Wireless environment

2. Course Outcomes:

1. To understand the basic principles for Information Gathering and Detecting Vulnerabilities in the system.
2. To detect vulnerabilities by scanning ports.
3. Ability to determine the security threats and vulnerabilities in computer networks using penetration testing techniques
4. Deploy and test exploits over targeting operating systems and services
5. Identify flaws and vulnerabilities in applications, websites, networks, systems, protocols, and configurations using both manual techniques and assistive tools
6. Know the various attacks caused due to the network and communication system in an application.

1. Detailed Syllabus:

Prerequisite: Web application Security, Information Security, Cryptography and network security

SN	Module	Detailed Content	Hrs	COs
1	Introduction to Hacking	**Introduction**: Terminologies, Categories and Types. Writing Reports, Risk assessment. **Reconnaissance**: Active and Passive. HTTrack Google directives, Harvester. **DNS Reconnaissance:** Whois, NSLookups, Dig. Searching for Email Addresses, Social engineering.	2	CO1
2	Information Gathering Techniques	**Types**: Active, Passive, Social Engineering. **DNS Reconnaissance**: whois, Nslookup, Host, Zone Transfers, Dig. **Google directive**: site, intitle, inurl, cache, filetype. **Port Scanning Types:** TCP and UDP scan, OS fingerprinting detection using Nmap.	6	CO2
3	Vulnerabilities assessment and Attacks	**Nessus:** Nessus Policies, Scanning with Nessus**,**Web Application Scanning **Attacks:** Password Attacks, Password Management, Online Password Attacks, Offline Password Attacks.	6	CO3

		Social Engineering: Spear-Phishing Attack Vectors - Web attack, Mass email attack,Mass Mailer Attack		
4	Exploitation	**Metasploit:** Metasploit framework, metasploit-Console, Payloads, Meterpreter. -Privilege Escalation,Introduction to armitage.	4	CO4
5	Web Application Testing	SQL Injection, XPath Injection, Local File Inclusion, Remote File Inclusion, Command Execution, Cross-Site Scripting,Cross-Site Request Forgery, Web Application Scanning with w3af.	7	CO5
6	Wireless Attacks	**Wireless Security:** SSID, WEP, MAC filtering, IPsec, Wardriving. **Software Tools:** Cracking wireless networks, Detecting wireless attack.	6	CO6

4. Suggested Experiments:

1. Setup Kali Linux in a Virtual machine and setup with DNS info and collection of local network.
2. Scan the network for target OS machines in the local network and virtual network.
3. Experiments to identify the open ports and firewall rules setup.
4. Use password guessing tools to guess a password. Use password strengthening tools to strengthen the password. Try guessing the password and tabulate the enhanced difficulty due to length of password and addition of special characters
5. Extract password hashes from operating systems. Use a password extraction tool, using word list, single crack or external mode to recover the password. Increase the complexity of the password and determine the point at which the cracking tool fails
6. Experiments on SQL injections.
7. Analysis of WEP flaws.
8. Experiments on Wireless DoS Attacks.
9. Buffer Overflow Prevention and prevention against Cross Site Scripting Attacks.
10. Experiments on Metasploit Framework.
11. Cross Site Scripting and Cross Site Request Forgery.
12. File upload vulnerability on Social engineering.

5. Theory Assessment:

A. **Internal Assessment (IA):** Two class tests of 40 marks each. The first class test is to be conducted when approx. 40% syllabus is completed and the second class test when an additional 35% syllabus is completed. Duration of each test shall be one hour.

B. **End Semester Theory Examination:** In question, paper weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.

1. Question paper will consist of 3 questions, each carrying 20 marks.
2. Question number 1 will be compulsory and based on maximum contents of the syllabus
3. Remaining questions will be mixed in nature (for example, if Q.2 has part (a) from module 3 then part (b) will be from other than module 3)
4. Total three questions need to be solved.

6. Practical Assessment: An Practical / Oral exam will be held based on the above syllabus. The final certification and acceptance of TW ensures the satisfactory performance of laboratory work and minimum passing in the TW.

A. **Term Work:** Term Work shall consist of practicals based on the above list. Also Term work Journal must include at least 2 assignments based on the topics mentioned in the syllabus.

B. **Term Work Marks:** 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance)

7. Books and References:

A. Books:

1. Georgia Weidman, ”Penetration Testing: A Hands On Introduction to Hacking”, No Startch Press, First Edition 2014. ISBN-13: 978-1593275648 ISBN-10: 1593275641.
2. Rafay Baloch, ”Ethical Hacking and Penetration Testing Guide”,CRC Press, 2015,ISBN :78-1-4822-3161-8.
3. Dr. Patrick Engebretson, The Basics of Hacking and Penetration Testing Ethical Hacking and Penetration Testing made easy , Syngress publications, Elsevier,2013. ISBN :978-0-12-411644-3.

B. **References:**

1. Andrew Whitaker and Daniel P. Newman, Penetration Testing and Network Defence The practical guide to simulating, detecting and responding to network attacks, CiscoPress, 2010. ISBN: 1-58705-208-3
2. B.Singh, H.Joseph and Abhishek Singh,”Vulnerability Analysis and Defense for theInternet, Springer, 2008 Edition. ISBN-10: 0387743898 ISBN-13: 978-0387743899.
3. Sabih, Zaid, “Learn Ethical Hacking from Scratch: Your stepping stone to penetration testing”, 2018 Packt Publishing Ltd, United Kingdom.

Back to Scheme

Course Code	Course Name	Teaching Scheme	Contact Hours				Credits Assigned			
			TH	Pract	Tut	Total	TH	Pract	Tut	Total
IT 391	Major Project I		-	6	-	6	-	3	-	3
		Examination Scheme	Internal Assessment			End Sem Exam		Term Work	Pract	Oral	Total Marks
			IA1	IA2	Avg	TH	Hrs				
			-	-	-	-	-	25	-	25	50

1. Project I Objectives:

The project work facilitates the students to develop and prove Technical, Professional and Ethical skills and knowledge gained during graduation program by applying them from problem identification, analyzing the problem and designing solutions. The course/instructor/guide aims to

1. To offer students a glimpse into real world problems and challenges that need IT based solutions
2. To enable students to create very precise specifications of the IT solution to be designed.
3. To introduce the vast array of literature available of the various research challenges in the field of IT
4. To create awareness among the students of the characteristics of several domain areas where IT can be effectively used.
5. To enable students to use all concepts of IT in creating a solution for a problem
6. To improve the team building, communication and management skills of the students.

2. Project I Outcomes: On successful completion of Project I learner/student will be able :

1. Discover potential research areas in the field of Computer Engineering .
2. Conduct a survey of several available literature in the preferred field of study
3. Compare and contrast the several existing solutions for research challenge
4. Demonstrate an ability to work in teams and manage the conduct of the research study.
5. Formulate and propose a plan for creating a solution for the research plan identified
6. To report and present the findings of the study conducted in the preferred domain

3. Guidelines for Project Topic Selection and Allocation:

Project topic selection Process to be defined and followed:

- Project orientation can be given at the end of 5th semester.
- Students should be informed about the domain and domain experts whose guidance can be taken before selecting projects.
- Students should be recommended to refer to papers from reputed conferences/ journals like IEEE, Elsevier, ACM, Springer etc. which are not more than 2-3 years old for review of literature.
- Students can certainly take ideas from anywhere, but be sure that they should evolve them in a unique way to suit their project requirements.
- Students can be informed to refer to Digital India portal, SIH portal or any other hackathon portal for problem selection.

4. Guidelines for Topic Selection: Topics can be finalized with respect to following criterion

The topics selected should be novel in nature (Product based, Application based or Research based) or should work towards removing the lacuna in currently existing systems.

Technology Used:

- Use of the latest technology or modern tools can be encouraged.
- Students should not repeat work done previously (work done in the last three years).

- Project work must be carried out by the group of at least 3 students and maximum 4.
- The project work can be undertaken in a research institute or organization/Industry/any business establishment. (out-house projects)
- The project proposal presentations can be scheduled according to the domains and should be judged by faculty who are experts in the domain.
- Head of department and senior staff along with Project coordinators will take decisions

regarding final selection of projects.

- Guide allocation should be done and students have to submit weekly progress reports to the internal guide.
- Internal guide has to keep track of the progress of Project and also has to maintain attendance reports. This progress report can be used for awarding term work marks.
- In case of industry/ out-house projects, visit by internal guide will be preferred and external members can be called during the presentation at various levels

5. Guidelines for Project Work:

1. Each group will be associated with a project mentor/guide. The group should meet with the project mentor/guide periodically and record of the meetings and work discussed must be documented
2. Department has to allocate half a day for project work in VI semester, 1 day in VII semester and 1 day in VIII semester every week.
3. Mock presentation as a part of term work evaluation will be conducted at department level by panel members appointed by the Head of the department of respective Programme.
4. A report is to be prepared summarizing the findings of the literature survey. A comparative evaluation of the different techniques surveyed is also to be done.
5. Teams must analyze all the results obtained by comparing with other standard techniques.
6. Every team must publish their work in national / international conferences/journals (if possible publish in Scopus indexed journals).
7. The team will finally propose a plan for project work to be continued in the final year.
8. A project report should preferably contain at least following details:
    - Abstract
    - Introduction
    - Literature Survey/ Existing system
    - Limitation Existing system or research gap
    - Problem Statement and Objective
    - Methodology (your approach to solve the problem) Proposed System
    - Details of Database or details about input to systems or selected data
    - Software and Hardware Set up
    - Implementation Plan for Next Semester
    - References

Desirable: Students can be asked to undergo some Certification course (for the technical skill set that will be useful and applicable for projects.)

6. Guidelines for Project I Evaluation:

1. Each team has to give a presentation/demo to the Internal Panel and External examiner and they will be jointly evaluated by a team of Internal and External Examiners approved by the Head of the department .
2. Each team will prepare a report that will summarize the results of the literature survey and the project proposal. The list of papers surveyed must be clearly documented.
3. Oral exams will be conducted on Project done by the students.
4. Suggested quality evaluation parameters are as follows:

- o Quality of problem selected
- o Clarity of problem definition and feasibility of problem solution
- o Relevance to the specialization / industrial trends
- o Originality
- o Clarity of objective and scope
- o Quality of analysis and design
- o Quality of written and oral presentation
- o Individual as well as team work

7. Project I Assessment:

Term Work: **50 Marks** and the distribution of marks for term work shall be done based on following:

- o Weekly progress Report.
- o Project Work Contribution in terms of research paper publication .
- o Project Report .
- o Term End Presentation .

The final certification and acceptance of TW ensures the satisfactory performance on the above aspects.

8. Oral Exam:

Oral examination of Project I should be conducted by Internal and External examiners approved by HOD at the end of the semester.

1. An Oral exam will be held based on Project and Presentation.
2. Oral Exam Marks: 25 marks

Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
IT 401	Cloud Computing	Contact Hours	3	-	-	3
		Credits	3	-	-	3

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
IT 401	Cloud Computing	40	40	40	60	–	–	–	100

1.Prerequisite: Computer Network, OSI references Model,Operating System

2.Course Objectives: The course/instructor aims to

1.Basics of cloud computing.
2. Key concepts of virtualization.
3. To study different Cloud Computing services and Models
4. Key components of Amazon Web Services and Google cloud Platform
5. To study cloud management
6. To study the Cloud security

3.Course Outcomes: On successful completion of this course, learner/student will be able to

1.Define Cloud Computing and memorize the different Cloud service and deployment models
2. Describe the importance of virtualization along with their technologies.
3. Use and Examine different cloud computing services and cloud Models.
4. Analyze the components Google Cloud platform and AWS
5. Describe the key components cloud Management
6. Design & develop Cloud Security

4.**DETAILED THEORY SYLLABUS:**

SN	Module	Detailed Content	Hrs	CO Mapping
0	Prerequisite	Computer Network, OSI references Model,Operating System	0	
I	Introduction	Defining Cloud Computing, Cloud and other similar configurations, Components of Cloud Computing , SLA,Cloud computing architecture,NIST Model, Cube Model	6	CO1
II	Virtualization	Hypervisors, Types of Hypervisors,Taxonomy of virtualization, Implementation Levels of Virtualization, Virtualization of CPU, Memory and I/O Devices, Virtualization Platforms	8	CO2
III	Cloud Computing Services	Exploring Cloud Computing Services: SPI Model: Software as a service, Platform as a service, and Infrastructure as a service.Anything as a service or Everything as a service (XaaS):Devops and containers in clouds	8	CO3

IV	AWS and Google Cloud	AWS cloud computing Platform, Elastic Compute Cloud(EC2): Compute Basics, Instance types, Life cycle of instances. Simple Storage Service (S3): Basics and Operations, Features, Amazon Glacier, Glacier vs S3.Amazon Virtual Private Cloud (Amazon VPC): Subnets, Route tables, Elastic IP Addresses (EIP), Elastic Network Interfaces (ENIs) & Security groups & ACL. Google Cloud Platform	5	CO4
V	Containers and Kubernete Engine	Pod and cluster autoscaling, Kubernetes applications,Architecting with Kubernetes Engine ,Kubernetes Scheduling II,Reliability & fault tolerance,Diagnosis via monitoring & tracing	6	CO5
VI	Cloud Security	Cloud Security Risks and Countermeasures, Data Protection in Cloud, Cloud Application Security, Cloud Identity and Access Management, Cloud Security as a Service, SAML, OAuth	6	CO6

5. Suggested Experiments

Lab Prerequisite: Computer Network, Operating System

Software Requirements: Windows, Linux, AWS, Docker, kubernetes

SUGGESTED LIST OF EXPERIMENTS :

SN	Module Name	Detailed Lab Description	Hrs
I	NIST Model	**Lab1:**Study of NIST model of cloud computing. **Lab2**:Understand different types of virtualizations, Host and bare metal hypervisors and implement horizontal scalability.	06
II	IAAS	**Lab3**:To create and access VM instances and demonstrate EC2 of AWS **Lab4**: To create and access S3 instances and demonstrate S3 of AWS **Lab5:** To design VPC using AWS/Azure	6
III	PAAS	**Lab6**: Objective: Deploy web applications on commercial cloud.	2
IV	Database as a services	**Lab7** :To create and access DynamoDB instances and demonstrate DynamoDB of AWS. **Lab 8**: To create and access RDS instances **Lab 9** : To create a NOSQL database using MonogoDB	4
V	Docker Containerization	**Lab10:** To study and Implement Containerization using Docker **Lab11:** To study and implement container orchestration using Kubernetes	4
VI	Cloud Security	**Lab 12:** To study and implement Identity and Access Management (IAM) practices on AWS/Azure cloud.	2

6. Theory Assessment:

A. **Internal Assessment (IA):** Two class tests of 40 marks each. The first class test is to be conducted when approx. 40% syllabus is completed and the second class test when an additional 35% syllabus is completed. Duration of each test shall be one hour.

B. **End Semester Theory Examination:** In question, paper weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.

1. Question paper will consist of 4 questions, each carrying 20 marks.
2. Question number 1 will be compulsory and based on maximum contents of the syllabus
3. Remaining questions will be mixed in nature (for example, if Q.2 has part (a) from module 3 then part (b) will be from other than module 3)
4. Total three questions need to be solved.

7**. Books and References:**

A.Text Books:

1. Barrie Sosinsky ,"Cloud Computing Bible",Wiley Publication.
2. Kailash Jayaswal, Jagannath Kallalurchi, Donald J. Houde, Dr. Deven Shah, "Cloud Computing Black Book", Dreamtech Press.
3. Joe Baron et.al ,"AWS certified solution Architect", Sybex publication.
4. Mastering Cloud Computing, Rajkumar Buyya, MGH publication.
5. Enterprise Cloud Computing by Gautam Shroff, Cambridge,2010
6. Cloud Security by Ronald Krutz and Russell Dean Vines, Wiley - India, 2010 ,
7. Getting Started with OwnCloud by Aditya Patawar , Packt Publishing Ltd, 2013

B.References:

1.Thomas Erl, Robert Cope, Amin Naserpour, "Cloud Computing Design Patterns", Pearson Publication.
2. Judith Hurwitz ,"Cloud Computing for Dummies" , Wiley Publication.
3. www.openstack.org
4. www.ulteo.org

Back to Scheme

Course Code	Course Name	Teaching Scheme	Contact Hours				Credits Assigned			
			TH	Pract	Tut	Total	TH	Pract	Tut	Total
IT 402	Data Science and Visualization		3	2	-	5	3	1	-	4
		Examination Scheme	Internal Assessment			End Sem Exam		Term Work	Pract	Oral	Total Marks
			IA1	IA2	Avg	TH	Hrs				
			40	40	40	60	2	25	-	25	150

1. Course Objectives: The course is aimed to:

1. To understand the foundations of the Data Science process, methods and techniques
2. To manage data and make prediction over the data
3. To understand the principles of text analytics
4. To visualize and understand the important part of data analysis.
5. To understand ethical responsibilities of data scientist and organization
6. To work on various application of data science

2. Course Outcomes: On successful completion of course learner/student will be able to:

1. Learn the fundamentals of data science to enable, reproduce and scalable data from a variety of sources.
2. Generate and process dataset and develop models for prediction.
3. Analyze text for common themes and trends.
4. Design visualizations and narrate stores based on data.
5. Develop a data science project ethically.
6. Analyze importance and impact of data science in varied applications using appropriate tools.

3. Detailed Theory Syllabus:

Prerequisite: DBMS, Python

SN	Module	Detailed Contents of Module	Hrs	COs
1	Introduction	Definition, working, defining goal, benefits and uses of Data Science, Data science vs BI, The data science process, Role of a Data Scientist.	5	CO1
2	Data Management and Predictive modeling	**Data management:** Understanding how to create the data set, Data collection methods, Data preparation - importance of data 'cleaning', validity and quality. Data analysis - how format and volume of data limits methods of analysis available **Predictive Modeling:** Probability and Statistics Basics, Common machine learning models, Feature engineering, Model selection, Performance metrics and hyperparameter optimization, Model Deployment	8	CO2
3	Text Analytics	Introduction to text Analytics, Need of Text Analytics, Understanding Text, Cleaning Text Data Sets, Text Classification, Text Clustering, Text mining techniques.	5	CO3
4	Data Visualization and communication	Identifying audience requirements, Data scientist as 'storyteller', Building a narrative, Explaining the technical - how to communicate the role played by ML and/or AI techniques resulting in an informed audience, Introduction to Data Visualization. Visualization Tools: Area Plots, Histograms,Bar Charts, Pie Charts, Box Plots, Scatter Plots, Waffle Charts, Word Clouds.	8	CO4

		Visualization: Geospatial Data, Time Series Data, Importance of data visualization, Dashboards.		
5	Ethics of data science	Responsibilities of actuaries around data science and AI, Data Science Ethics, Doing good data science, Owners of the data, Valuing different aspects of privacy, Getting informed consent, The Five Cs, Developing ethical and professional safeguards	5	CO5
6	Applications	Tools: Tableau, Qlikview, Microsoft Power BI, and D3; Applications: Healthcare, Banking, Finance, Sports, Advertisement, Transport, Tourism.	5	CO6

4. List of Suggested Practicals:

1. Write an R script, to create R objects for calculator application and save in a specified location in a disk.
2. Write an R script to find subset of dataset by using subset (), aggregate () functions on iris dataset.
3. Reading different types of data sets (.txt, .csv) from Web and disk and writing in file in specific disk location. Also reading Excel data sheets in R.
4. Find the correlation matrix. Plot the correlation plot on the dataset and visualize giving an overview of relationships among data on iris data.
5. Analysis of covariance using variance (ANOVA) based on the data with categorical variables on iris data.
6. Apply multiple regressions, if data have a continuous Independent variable. Apply on the given dataset.
7. Import data from web storage. Name the dataset and now do Logistic Regression to find out relation between variables on a given data. Apply regression Model techniques to predict the data on such a dataset.
8. Install relevant packages for classification. Choose a classifier for classification problems and evaluate the performance of the classifier.
9. Apply Clustering algorithms (unsupervised classification) and plot the cluster data using R visualizations.

5. Theory Assessment:

A. Internal Assessment (IA): Two class tests of 40 marks each. The first class test is to be conducted when approx. 40% syllabus is completed and the second class test when an additional 35% syllabus is completed. Duration of each test shall be one hour.

B. End Semester Theory Examination: In question, paper weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.

1. Question paper will consist of 3 questions, each carrying 20 marks.
2. Question number 1 will be compulsory and based on maximum contents of the syllabus
3. Remaining questions will be mixed in nature (for example, if Q.2 has part (a) from module 3 then part (b) will be from other than module 3)
4. Total three questions need to be solved.

6. Practical Assessment: An Practical / Oral exam will be held based on the above syllabus. The final certification and acceptance of TW ensures the satisfactory performance of laboratory work and minimum passing in the TW.

A. **Term Work:** Term Work shall consist of practicals based on the above list. Also Term work Journal must include at least 2 assignments based on the topics mentioned in the syllabus.

B. **Term Work Marks:** 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance)

Oral/Viva Assessment: An oral exam will be held based on the above syllabus.

7. Books and References:

1. Davy Cielen,Meysman,Mohamed Ali, “Introducing Data Science”, Dreamtech Press

2. Kevin P. Murphy, “Machine Learning a Probabilistic Perspective”, The MIT Press
3. Ethics and Data Science, D J Patil, Hilary Mason, Mike Loukides, O’ Reilly, 1st edition, 2018
4. Noel Cressie, Christopher K. Wikle , “Statistics for Spatio-Temporal Data, Wiley
5. Rachel Schutt and Cathy O’Neil, “Doing Data Science”, O’Reilly Media
6. Joel Grus, Data Science from Scratch: First Principles with Python, O'Reilly Media
7. EMC Education Services,”Data Science and Big Data Analytics”,Wiley

Back to Scheme

Course Code	Course Name	Teaching Scheme	Contact Hours				Credits Assigned			
			TH	Pract	Tut	Total	TH	Pract	Tut	Total
IT 403	Skill Lab I (DevOps)		-	2	-	1	-	1	-	1
		Examination Scheme	Internal Assessment			End Sem Exam		Term Work	Pract	Oral	Total Marks
			IA1	IA2	Avg	TH	Hrs				
			-	-	-	-	-	25	-	25	50

1. Lab Objectives:

1. To understand the fundamentals of DevOps engineering and be fully proficient with DevOps terminologies to meet business requirements
2. To obtain knowledge of Version Control Systems to effectively track changes with Git, GitHub
3. To understand automated testing techniques using Selenium
4. To understand concept of Containerization, deployment of applications and Container Orchestration using Docker Swarm
5. To synthesize Software Configuration Management and Provisioning using Ansible
6. To understand the importance of Jenkins as an Integration tool to build and deploy software applications on server environment

2. Lab Outcomes: Student will be able to:

1. To understand DevOps practices which aims to simplify Software Development Life Cycle
2. To use different Version Control tools like GIT, SVN, RCS, Mercurial, etc
3. To use Selenium to perform Continuous Testing
4. To use Docker as a Containerization and Container Orchestration tool
5. To perform Provisioning and Software Configuration Management using Ansible tool
6. To integrate tools like Jenkins with other build, test and deploy applications in DevOps environment

3. Prerequisite: Operating System, Linux Administration, Java /Web Application Programming, and Software Engineering. AWS Free tier account (Preferable)

4. Detailed Syllabus:

SN	Module	Detailed Content	Hrs	LOs
0	Prerequisite	Knowledge of Linux Operating system, installation and configuration of services and command line basics, Basics of Computer Networks and Software Development Life cycle	0	LO1
1	Continuous Development (Version Control Systems)	Types of version control systems. Git architecture. Create and fork repositories in GitHub. Apply branch, merge, rebase, cherry-pick concepts. Implement different Git workflow strategies in real-time scenarios. Recovering files, reverting commits, stashing commits. Understand Git operations in IDE such as AWS cloud9.	4	LO1, LO2
2	Continuous Testing	Selenium and how to automate your test cases for testing web elements. You will also get introduced to X-Path, TestNG and integrate Selenium with Jenkins and Maven.. Learning about	4	LO3

		creating Test Cases in Selenium WebDriver. Run Selenium Tests in Jenkins Using Maven.		
3	Continuous Deployment (Containerization)	Introduction to Docker Architecture and Container Life Cycle. Understanding images and containers. Create and Implement docker images using Dockerfile. Container Lifecycle and working with containers. To Build, deploy and manage web or software applications on Docker Engine. Publishing image on Docker Hub. Introduction to Docker Compose.	4	LO4
4	Continuous Deployment (Container Orchestration)	Defining and running multi-container Docker applications using Docker-Compose / Kubernetes. To Understand deploying, managing, and scaling containerized applications using Docker Swarm. Using Docker Swarm for container orchestration.	4	LO4
5	Continuous Operations (Software Configuration Management and Provisioning)	Defining and understanding Software Configuration Management (SCM) and Provisioning. Understand the differences between push based and pull based configuration systems. Use Ansible to Provision softwares and to maintain the software configuration. Add / delete / group different hosts. Manage software configurations / updates from the central master.	4	LO5
6	Continuous Integration	Continuous Integration using Jenkins by building and automating test cases using Maven / Gradle / Ant. Introduction to Jenkins (With Architecture) Introduction to Maven / Gradle / Ant. Jenkins Management Adding a slave node to Jenkins Build the pipeline of jobs by integrating Jenkins with other tools. Create a pipeline script to deploy an application over the tomcat server	4	LO6

5. Practical Assessment: An Oral exam will be held based on the above syllabus. The final certification and acceptance of TW ensures the satisfactory performance of laboratory work and minimum passing in the TW.

A. **Term Work:** Term Work shall consist of 10 experiments based on the above list. Also Term work Journal must include at least 2 assignments based on the topics mentioned in the syllabus. Term work marks distribution: 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance)
B. **Oral/Viva Assessment:** An Oral exam will be held based on the above syllabus.

Text Books:

1. Scott Chacon and Ben Straub, "Pro Git", Apress Publications.
2. Unmesh Gundecha, "Selenium Testing Tools Cookbook", Packt Publishing.
3. Nigel Poulton, "Docker Deep Dive".
4. Jeff Geerling, "Ansible for DevOps", Midwestern Mac publishing.
5. John Ferguson, "Jenkins: The Definitive Guide", O'Reilly Media.

References:

1. Gene Kim, Kevin Behr, and George Spafford, "The Phoenix Project: A Novel About IT, DevOps, and Helping Your Business Win", IT Revolution Press.
2. Gene Kim, Jez Humble, Patrick Debois, and John Willis, "DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations", IT Revolution Press.

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Department Level Optional Course (DLOC)

DLOC - IV and DLOC - V

Sem-VII Specialization	1. AI and Robotics	2. IoT and Data Analytics	3. Information Security and Forensics	4. Bioinformatics
DLOC IV	IT 441	IT 442	IT 443	IT 444
	Natural Language Processing	Industrial IOT	Digital Forensics	Structural Bioinformatics
DLOC V	IT 451	IT 452	IT 453	IT 454
	Computer Vision	Information Retrieval	Multimedia Forensics	Systems Biology

Course Code	Course Name	Teaching Scheme	Contact Hours				Credits Assigned			
			TH	Pract	Tut	Total	TH	Pract	Tut	Total
IT 441	Natural Language Processing		3	2	-	5	3	1	-	4
		Examination Scheme	Internal Assessment			End Sem Exam		Term Work	Pract	Oral	Total Marks
			IA1	IA2	Avg	TH	Hrs				
			40	40	40	60	2	25	-	25	150

1. Course Objectives: The course / instructor aims

1. To give the fundamentals of natural language processing (NLP) and to learn how to apply basic algorithms in this field.
2. To explain the basic text processing techniques and significance of morphology.
3. To describe the basic concepts and algorithmic description of the main language levels: syntax, semantics.
4. To elaborate language models generation and applications.
5. To give the significance of pragmatics and discourse for natural language understanding.
6. To Provide the design and implement applications based on NLP.

2. Course Outcomes: On successful completion of course learner/student will be able to:

1. Identify and list the applications in the field of NLP.
2. Apply text processing techniques and analysis of morphology of text
3. Model the linguistic phenomena with formal grammars and design semantic structure
4. Create language model and apply it for NLP applications
5. Understand the mathematical and linguistic foundations underlying approaches to analyze pragmatic and resolve coreference
6. Apply NLP techniques to design real world NLP applications such as machine translation, text categorization, text summarization, and information extraction.

3. Detailed Theory Syllabus:

Prerequisite: Data structure & Algorithms, Theory of computer science, Probability Theory.

Module No	Module	Detailed Contents of Module	Hrs.
1	Introduction	Introduction, Need of NLP, Goals of NLP, History of NLP , Generic NLP system, Knowledge of Language, Ambiguity in Natural language, Stages in NLP, Challenges of NLP, Applications of NLP	3
2	Morphology analysis and Language modeling	Tokenization, Morphology analysis, Survey of English Morphology, Inflectional morphology & Derivational morphology, Stemming, Lemmatization, Regular expression. Morphological Models: Dictionary lookup, Finite state Morphological parsing, Finite State Transducer, Applications of Morphology. N-grams and its variation: Bigram, Trigram, Language model, N-grams Language model, N-grams Challenges, N-gram for spelling correction.	8
3	Syntax analysis	Part-Of-Speech tagging (POS), Tag set for English (Penn Treebank), Challenges in POS tagging, Rule based POS tagging, Stochastic POS tagging, Transformation-based Tagging, HMM Viterbi for POS tagging; Issues in HMM POS tagging. Parsers: Parsing With Context Free Grammar, Constituency Parsing, Top down parser; Bottom Up Parser. Problems areas of Context Free Grammars: Agreement, Subcategorization, Movement, Challenges of Parsing Natural Language, Sequence labeling, Methods of Sequence	8

		Labeling: HMM, Maximum Entropy, Conditional Random Field (CRF), Applications of Syntax analysis.	
4	Semantic Analysis	Lexical Semantics, Compositional semantics, Semantic analysis vs. other areas of natural language processing, Approaches to semantic analysis: Predicate logic, Statistical approach, Information Retrieval, Domain knowledge driven analysis, Applications of semantic analysis, Challenges in semantic analysis, Attachment for fragment of English sentences, Representing Meaning, Lexeme and Lexicon, Relations among lexemes & their senses –Homonymy, Polysemy, Synonymy, Hyponymy, WordNet, WordNet Relations, WordNet Application, Word Sense Disambiguation (WSD), Approaches and Methods to Word Sense Disambiguation (WSD), Challenges in WSD.	6
5	Discourse Context and World Knowledge	Pragmatic analysis: Five aspects of pragmatics Discourse - reference resolution: Reference Phenomena, Syntactic and Semantic Constraints on Coreference, Preferences in Pronoun Interpretation, An Algorithm for Pronoun Resolution. Coreference Resolution- Coreference, Distinctions in Coreference, Coreference Resolution, Hobbs Algorithm, Why Coreference Resolution is Hard, Coreference vs. Anaphora, Application.	6
6	Applications of NLP	Machine Translation, Information Retrieval, Question Answers System, Text Categorization, Summarization, Sentiment analysis, Named Entity Recognition, Plagiarism Detection.	8

4. Suggested Experiments:

- **A.** Write a program to implement tokenization, filtration and script validation, stop words, stemming, part of speech tagging, named entity recognition, lemmatization, corpora, wordnet and morphology.
- **B.** Write a program to generate a parse tree from text and extract nouns and verb phrases of text.
- **C.** Natural Language Processing case study for News classification.

5. Theory Assessment:

- **A. Internal Assessment (IA):** Two class tests of 40 marks each. The first class test is to be conducted when approx. 40% syllabus is completed and the second class test when an additional 35% syllabus is completed. Duration of each test shall be one and a half hours.
- **B. End Semester Theory Examination:** In question, paper weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.
  1. Question paper will consist of 3 questions, each carrying 20 marks.
  2. Question number 1 will be compulsory and based on maximum contents of the syllabus
  3. Remaining questions will be mixed in nature (for example, if Q.2 has part (a) from module 3 then part (b) will be from other than module 3)
  4. Total three questions need to be solved.

6. Practical Assessment: An Practical / Oral exam will be held based on the above syllabus. The final certification and acceptance of TW ensures the satisfactory performance of laboratory work and minimum passing in the TW.

- **A. Term Work:** Term Work shall consist of practicals based on the above list. Also Term work Journal must include at least 2 assignments based on the topics mentioned in the syllabus.
- **B. Term Work Marks:** 25 Marks (Total marks) = 10 Marks (Mini Project) + 5 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance)

7. Books and References:

A. Books:

1. Sharvari Govilkar, Sagar Kulkarni, Dhiraj Amin — Natural Language Processing, 2018, StartEDU solutions.
2. Daniel Jurafsky, James H. Martin ―Speech and Language Processing‖ Second Edition, Prentice Hall, 2008.
3. Christopher D.Manning and Hinrich Schutze, — Foundations of Statistical Natural Language Processing —, MIT Press, 1999.

B. References:

1. Siddiqui and Tiwary U.S., Natural Language Processing and Information Retrieval, Oxford University Press (2008).
2. Daniel M Bikel and ImedZitouni — Multilingual natural language processing applications Pearson, 2013.
3. Alexander Clark (Editor), Chris Fox (Editor), Shalom Lappin (Editor) — The Handbook of Computational Linguistics and Natural Language Processing
4. Steven Bird, Ewan Klein, Natural Language Processing with Python, O‘Reilly
5. Brian Neil Levine, An Introduction to R Programming
6. Niel J le Roux, Sugnet Lubbe, A step by step tutorial: An introduction into R application and programming.

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Course Code	Course Name	Teaching Scheme	Contact Hours				Credits Assigned			
			TH	Pract	Tut	Total	TH	Pract	Tut	Total
IT 442	Industrial IoT		3	2	-	5	3	1	-	4
		Examination Scheme	Internal Assessment			End Sem Exam		Term Work	Pract	Oral	Total Marks
			IA1	IA2	Avg	TH	Hrs				
			40	40	40	60	2	25	-	25	150

1. **Prerequisite:** Fundamentals of IoT and IoE.

2. Course Objectives: The course / instructor aims to

1. Define fundamentals of IIoT and its application.
2. Describe how reference architecture of IIoT is build
3. Explain features and types of middleware transport protocol.
4. Give insight into the technical innovation in the Industrial internet.
5. Show how software design concepts are implemented in IIoT
6. Describe the building blocks of IIoT utilized in smart manufacturer and smart factory.

3. Course Outcomes: On successful completion of this course, learner/ student will be able to:

1. Understand fundamentals concepts of IIoT and its application..
2. Know how to design the architecture of IIoT.
3. Apply middleware transport protocol for IIoT case study.
4. Apply innovative industrial internet technology to build IIoT applications.
5. Apply software design concepts to build applications for IIoT.
6. Understand working of IIoT based on smart factory and smart manufacture.

4. Detailed Theory Syllabus

SN	Module	Detailed Content	Hrs	COs
I	Introduction	Innovation and IIoT – Intelligent Devices – Industrial Internet – Health care –Oil and Gas Industry – Smart Office – Logistics – IoT Innovations in Retail	05	CO1
II	IIoT Reference Architecture	Industrial Internet Architecture Framework – Functional Viewpoint – Operational Domain, Information Domain, Application Domain, Business Domain – Implementation View point – Architectural Topology – Three Tier Topology – Data Management**.**	07	CO2
III	Middleware Transport Protocol	TCP/IP, UDP, RTP, CoAP –Middleware Software patterns –Software Design patterns – Application Programming Interface (API) – CAN Protocol-Web Services – Middleware IIoT – Securing the IIoT- Identity Access Management.	07	CO3
IV	Technical innovators in Industrial Internet	Miniaturization – Cyber Physical Systems – Wireless technology – IP Mobility – Network Functionality Virtualization – Cloud and Fog - Big Data and Analytics – M2M Learning and Artificial Intelligence.	07	CO4
V	Software Design Concepts	Technical perspective of API , API Analogy, Web Services, SOAP Vs REST services, Microservices	05	CO5
VI	Industry 4.0	Characteristics of Industry 4.0, Value chain, Design Principle, Building blocks, Smart manufacture, Smart Factory and real time world factories	07	CO6

5. DETAILED PRACTICAL SYLLABUS:

Lab Prerequisite: Knowledge of IoT hardware Machine learning algorithms, Python Programming Arduino IDE, Firebase database

Suggested List of Experiments:

Industrial IoT Lab consists of various use case-based products which make the complete end to end solutions from the End node to the application server to do product prototype in the respective field using following packages.

1. Case study on Agriculture Sensor Kit based on LoRaWAN
2. Case study on Water Management Sensor Kit based on LoRaWAN
3. Case study on Temperature & Humidity sensor Kit based on LoRaWAN
4. Case study on GPS Tracker based on LoRaWAN
5. Case study on Energy Meter based on LoRaWAN

6. Theory Assessments:

1. **Internal Assessment:** Two Internal assessments will be conducted for 40 marks each with average marks of both assessments as final score.
2. **End Sem Theory Examination:**
   - Question paper will consist of 5 questions, each carrying 20 marks.
   - Total 3 questions need to be solved.
   - Q.1 will be compulsory, based on the entire syllabus.
   - Remaining questions will be randomly selected from all the modules.
   - Weightage of marks should be proportional to the number of hours assigned to each **module.**

7. Practical Assessments:

1. **Termwork Assessment:** Term Work shall consist of at least 10 to 12 practical's based on the above list. Also Term work Journal must include at least 2 assignments. Term Work Marks: 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance).
2. **Oral/Viva Assessment:** An oral exam will be held based on the above syllabus.

8. **Text Books:**
    1. S. Misra, C. Roy, and A. Mukherjee, Introduction to Industrial Internet of Things and Industry 4.0. CRC Press.2020
    2. Dr. Guillaume Girardin , Antoine Bonnabel, Dr. Eric Mounier, 'Technologies Sensors for the Internet of Things Businesses & Market Trends 2014 -2024',Yole Development Copyrights ,2014.
    3. Industry 4.0: The Industrial Internet of Things Alasdair Gilchrist Publications: Apress
    4. S. Misra, A. Mukherjee, and A. Roy, Introduction to IoT. Cambridge University Press, 2020
    5. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015

9. References:
    1. Guillaume Girardin , Antoine Bonnabel, Dr. Eric Mounier, 'Technologies Sensors for the Internet of Things Businesses & Market Trends 2014 -2024', Yole Development Copyrights, 2014
    2. Bartodziej, Christoph Jan, The Concept Industry 4.0 An Empirical Analysis of Technologies and Applications in Production Logistics, Springer: Publication in the field of economic science.
    3. OvidiuVermesan and Peter Friess, "Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems", River Publishers

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Course Code	Course Name	Teaching Scheme	Contact Hours				Credits Assigned			
			TH	Pract	Tut	Total	TH	Pract	Tut	Total
IT 443	Digital Forensics		3	2	-	5	3	1	-	4
		Examination Scheme	Internal Assessment			End Sem Exam		Term Work	Pract	Oral	Total Marks
			IA1	IA2	Avg	TH	Hrs				
			40	40	40	60	2	25	-	25	150

1. **Prerequisite:** Computer Network, Cryptography and Security

2. Course Objectives: The course / instructor aims to

1. To discuss the need and process of digital forensics and Incident Response Methodology.
2. To explore the procedures for identification, preservation, and acquisition of digital evidence.
3. To explore techniques and tools used for analyzing Hard Disk ., RAM Forensics and Malware Analysis
4. To explore techniques and tools used in digital forensics for Operating systems and malware investigation .
5. To explore Mobile Forensics, SIM Card Forensics and GPS Forensics.
6. To explore techniques and tools used for Browser browser, email forensics and Generating the Report.

3. Course Outcomes: On successful completion of this course, learner/ student will be able to:

1. Discuss the phases of Digital Forensics and methodology to handle the computer security incident.
2. Describe the process of collection, analysis and recovery of the digital evidence.
3. Explore various tools to analyze malwares and acquired images of RAM/hard drive.
4. Acquire Evidences from Operating System and Malware Analysis.
5. Acquire adequate perspectives of digital forensic investigation in mobile devices
6. Analyze the source and content authentication of emails and browsers and Produce unambiguous investigation reports which offer valid conclusions.

4. Detailed Theory Syllabus

SN	Module Name	Detailed Content	Hrs	COs
1	Introduction to Digital Forensics	1.1 Digital Forensics Definition, Digital Forensics Goals, Digital Forensics Categories - Computer Forensics, Mobile Forensics, Network Forensics, Database Forensics. 1.2 **Introduction to Incident**: Computer Security Incident, Goals of Incident Response, CSIRT, Incident Response Methodology, Phase after detection of an incident.	4	CO1
2	Digital Evidence, Examination and Acquisition	2.1 Digital evidence, Types of Digital Evidence, Challenges in acquiring Digital evidence, Admissibility of evidence, Challenges in evidence handling, Chain of Custody. 2.2 **Digital Forensics Examination Process**: Seizure, Acquisition, Analysis, Reporting. Necessity of forensic duplication, Forensic image formats, Forensic duplication techniques. 2.3 **Acquiring Digital Evidence**: Forensic Image File Format, Acquiring Volatile Memory (Live Acquisition), Acquiring Nonvolatile Memory (Static Acquisition), Hard Drive Imaging Risks and Challenges, Network Acquisition.	7	CO2
3	Forensics Investigation	3.1 Analyzing Hard Drive Forensic Images, Analyzing RAM Forensic Image, Investigating Routers. 3.2 **Malware Analysis**: Malware, Viruses, Worms, Essential skills and tools for Malware Analysis, List of Malware Analysis Tools and Techniques.	8	CO3
4	Forensics Investigation	4.1 **Investigating Windows Systems**: File Recovery, Windows Recycle Bin Forensics, Data Carving, Windows Registry Analysis, USB Device Forensics, File Format Identification, Windows Features Forensics Analysis, Windows 10 Forensics, Cortana Forensics. 4.2 **Investigating Unix Systems**: Reviewing Pertinent Logs, Performing Keyword Searches, Reviewing Relevant Files, Identifying Unauthorized User Accounts or Groups, Identifying Rogue Processes, Checking for Unauthorized Access Points, Analyzing Trust Relationships.	8	CO4
5	Mobile Forensics	5.1 Android Forensics, Mobile Device Forensic Investigation - Storage location, Acquisition methods, Data Analysis. 5.2 **GPS forensics**: GPS Evidentiary data, GPS Exchange Format (GPX), GPX Files, Extraction of Waypoints and TrackPoints, Display the Tracks on a Map. 5.3 **SIM Cards Forensics**: The Subscriber Identification Module (SIM), SIM Architecture, Security, Evidence Extraction.	7	CO5
6	Forensic Investigation Reporting	6.1 Image classification, Image Captioning, Image generation, Text summarization, Video to Text using LSTM. 6.2 Investigative Report Template, Layout of an Investigative Report,Guidelines for Writing a Report.	5	CO6

5. DETAILED PRACTICAL SYLLABUS:

Lab Prerequisite: Knowledge of Machine learning algorithms beneficial, Python Programming.

Suggested List of Experiments:

1. Analysis of forensic images using open source tools: FTK Imager, Autopsy.
2. Explore forensics tools in kali linux for acquiring, analyzing and duplicating data.
3. Performing penetration testing using Metasploit - kali Linux.
4. Performing RAM Forensic to analyze memory images to find traces of an attack: (i) Capturing RAM Using the DumpIt Tool; (ii) Volatility tool.

5. Network forensics using Network Miner.
6. Windows Recycle Bin Forensics.
7. Data Carving using open source tools: Foremost, Scalpel, Jpegcarver
8. USB Device Forensics using USBDeview, USB Detective.
9. Web Browser Forensics using DB Browser for SQLite
10. Generate a Timeline Report Using Autopsy
11. Email Analysis
12. Case Study

6. Theory Assessments:

1. **Internal Assessment:** Two Internal assessments will be conducted for 40 marks each with average marks of both assessments as final score.
2. **End Sem Theory Examination:**
   - Question paper will consist of 5 questions, each carrying 20 marks.
   - Total 3 questions need to be solved.
   - Q.1 will be compulsory, based on the entire syllabus.
   - Remaining questions will be randomly selected from all the modules.
   - Weightage of marks should be proportional to the number of hours assigned to each **module.**

7. Practical Assessments:

1. **Termwork Assessment:** Term Work shall consist of at least 10 to 12 practical's based on the above list. Also Term work Journal must include at least 2 assignments. Term Work Marks: 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance).
2. **Oral/Viva Assessment:** An oral exam will be held based on the above syllabus.

8. Text Books:

1. Kevin Mandia, Chris Prosise, ―Incident Response and computer forensics‖, Tata McGrawHill, 2006.
2. Digital Forensics Basics - A Practical Guide Using Windows OS — Nihad A. Hassan, APress, 2019.
3. Xiaodong Lin, ―Introductory Computer Forensics: A Hands-on Practical Approach‖, Springer 2018.

9. References:

Suggested MOOC Course Links

1. Ethical Hacking: https://nptel.ac.in/courses/106/105/106105217/
2. Digital Forensics: https://onlinecourses.swayam2.ac.in/cec20_lb06/preview
3. Cyber Incident Response: https://www.coursera.org/learn/incident-response
4. Penetration Testing, Incident Responses and Forensics: https://www.coursera.org/learn/ibm-penetration-testing-incident-response-forensics

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Course Code	Course Name	Teaching Scheme	Contact Hours				Credits Assigned			
			TH	Pract	Tut	Total	TH	Pract	Tut	Total
IT 451	Computer Vision		3	2	-	5	3	1	-	4
		Examination Scheme	Internal Assessment			End Sem Exam		Term Work	Pract	Oral	Total Marks
			IA1	IA2	Avg	TH	Hrs				
			40	40	40	60	2	25	-	25	150

1. Course Objectives:

The course is aimed to:

1. To introduce fundamentals of computer vision and its relationship with Artificial Intelligence.
2. To learn the process of image formation, transformation and geometric primitives using a digital camera.
3. To learn various algorithms in computer vision.
4. To study various algorithms for Image Descriptors and Features.
5. To explore pattern recognition and classification techniques using ANN and CNN.
6. To know computer vision applications such as motion estimation, segmentation and object recognition.

2. Course Outcomes:

On successful completion of course learner/student will be able to:

1. To describe fundamentals of Computer Vision and distinguish between Image Processing and Computer Vision and also explain its relationship with other domains like AI,ML etc.
2. To describe the process of image formation and storage using digital devices.
3. To remember and apply image pre-processing techniques required for computer vision.
4. To extract colour, texture and shape features from images to describe and perform analysis.
5. To implement classification techniques to identify and recognize objects.
6. To identify and apply computer vision techniques in real life situations.

3. Detailed Theory Syllabus:

Prerequisite: Programming and Mathematic course

SN	Module	Detailed Contents of Module	Hrs	COs
0	Prerequisite	Basic coordinate geometry, matrix algebra, linear algebra	2	
I	Computer Vision Fundamentals	What is Computer Vision (CV), Challenge of CV, Tasks in CV, Difference between Image Processing and CV, Relationship of Artificial Intelligence and CV.	3	CO1
II	Image Formation	Transformations: Camera, Sampling and aliasing, Geometric primitives. 2D and 3D transformation, 3D rotations, 3D to 2D projections, Lens distortions. Photometric image formation: Lighting, Reflectance and shading, Optics.	6	CO2
III	Image Preprocessing	Image Enhancement: Point Processing, Mask Processing, Spatial and Frequency Domain Filtering. Image Transforms: Haar, Curvelet, Ridgelet, ,Shearlet,Contourlet Transform Image Morphology: Dilation, Erosion, Opening and Closing. Morphological operations:Binary Morphological	8	CO3

		operations,Application,Grayscale Morphological operations,Distance Transformation		
IV	Image Feature Representation	Image Features: Color, Texture, Shape. Histogram of Oriented Gradients, Scale Invariant Feature Transform. Image Representation and Description: Chain Code, Shape Number, Fourier Descriptors, Image Moments. Texture Descriptors:Texture representation methods,Gabor filter,MPEG-7 homogeneous texture descriptor Edge Detection: Gradient-based methods,Laplacian of Gaussian operator,Difference of Gaussian Operator,Canny Edge Detector,Hough Transform for detection of lines and shape.	8	CO4
V	Pattern Recognition and Classification	Introduction to Pattern Recognition: Linear Regression, Decision Functions, Statistical Decision Theory, Gaussian Classifier, Parameter Estimation, Dimension Reduction, Template Matching. Image Classification: Artificial Neural Network (ANN), Convolutional Neural Networks (CNNs), Autoencoder.	8	CO5
VI	Applications of Computer Vision	Motion Estimation and Object Tracking, Gesture Recognition, Face and Facial Expression Recognition, Image Fusion, Medical Image Segmentation.	4	CO6
	Motion Estimation	Regularization theory , Optical computation , Stereo Vision , Motion estimation , Structure from motion		

4. Suggested Experiments:

Software Requirements if any: Python.

1. Install OpenCV for Python on Windows & Manipulate with the images Images.
2. Image Processing:
    a. Image Processing:OpenCV Resize Image ,OpenCV Image Rotation
    b. OpenCV Drawing Functions,Eroding an Image,Blurring an Image,Create Border around Images, Grayscaling of Images,Scaling, Rotating, Erosion and Dilation of images
    c. Convert an image from one color space to another ,Filter Color with OpenCV Denoising of colored images,Visualizing image in different color spaces

3.Feature Detection:

    a. OpenCV Blob Detection,Canny Edge Detection
    b. OpenCV Image Smoothing
    c. Shifting and Edge Detection
    d. Line detection using Hough Line method
    e. Circle Detection
    f. Detect corner of an image

4.Histogram:

    a. Analyze an image using Histogram,Histograms Equalization, Simple Thresholding Adaptive Thresholding
    b. OpenCV Image Threshold OpenCV Contours,OpenCV Mouse Event

5.Pattern Recognition and Classification

    a. OpenCV Video Capture
    b. Face Detection with OpenCV
    c. Car detection with OpenCV

5. Theory Assessment:

A. Internal Assessment (IA): Two class tests of 40 marks each. The first class test is to be conducted when approx. 40% syllabus is completed and the second class test when an additional 35% syllabus is completed. Duration of each test shall be one hour.

B. End Semester Theory Examination: In question, paper weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.

1. Question paper will consist of 3 questions, each carrying 20 marks.
2. Question number 1 will be compulsory and based on maximum contents of the syllabus
3. Remaining questions will be mixed in nature (for example, if Q.2 has part (a) from module 3 then part (b) will be from other than module 3)
4. Total three questions need to be solved.

6. Practical Assessment: An Practical / Oral exam will be held based on the above syllabus. The final certification and acceptance of TW ensures the satisfactory performance of laboratory work and minimum passing in the TW.

A. **Term Work:** Term Work shall consist of practicals based on the above list. Also Term work Journal must include at least 2 assignments based on the topics mentioned in the syllabus.

B. **Term Work Marks:** 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance)

7. Books and References:

A. Text Books:

1. Bhuyan, Manas Kamal. Computer vision and image processing: Fundamentals and applications. CRC Press, 2019.
2. Computer Vision - A modern approach, by D. Forsyth and J. Ponce, Prentice Hall Robot Vision, by B. K. P. Horn, McGraw-Hill.
3. Richard Szeliski, Computer Vision: Algorithms and Applications (CVAA). Springer, 2010

B. References:

1. Milan Sonka,Vaclav Hlavac, Roger Boyle, "Image Processing, Analysis, and Machine Vision" Thomson Learning
2. E. R. Davies, Computer & Machine Vision, Fourth Edition, Academic Press, 2012
3. Simon J. D. Prince, Computer Vision: Models, Learning, and Inference, Cambridge University Press, 2012
4. Mark Nixon and Alberto S. Aquado, Feature Extraction & Image Processing for Computer Vision, Third Edition, Academic Press, 2012.

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Course Code	Course Name	Teaching Scheme	Contact Hours				Credits Assigned			
			TH	Pract	Tut	Total	TH	Pract	Tut	Total
IT 452	Information Retrieval		3	2	-	5	3	1	-	4
		Examination Scheme	Internal Assessment			End Sem Exam		Term Work	Pract	Oral	Total Marks
			IA1	IA2	Avg	TH	Hrs				
			40	40	40	60	2	25	-	25	150

1. Course Objectives: The course is aimed to:

1. To learn the important concepts and algorithms in IRS
2. To understand the data/file structures that are necessary to design, and implement information retrieval (IR) systems.
3. To understand different models for information retrieval systems.
4. To understand and analyse different types of search algorithms for retrieval.
5. To understand indexing and clustering algorithms.
6. To understand information retrieval from multimedia.

2. Course Outcomes: On successful completion of course learner/student will be able to:

1. Ability to apply IR principles to locate relevant information large collections of data
2. Ability to design different document clustering algorithms
3. Ability to Implement retrieval systems for web search tasks.
4. Ability to Design an Information Retrieval System for web search tasks.
5. Ability to apply appropriate algorithms to retrieve relevant information from documents, images and videos.
6. Ability to implement indexing and searching algorithms.

3. Detailed Theory Syllabus:

Prerequisite: Data Structures

Module	Module	Detailed Contents of Module	Hrs.	COs
1	Introduction to IR	Definition of Information Retrieval System - Objectives of Information Retrieval Systems - Functional Overview - Relationship to Database Management Systems - Digital Libraries and Data Warehouses , Information versus Data Retrieval, A Taxonomy of Information Retrieval Models. The Retrieval Process- Ad Hoc and Filtering. Classic Information Retrieval :Basic Concepts, Boolean Model ,Vector Model, Probabilistic Model, Brief Comparison of Classic Models ,Alternative Set Theoretic Models :Fuzzy Set Model, Extended Boolean Model, Alternative Algebraic Models :Generalized Vector Space Model ,Latent Semantic Indexing Model	08	CO1
2	Functions and Indexing	Search Capabilities - Browse Capabilities - Miscellaneous Capabilities - Indexing Process –Automatic Indexing-Statistical Indexing – Natural Language – Concept Indexing - Hypertext Linkages-Information Extraction	08	CO2

3	Data Structure in IR	Stemming Algorithms - Inverted File Structure - N-Gram Data Structures - PAT Data Structure - Signature File Structure - Hypertext and XML Data Structures - Hidden Markov Models	06	CO2
4	Document and Term Clustering	Introduction to Clustering - Thesaurus Generation - Item Clustering - Hierarchy of Clusters	04	CO2
5	Search Techniques in IR	Search Statements and Binding - Similarity Measures and Ranking - Relevance Feedback - Selective Dissemination of Information Search - Weighted Searches of Boolean Systems - Searching the INTERNET and Hypertext – Introduction to Text Search Techniques - Software Text Search Algorithms	08	CO3, CO4, CO6
6	Visualization and Multimedia	Introduction to Information Visualization - Cognition and Perception - Information Visualization Technologies .Spoken Language Audio Retrieval –Non-Speech Audio Retrieval - Graph Retrieval - Imagery Retrieval - Video Retrieval	06	CO5

4. Suggested Experiments: Software Requirements if any: Python / Java / Hadoop.

Suggested List of Experiments :

1. Study of different Retrieval Models
2. Implement Page Rank Algorithm.
3. Implement Dynamic programming algorithm for computing the edit distance between strings s1 and s2. (Hint. Levenshtein Distance)
4. Write a program to Compute Similarity between two text documents.
5. Write a map-reduce program to count the number of occurrences of each alphabetic character in the given dataset. The count for each letter should be case-insensitive (i.e., include both upper-case and lower-case versions of the letter; Ignore non-alphabetic characters).
6. Implement a basic IR system using Lucene.
7. Write a program for Pre-processing of a Text Document: stop word removal.
8. Write a program to implement a simple web crawler.
9. Write a program to parse XML text, generate Web graphs and compute topic specific page rank.
10. CaseStudy on a text processing tool AntConc:Concordance Tool,Concordance Plot Tool,File View Tool,Clusters/N-Grams Tool,Collocates Tool,Word List Tool,Keyword List

5. Theory Assessment:

A. **Internal Assessment (IA):** Two class tests of 40 marks each. The first class test is to be conducted when approx. 40% syllabus is completed and the second class test when an additional 35% syllabus is completed. Duration of each test shall be one hour.

B. **End Semester Theory Examination:** In question, paper weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.

1. Question paper will consist of 3 questions, each carrying 20 marks.
2. Question number 1 will be compulsory and based on maximum contents of the syllabus
3. Remaining questions will be mixed in nature (for example, if Q.2 has part (a) from module 3 then part (b) will be from other than module 3)
4. Total three questions need to be solved.

6. Practical Assessment: An Practical / Oral exam will be held based on the above syllabus. The final certification and acceptance of TW ensures the satisfactory performance of laboratory work and minimum passing in the TW.

1. **Term Work:** Term Work shall consist of practicals based on the above list. Also Term work Journal must include at least 2 assignments based on the topics mentioned in the syllabus.
2. **Term Work Marks:** 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance)

7. Books and References:

A. Books:

1. Information Storage and Retrieval Systems – Theory and Implementation, Second Edition, Gerald J. Kowalski, Mark T. Maybury, Springer
2. Introduction to Information Retrieval By Christopher D. Manning, Prabhakar Raghavan, Hinrich Schütze
3. Information Retrieval : Implementing and Evaluating Search Engines By Stefan Büttcher, Charles L. A. Clarke, Gordon V. Cormack

B. References:

1. Frakes, W.B., Ricardo Baeza-Yates: Information Retrieval Data Structures and Algorithms, Prentice Hall, 1992
2. Information Storage & Retrieval By Robert Korfhage – John Wiley & Sons
3. Modern Information Retrieval By Yates and Neto Pearson Education

Back to Scheme

Course Code	Course Name	Teaching Scheme	Contact Hours				Credits Assigned			
			TH	Pract	Tut	Total	TH	Pract	Tut	Total
IT 453	Multimedia Forensics		3	2	-	5	3	1	-	4
		Examination Scheme	Internal Assessment			End Sem Exam		Term Work	Pract	Oral	Total Marks
			IA1	IA2	Avg	TH	Hrs				
			40	40	40	60	2	25	-	25	150

1. **Prerequisite:** Computer Network, Cryptography and Security

2. Course Objectives: The course / instructor aims to

1. To discuss the need and process of digital forensics and Incident Response Methodology.
2. To explore the procedures for identification, preservation, and acquisition of digital evidence.
3. To explore techniques and tools used for analyzing Hard Disk ., RAM Forensics and Malware Analysis
4. To explore techniques and tools used in digital forensics for Operating systems and malware investigation .
5. To explore Mobile Forensics, SIM Card Forensics and GPS Forensics.
6. To explore techniques and tools used for Browser browser, email forensics and Generating the Report.

3. Course Outcomes: On successful completion of this course, learner/ student will be able to:

1. Discuss the phases of Digital Forensics and methodology to handle the computer security incident.
2. Describe the process of collection, analysis and recovery of the digital evidence.
3. Explore various tools to analyze malwares and acquired images of RAM/hard drive.
4. Acquire Evidences from Operating System and Malware Analysis.
5. Acquire adequate perspectives of digital forensic investigation in mobile devices
6. Analyze the source and content authentication of emails and browsers and Produce unambiguous investigation reports which offer valid conclusions. .

4. Detailed Theory Syllabus

SN	Module Name	Detailed Content	Hrs	COs

1	Introduction to Digital Forensics	1.1 Digital Forensics Definition, Digital Forensics Goals, Digital Forensics Categories - Computer Forensics, Mobile Forensics, Network Forensics, Database Forensics. 1.2 **Introduction to Incident**: Computer Security Incident, Goals of Incident Response, CSIRT, Incident Response Methodology, Phase after detection of an incident.	6	CO1
2	Digital Evidence, Examination and Acquisition	2.1 Digital evidence, Types of Digital Evidence, Challenges in acquiring Digital evidence, Admissibility of evidence, Challenges in evidence handling, Chain of Custody. 2.2 **Digital Forensics Examination Process**: Seizure, Acquisition, Analysis, Reporting. Necessity of forensic duplication, Forensic image formats, Forensic duplication techniques. 2.3 **Acquiring Digital Evidence**: Forensic Image File Format, Acquiring Volatile Memory (Live Acquisition), Acquiring Nonvolatile Memory (Static Acquisition), Hard Drive Imaging Risks and Challenges, Network Acquisition.	9	CO2
3	Forensics Investigation	3.1 Analyzing Hard Drive Forensic Images, Analyzing RAM Forensic Image, Investigating Routers. 3.2 **Malware Analysis**: Malware, Viruses, Worms, Essential skills and tools for Malware Analysis, List of Malware Analysis Tools and Techniques.	4	CO3
4	Forensics Investigation	4.1 **Investigating Windows Systems**: File Recovery, Windows Recycle Bin Forensics, Data Carving, Windows Registry Analysis, USB Device Forensics, File Format Identification, Windows Features Forensics Analysis, Windows 10 Forensics, Cortana Forensics. 4.2 **Investigating Unix Systems**: Reviewing Pertinent Logs, Performing Keyword Searches, Reviewing Relevant Files, Identifying Unauthorized User Accounts or Groups, Identifying Rogue Processes, Checking for Unauthorized Access Points, Analyzing Trust Relationships.	8	CO4
5	Mobile Forensics	5.1 Android Forensics, Mobile Device Forensic Investigation - Storage location, Acquisition methods, Data Analysis. 5.2 **GPS forensics**: GPS Evidentiary data, GPS Exchange Format (GPX), GPX Files, Extraction of Waypoints and TrackPoints, Display the Tracks on a Map. 5.3 **SIM Cards Forensics**: The Subscriber Identification Module (SIM), SIM Architecture, Security, Evidence Extraction.	8	CO5
6	Forensic Investigation Reporting	6.1 Image classification, Image Captioning, Image generation, Text summarization, Video to Text using LSTM. 6.2 Investigative Report Template, Layout of an Investigative Report,Guidelines for Writing a Report.	4	CO6

5. DETAILED PRACTICAL SYLLABUS:

Lab Prerequisite: Knowledge of Machine learning algorithms beneficial, Python Programming.

Suggested List of Experiments:

1. Analysis of forensic images using open source tools: FTK Imager, Autopsy.
2. Explore forensics tools in kali linux for acquiring, analyzing and duplicating data.
3. Performing penetration testing using Metasploit - kali Linux.
4. Performing RAM Forensic to analyze memory images to find traces of an attack: (i) Capturing RAM Using the DumpIt Tool; (ii) Volatility tool.
5. Network forensics using Network Miner.
6. Windows Recycle Bin Forensics.
7. Data Carving using open source tools: Foremost, Scalpel, Jpegcarver

8. USB Device Forensics using USBDeview, USB Detective.
9. Web Browser Forensics using DB Browser for SQLite
10. Generate a Timeline Report Using Autopsy
11. Email Analysis
12. Case Study

6. Theory Assessments:

1. **Internal Assessment:** Two Internal assessments will be conducted for 40 marks each with average marks of both assessments as final score.
2. **End Sem Theory Examination:**
   - Question paper will consist of 5 questions, each carrying 20 marks.
   - Total 3 questions need to be solved.
   - Q.1 will be compulsory, based on the entire syllabus.
   - Remaining questions will be randomly selected from all the modules.
   - Weightage of marks should be proportional to the number of hours assigned to each **module.**

7. Practical Assessments:

1. **Termwork Assessment:** Term Work shall consist of at least 10 to 12 practical's based on the above list. Also Term work Journal must include at least 2 assignments. Term Work Marks: 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance).
2. **Oral/Viva Assessment:** An oral exam will be held based on the above syllabus.

8. Text Books:

1. Kevin Mandia, Chris Prosise, ―Incident Response and computer forensics‖, Tata McGrawHill, 2006.
2. Digital Forensics Basics A Practical Guide Using Windows OS — Nihad A. Hassan, APress, 2019.
3. Xiaodong Lin, ―Introductory Computer Forensics: A Hands-on Practical Approach‖, Springer 2018.

9. References:

Suggested MOOC Course Links

1. Ethical Hacking: https://nptel.ac.in/courses/106/105/106105217/
2. Digital Forensics: https://onlinecourses.swayam2.ac.in/cec20_lb06/preview
3. Cyber Incident Response: https://www.coursera.org/learn/incident-response
4. Penetration Testing, Incident Responses and Forensics: https://www.coursera.org/learn/ibm-penetration-testing-incident-response-forensics

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Course Code	Course Name	Teaching Scheme	Contact Hours				Credits Assigned			
			TH	Pract	Tut	Total	TH	Pract	Tut	Total
IT 492	Major Project II		-	8	-	4	-	8	-	4
		Examination Scheme	Internal Assessment			End Sem Exam		Term Work	Pract	Oral	Total Marks
			IA1	IA2	Avg	TH	Hrs				
			-	-	-	-	-	100	-	50	150

1. Course Objectives:

The project work facilitates the students to develop and prove Technical, Professional and Ethical skills and knowledge gained during graduation program by applying them from problem identification, analyzing the problem and designing solutions.

2. Course Outcomes: Learner will able

1. To develop the understanding of the problem domain through extensive review of literature.
2. To Identify and analyze the problem in detail to define its scope with problem specific data.
3. To know various techniques to be implemented for the selected problem and related technical skills through feasibility analysis.
4. To design solutions for real-time problems that will positively impact society and the environment..
5. To develop clarity of presentation based on communication, teamwork and leadership skills.
6. To inculcate professional and ethical behavior.

3. Guidelines for : Project II Report Format:

At the end of semester, each group needs to prepare a project report as per the guidelines issued by the Department.

A project report should preferably contain at least following details:

- Abstract
- Introduction
- Literature Survey/ Existing system
- Limitation Existing system or research gap
- Problem Statement and Objective
- Proposed System
    - Analysis/Framework/ Algorithm
    - Design details
    - Methodology (your approach to solve the problem) Proposed System
- Experimental Setup
    - Details of Database or details about input to systems or selected data
    - Performance Evaluation Parameters (for Validation)
    - Software and Hardware Set up
- References

4. Project II Evaluation:

1. Each team has to give a presentation/demo to the Internal Panel and External examiner and they will be jointly evaluated by a team of Internal and External Examiners approved by the Head of the department .
2. Each team will prepare a report that will summarize the results of the literature survey and the project proposal. The list of papers surveyed must be clearly documented.
3. Oral exams will be conducted on Project II done by the students.

Suggested quality evaluation parameters are as follows:

- o Quality of problem selected
- o Clarity of problem definition and feasibility of problem solution
- o Relevance to the specialization / industrial trends
- o Originality
- o Clarity of objective and scope
- o Quality of analysis and design
- o Quality of written and oral presentation
- o Individual as well as team work

5. Term Work:

Distribution of marks for term work shall be done based on following:

- o Weekly Log Report
- o Project Work Contribution
- o Project Report
- o Term End Presentation

The final certification and acceptance of TW ensures the satisfactory performance on the above aspects.

6. Oral and Practical:

Oral and practical examination of Project should be conducted by Internal and External examiners approved by HOD at the end of the semester.

1. An Oral exam will be held based on Project Demonstration and Presentation.
2. Oral Exam Marks: 25 marks

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Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
IT 405	Skill Lab II (R Programming)	Contact Hours	-	4	-	4
		Credits	-	2	-	2

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
IT 405	Skill Lab II (R Programming)	–	–	–	–	25	—	25	50

1. **Lab Objectives: The course/instructor aims to**

L1. To provide an overview of a new language R used for data science.
L2. To introduce students to the R programming environment and related ecosystem and thus provide them with an in-demand skill-set, in both the research and business environments
L3. To introduce the extended R ecosystem of libraries and packages.
L4. To demonstrate usage of as standard Programming Language.
L5. To familiarize students with how various statistics like mean median etc. can be collected for data exploration in R
L6. To enable students to use R to conduct analytics on large real life datasets.

2. **Lab Outcomes: On successful completion of this course, learner/student will be able to**

LO1: Install and use R for simple programming tasks.
LO2: Extend the functionality of R by using add-on packages
LO3: Extract data from files and other sources and perform various data manipulation tasks on them.
LO4: Code statistical functions in R.
LO5: Use R Graphics and Tables to visualize results of various statistical operations on data .
LO6:Apply the knowledge of R gained to data Analytics for real life applications.

SOFTWARE requirements:

1. The R statistical software program. Available from: https://www.r-project.org/
2. RStudio an Integrated Development Environment (IDE) for R. Available from: https://www.rstudio.com/

3. Detailed Lab syllabus:

Sr. No.	Module Name	Detailed Lab Description	Hrs	LO Mapping
0	Prerequisite	Prerequisites - Any programming Language like Java Python. Basic statistics. Data Mining Algorithms	02	--
I	Introduction: Installing R on personal machines.	● The basic functionality of R will be demonstrated, Variable types in R. Numeric variables, strings and factors. ● Accessing the help system. Retrieving R packages.	04	LO 1, LO 2, LO 3

	installing R and RStudio.	• Basic data types and operations: numbers, characters and composites. • Data entry and exporting data		
II	Data structures	Data structures: vectors, matrices, lists and data frames.	04	LO1, LO3
III	R as a programming language:	• R as a programming language: Grouping, loops and conditional execution, Functions • Exploratory data analysis Range, summary, mean, variance, median, standard deviation, histogram, box plot, scatterplot	04	LO 1, LO 4
IV	Graphics in R	• Graphics and tables • Working with larger datasets • Building tables with aggregate • Introduction to ggplot2 graphics	06	LO 3
V	Regression and correlation	• Simple regression and correlation, Multiple regression • Tabular data and analysis of Categorical data	02	LO 4
VI	R for Data Science (Mini Project)	Implementing a mini project using any data mining or big data analytics algorithm in R • Extracting data from a large Dataset • Exploratory analysis • Using Mining algorithm • Visualizations and interpretation of results	06	LO 5, LO 6

4. Lab Assessments:

1. **Term Work**: Term Work shall consist of at least 5 practical based on the above Topics and a Mini Project.
   Distribution of Term Work Marks:
   Mini Project : 10 Marks
   Experiment : 10 Marks
   Attendance : 05 Marks
2. **Oral/Viva Assessment:** An oral exam will be held based on the above syllabus.

5.Textbooks and References:

A. **Text Books:**

1. URL: https://cran.r-project.org/doc/manuals/r-release/R-intro.pdf (Online Resources)
2. R Cookbook Paperback – 2011 by Teetor Paul O Reilly Publications
3. Beginning R: The Statistical Programming Language by Dr. Mark Gardener, Wiley Publications
4. R Programming For Dummies by Joris Meys Andrie de Vries, Wiley Publications

B. **References:**

1. Hands-On Programming with R by Grolemund, O Reilly Publications
2. R for Everyone: Advanced Analytics and Graphics, 1e by Lander, Pearson Ltd.
3. R for Data Science Learning Dan Toomey December 2014 Packt Publishing Limited

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Department Level Optional Course (DLOC)

DLOC - VI

Semester VIII Specialization	1. AI and Robotics	2. IoT and Data Analytics	3. Information Security and Forensics	4. Bioinformatics
DLOC VI	IT 461	IT 462	IT 463	IT 464
	Robotics	Social Media Analytics	Social Frauds and Privacy	Computer Aided Drug Design

Course Code	Course Name	Teaching Scheme	Contact Hours				Credits Assigned			
			TH	Pract	Tut	Total	TH	Pract	Tut	Total
IT 461	Robotics		3	-	-	3	3	-	-	3
		Examination Scheme	Internal Assessment			End Sem Exam		Term Work	Pract	Oral	Total Marks
			IA1	IA2	Avg	TH	Hrs				
			40	40	40	60	2	-	-	-	100

1. **Prerequisite:** Mathematical concepts of Geometry, Matrices Algebra, knowledge of Basic Electronics.

1. Course Objectives: The course is aimed to:

1. Learn the basics of Robots.
2. Learn the concepts of Direct and Inverse Kinematics of Robotics.
3. Learn the concepts of Motions, velocities and dynamic analysis of force.
4. Learn the concepts of Trajectory planning.
5. Learn the concepts of Motion Planning.
6. Learn the concepts of robot programming languages and acquire skills to program robots.

2. Course Outcomes: On successful completion of course learner/student will be able to:

1. Apply the basic concepts of Robots.
2. Apply and evaluate the concepts of Direct and Inverse Kinematics of Robotics.
3. Identify actuators, sensors and control of a robot for different applications.
4. Apply and evaluate Trajectory Planning for rigid robots and mobile robots.
5. Apply Robotics to solve day to day problems using vision algorithms.
6. Apply the concepts of Motion planning.

3. Detailed Theory Syllabus:

SN	Module	Detailed Content	Hrs	COs
1	Introduction	Robot Classification, Robot Components, Degrees of freedom, Joints, Coordinates, Coordinate frames, workspace, applications, Soft and Hard automation	3	CO1
2	Direct and Inverse Kinematics	**Direct (Forward) Kinematics**: Homogeneous coordinates, Link coordinates, Coordinate frame, coordinate transform, Arm equations, An example – Four Axis SCARA. **Inverse Kinematics**: Inverse kinematics problem, Tool Configuration, An example – Four Axis SCARA.	8	CO2
3	Sensors and Actuators	**Sensors:** Characteristics, Utilization, Types – Position, Velocity, Acceleration, Force and Pressure, Torque, Visible Light and Infrared, Touch and Tactile, Proximity, Range Finders sensors. **Actuators and Drive System**: Characteristics, Hydraulic Actuators, Pneumatic Devices, Electric Motors	6	CO3
4	Workspace Analysis and Trajectory Planning	Trajectory planning, Joint-space trajectory planning, Cartesian-space trajectories, Workspace fixtures, Pick and place operations, Continuous path motion, Interpolated motion, Straight-line motion.	7	CO4
5	Robot Vision	Image representation, Template matching, Polyhedral objects, Shane analysis. **Segmentation:** Thresholding, region labeling, Shrink operators, Swell operators, Euler numbers. Perspective transformation, Structured Illumination, Camera calibration.	8	CO5
6	Task and Motion Planning	Task level programming, Uncertainty, Configuration, Space, Gross motion, Planning, Grasp planning, Fine-motion Planning, Simulation of Planar motion, Source and goal scenes, Task planner simulation. Concept of motion planning. Bug Algorithms: Bug1, Bug2, Tangent Bug.	6	CO6

4. Suggested Experiments:

1. Forward Kinematics of Cylindrical Robot Coordinates.
2. Forward Kinematics of 3 DOF Robots using D-H algorithm.
3. Inverse Kinematics of 2 DOF Robots.
4. Inverse Kinematics of 3 DOF Robots.
5. Inverse Kinematics of 3 DOF Robot Arm.
6. Trajectory using Third Order Polynomial.
7. Simulation of BUG 2 Algorithm.
8. Simulation of Tangent BUG.
9. Edge detection algorithm.

5. Theory Assessment:

A. **Internal Assessment (IA):** Two class tests of 40 marks each. The first class test is to be conducted when approx. 40% syllabus is completed and the second class test when an additional 35% syllabus is

completed. Duration of each test shall be one and a half hours.

B. **End Semester Theory Examination:** In question, paper weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.

1. Question paper will consist of 3 questions, each carrying 20 marks.
2. Question number 1 will be compulsory and based on maximum contents of the syllabus
3. Remaining questions will be mixed in nature (For example, if Q.2 has part (a) from module 3 then part (b) will be from other than module 3)
4. Total three questions need to be solved.

6. Term Work Assessment: The final certification and acceptance of TW ensures the satisfactory performance of laboratory work and minimum passing in the TW.

A. **Term Work:** Term Work shall consist of practical's based on the above list. Also Term work Journal must include at least 2 assignments based on the topics mentioned in the syllabus.

B. **Term Work Marks:** 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance)

7. Books and References:

A. **Books:**

1. Saeed Benjamin Niku, "Introduction to Robotics – Analysis, Control, Applications", Wiley, 2e, 2011.
2. Robert Shilling, "Fundamentals of Robotics-Analysis and control", PHI.
3. Fu, Gonzales and Lee, "Robotics", McGraw Hill
4. Principles of Robot Motion – Theory, Algorithms and Implementation by Howie Choset, Lynch, PHI

B. **References:**

1. Mark W. Spong & M. Vidyasagar, "Robot Dynamics & Control", Wiley India, 2e, 2004
2. Staughard, "Robotics and AI", PHI.
3. Grover, Wiess, Nagel, Oderey, "Industrial Robotics", McGraw Hill.
4. Walfram Stdder, "Robotics and Mechatronics," TMH.
5. Niku, "Introduction to Robotics", Pearson Education
6. Klafter, Chmielewski, Negin, "Robot Engineering", PHI.
7. Mittal, Nagrath, "Robotics and Control", TMH.

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Course Code	Course Name	Teaching Scheme	Contact Hours				Credits Assigned			
			TH	Pract	Tut	Total	TH	Pract	Tut	Total
IT 462	Social Media Analytics		3	-	-	3	3	-	-	3
		Examination Scheme	Internal Assessment			End Sem Exam		Term Work	Pract	Oral	Total Marks
			IA1	IA2	Avg	TH	Hrs				
			40	40	40	60	2	-	-	-	100

1. Course Objectives: The course / instructor aims:

1. To familiarize the concept of social media.
2. To explain the concept of social media analytics and understand its significance.
3. To enable the learners to develop skills required for analyzing the effectiveness of social media.
4. To describe the different tools of social media analytics.
5. To demonstrate the different visualization techniques for Social media analytics.
6. To familiarize with the ethical and legal implications of leveraging social media data.

2. Course Outcomes: On successful completion of course learner/student will be able to:

1. Understand the concept of Social media
2. Give the significance of social media Analytics.
3. Analyze the effectiveness of social media
4. Use different Social media analytics tools effectively and efficiently.
5. Demonstrate the different effective Visualization techniques to represent social media analytics.
6. Acquire the hands-on skills needed to work with social media data.

3. Detailed Theory Syllabus:

Prerequisite: Graph Theory, Data Mining, Python/R programming

Module	Module Name	Detailed Contents of Module	Hrs.
1	Social Media Analytics: An Overview	Core Characteristics of Social Media, Types of Social Media, Social media landscape, Need for Social Media Analytics (SMA), SMA in organizations. Purpose of Social Media Analytics, Social Media vs. Traditional Business Analytics, Seven Layers of Social Media Analytics, Types of Social Media Analytics, Social Media Analytics Cycle, Challenges to Social Media Analytics, The Limitations of Social Media Analytics, Social Media Analytics Tools.	6
2	Social Network Structure, Measures & Visualization	Basics of Social Network Structure - Nodes, Edges & Tie Describing the Networks Measures - Degree Distribution, Density, Connectivity, Centralization, Tie Strength & Trust Network Visualization - Graph Layout, Visualizing Network features, Scale Issues. Social Media Network Analytics - Common Network Terms, Common Social Media Network Types, Types of Networks, Common Network Terminologies, Network Analytics Tools	8
3	Social Media Text, Action & Hyperlink Analytics	Social Media Text Analytics - Types of Social Media Text, Purpose of Text Analytics, Steps in Text Analytics, Social Media Text Analysis Tools. Social Media Action Analytics - What Is Actions Analytics? Common Social Media Actions, Actions Analytics Tools. Social Media Hyperlink Analytics - Types of Hyperlinks, Types of Hyperlink Analytics, Hyperlink Analytics Tools.	6

4	Social Media Location & Search Engine Analytics	Location Analytics - Sources of Location Data, Categories of Location Analytics, Location Analytics and Privacy Concerns, Location Analytics Tools. Search Engine Analytics - Types of Search Engines, Search Engine Analytics, Search Engine Analytics Tools.	6
5	Social Information Filtering & Social Media Brand Reputation Management	Social Information Filtering - Social Sharing and filtering , Automated Recommendation systems, Traditional Vs social Recommendation Systems. Understanding Social Media and Business Alignment, Social Media KPI, Formulating a Social Media Strategy, Managing Social Media Risks. Brand Reputation Management - Strategies for monitoring and managing online brand reputation, crisis management, and responding to customer feedback.	6
6	Social Media Campaign Analytics & Ethics	Social Media Campaign Analytics - Evaluating the effectiveness of social media marketing campaigns, tracking conversions, and optimizing campaign performance. Addressing privacy concerns, data protection, ethical implications in social media analytics and legal considerations.	6

4. Suggested Experiments:

1. Study of
   i) Social Media platforms (Facebook, twitter, YouTubeetc)
   ii) Social Media analytics tools (Facebook insights, google analytics, Netlytic)
   iii) Social Media Analytics techniques and engagement metrics (page level, post level, member level)
   iv) Applications of Social media analytics for business."
2. Select the social media platforms of your choice (Twitter, Facebook, LinkedIn, YouTube, Web blogs etc) and collect social media data for business.
3. Perform data cleaning (preprocess, filter) and store the social media data for business in database
4. Perform exploratory data analysis and visualization of social media data for business.
5. Perform social network data analytics to identify social media influencers for business
6. Perform content based analysis (topic , issue , trend, sentiment/opinion analysis) of social media data for business.
7. Develop a dashboard and reporting tool based on real time and historical social media data for business.
8. Design the creative content for promotion of your business on social media platform
9. Analyze competitor activities using social media data related to your business
10. Develop social media analytics models of your business

5. Theory Assessment:

A. **Internal Assessment (IA):** Two class tests of 40 marks each. The first class test is to be conducted when approx. 40% syllabus is completed and the second class test when an additional 35% syllabus is completed. Duration of each test shall be one and a half hours.

B. **End Semester Theory Examination:** In question, paper weightage of each module will be proportional to the number of respective lecture hours as mentioned in the syllabus.

1. Question paper will consist of 3 questions, each carrying 20 marks.
2. Question number 1 will be compulsory and based on maximum contents of the syllabus
3. Remaining questions will be mixed in nature (for example, if Q.2 has part (a) from module 3 then part (b) will be from other than module 3)
4. Total three questions need to be solved.

6. Assessment:

A. Term Work: Term Work shall consist of practicals based on the above list. Also Term work Journal must include at least 2 assignments based on the topics mentioned in the syllabus.

B. Term Work Marks: 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance)

7. Books and References:

Books:

1. Seven Layers of Social Media Analytics_ Mining Business Insights from Social Media Text, Actions, Networks, Hyperlinks, Apps, Search Engine, and Location Data, Gohar F. Khan,(ISBN-10: 1507823207).
2. Analyzing the Social Web 1st Edition by Jennifer Golbeck
3. Mining the Social Web_ Analyzing Data from Facebook, Twitter, LinkedIn, and Other Social Media Sites, Matthew A Russell, O'Reilly
4. Charu Aggarwal (ed.), Social Network Data Analytics, Springer, 2011

References:

1. Social Media Analytics [2015], Techniques and Insights for Extracting Business Value Out of Social Media, Matthew Ganis, Avinash Kohirkar, IBM Press
2. Social Media Analytics Strategy_ Using Data to Optimize Business Performance, Alex Gonçalves, APress Business Team
3. Social Media Data Mining and Analytics, Szabo, G., G. Polatkan, O. Boykin & A. Chalkiopoulos (2019), Wiley, ISBN 978-1-118-82485-6
4. Python Social Media Analytics: Analyze and visualize data from Twitter, YouTube, GitHub, and more Kindle Edition by Siddhartha Chatterjee , Michal Krystyanczuk
5. Learning Social Media Analytics with R,by Raghav Bali, Dipanjan Sarkar, Tushar Sharma.
6. Jennifer Golbeck, Analyzing the social web, Morgan Kaufmann, 2013
7. Matthew A. Russell. Mining the Social Web: Data Mining Facebook, Twitter, Linkedin, Google+, Github, and More, 2nd Edition, O'Reilly Media, 2013.
8. Charu Aggarwal (ed.), Social Network Data Analytics, Springer, 2011

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Course Code	Course Name	Scheme	Theory	Practical	Tutorial	Total
IT 493	Major Project III	Contact Hours	-	8	-	8
		Credits	-	4	-	4

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Internal Assessment			End Sem Exam				
		IA 1	IA 2	Average					
IT 493	Major Project III	-	-	-	-	50	-	50	100

1. **Objectives:**
   1. To offer students a glimpse into real world problems and challenges that need IT based solutions
   2. To enable students to create very precise specifications of the IT solution to be designed.
   3. To introduce students to the vast array of literature available of the various research challenges in the field of IT
   4. To create awareness among the students of the characteristics of several domain areas where IT can be effectively used.
   5. To enable students to use all concepts of IT in creating a solution for a problem
   6. To improve the team building, communication and management skills of the students.

2. **Outcomes:**
   1. Discover potential research areas in the field of IT
   2. Conduct a survey of several available literature in the preferred field of study
   3. Compare and contrast the several existing solutions for research challenge
   4. Demonstrate an ability to work in teams and manage the conduct of the research study.
   5. Formulate and propose a plan for creating a solution for the research plan identified
   6. To report and present the findings of the study conducted in the preferred domain

3. **Guidelines:**
   1. The project work is to be conducted by a group of three students
   2. Each group will be associated with a project mentor/guide. The group should meet with the project mentor/guide periodically and record of the meetings and work discussed must be documented.
   3. Students will do literature surveys in Sem VI.
   4. Students will do design, implementation and coding in Sem VII.
   5. Department has to allocate 1 day in VII semester and 1 day in VIII semester every week.
   6. Each group along with its guide/mentor shall identify a potential research area/problem domain, on which the study is to be conducted.
   7. Each team will do a rigorous literature survey of the problem domain by reading and understanding at least 3-5 research papers from current good quality national/international journals/conferences. (Papers selected must be indexed by Scopus/IEEE/Springer/ACM etc.). The list of papers surveyed must be clearly documented.
   8. The project assessment for term work will be done at least two times at department level by giving presentation to panel members which consist of at least three (3) members as Internal examiners (including the project guide/mentor) appointed by the Head of the department of respective Programme.
   9. A report is to be prepared summarizing the findings of the literature survey. A comparative evaluation of the different techniques surveyed is also to be done.

10. Students will do testing and analysis in Sem VIII followed by publication.
11. Teams must analyze all the results obtained by comparing with other standard techniques.
12. Every team must publish their work in national / international conference/journals (if possible publish in Scopus indexed journals).

Project III Report Format: At the end of semester, each group needs to prepare a project report as per the guidelines issued by the University of Mumbai. Report should be submitted in hardcopy. Also, each group should submit softcopy of the report along with project documentation, implementation code, required utilities, software and user Manuals.

A project report should preferably contain at least following details:

- Abstract
- Introduction
- Literature Survey/ Existing system
- Limitation Existing system or research gap
- Problem Statement and Objective
- Proposed System
- Analysis/Framework/ Algorithm
- Design details
- Methodology (your approach to solve the problem) Proposed System
- Experimental Setup
- Details of Database or details about input to systems or selected data
- Performance Evaluation Parameters (for Validation)
- Software and Hardware Set up
- Results and Discussion
- Conclusion and Future Work
- References
- Appendix – List of Publications or certificates

Desirable: Students should be encouraged -

- To participate in various project competitions.
- To write at least one technical paper & publish in a reputed journal.
- To participate in national / international conferences of repute.
- To Publish a patent based on a project idea.
- To file/ register a copyright

4. **Evaluation**

1. Each team has to give a presentation/demo to the Internal Panel and External examiner.
2. Each team will prepare a report that will summarize the results of the literature survey and implementation and coding as project proposal in SEM VII. The list of papers surveyed must be clearly documented.
3. Each group will be jointly evaluated by a team of Internal and External Examiners approved by the University of Mumbai.
4. Oral exams will be conducted on the project done by the students.

5. **Term Work:**

Term Work shall consist of full Project-II on above guidelines/syllabus.

Term Work Marks: 50 Marks (Total marks) = 45 Marks (Project-II) + 5 Marks (Attendance)

6. **Oral Exam:** An Oral exam will be held based on the Project-III Demonstration and Presentation. Suggested quality evaluation parameters are as following:
    a. Relevance to the specialization / industrial trends
    b. Modern tools used
    c. Innovation
    d. Quality of work and completeness of the project
    e. Validation of results
    f. Impact and business value
    g. Quality of written and oral presentation
    h. Individual as well as team work

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Course Code	Course Name	Teaching Scheme	Contact Hours				Credits Assigned			
			TH	Pract	Tut	Total	TH	Pract	Tut	Total
IT494	Internship		-	16	-	16	-	8	-	8
		Examination Scheme	Internal Assessment			End Sem Exam		Term Work	Pract	Oral	Total Marks
			IA1	IA2	Avg	TH	Hrs				
			-	-	-	-	-	100	-	100	200

Course Description:

Provides the student with an opportunity to gain knowledge and skills from a planned work experience in the student's chosen career field. Internship or placements are directly related to the student's program of study and provide learning experiences not available in the classroom setting. Internships provide entry-level, career-related experience, and workplace competencies that employers value when hiring new employees. Internships may also be used as an opportunity to explore career fields.

1. Course Objectives: The course is aimed to:

1. To identify relevant industries to solve societal/environmental problems.
2. To familiarize the process of solving the problem in a corporate environment.
3. To provide an opportunity to apply theoretical knowledge and skills into practice.
4. To develop networking with professionals while learning new skills.
5. To get an exposure or real time experience on live industry projects.
6. To understand the code of conduct and professional ethics and handle the work environments.

2. Course Outcomes: On successful completion of course learner/student will be able to:

1. Attain an exposure to real life organizational situations and achieve hands on experience in an organization
2. Build proficiency in a range of business or industry skills appropriate to the field of the internship/placement.
3. Develop professional and intercultural communication through written, verbal, and non-verbal means.
4. Articulate software development lifecycle (SDLC) phases in developing software projects and in writing the project document.
5. Refine and clarify professional and career goals through critical analysis of the internship experience or research project.
6. Inculcate the self-learning to know the job opportunities, higher studies and build a professional network.

3. Guidelines regarding Internship:

1. To get hands-on experience of the real world, every candidate is required to undertake an individual internship in an organization of repute. The duration of Internship will be a minimum of 14 weeks to a maximum of 20 weeks.
2. The internship duration /slot will start immediately after completion of semester VII examinations and it will end on the last instructional date of the semester VIII (as per the academic calendar).
3. All students enrolled in semester VII have to submit the Application Form in the prescribed format to the Internship Cell/ Internship Coordinator at least a month prior to the last instructional day of semester VII
4. Students shall submit an implementation plan in the form of Gantt/PERT/CPM chart, which will cover weekly activity of the internship.
5. In case of an internship offered through the college selection process, the student is eligible for only one offer and cannot appear for further process once selected.

6. The applications will be scrutinized by the internship approval committee at college /department level for its merit. The decision of the committee will be final and further grievances will not be entertained.
    1. The college will assign a mentor for each student who will monitor the student's progress throughout the duration of the internship. The students are expected to be in contact with the mentor on a regular basis.
    2. Students can join an internship only after getting an approval from the internship-committee.
    3. In case any student attempts to join an internship bypassing college procedure, it will not be considered for credit completion of semester VIII and hence for award of the B.Tech degree.
7. Faculty Internship Advisor or Internship Education Program Advisor may give input to students during internship, however, focus shall be on self-learning by the student.
8. A log book to be prepared by each student, wherein students can record weekly work progress, faculty Internship Advisor can verify and record notes/comments.
9. Students should make an Internship report as per the format provided.

4. Suggested Internships Categories: Following are the suggested categories of a valid Internships:

1. Industrial Internship- Private, Public, LLP or Start-up company
2. Incubation center - Under start-up or pre-incubation registered with Incubation center, Innovation / Entrepreneurship related activities.
3. Government Sector - BSNL, BEL, BHEL, ONGC, GMRT, Railways etc..
4. Government Research organization - IIT's, NIT's, IITM, IISR, DIAT, ISRO, TIFR etc..
5. Research lab - NCL, CSIR, CME, CPR, HEMRL, DRDO, Police Research Centre etc..
6. Institutional Internship through UGROP.
7. Internships other than UG project work offered by PI/CoPI of any Research project, live Industry projects, different technical activity clubs, learning at departmental Lab/ Tinkering Lab/ Institutional workshop etc..

5. Internship Attendance Guidelines:

1. Students are required to report to work on time and according to the requirements of the student's individualized work schedule.
2. Students are expected to conform to all attendance policies established by the employer and must notify the Faculty Internship Advisor in the event of absence from work.
3. When the employer is open for business on college holidays, the student is expected to report to work as scheduled.
4. Individual work schedules are established by agreement of the student, employer, and Faculty Internship Advisor.

6. Internship Report Format:

At the end of semester a project report should preferably contain at least following details:

1. Introduction

1.1 About the Organization
1.2 About the Internship
1.3 Purpose of Internship
1.4 Scope and Objectives of Internship
1.5 Roles and Responsibility
1.6 Organization of the Internship Report

2. Internship Activities

2.1 Responsibilities and Tasks Assigned
2.2 Weekly Overview of Internship Activities

3. Work Accomplishments

3.1 Details of Work Carried Out

3.2 Challenges Faced

3.3 Achievements and Benefits to the Company/Society

4. Learning through Internship

4.1 Technology Used

4.2 Methodology Adopted

4.3 Skills Acquired/Enhanced

5. Conclusion

5.1 Summary of Key Points

5.2 Overall Internship Experience

Bibliography

Internship Certificate

7. Internship Evaluation Guidelines:

The institute shall ask the Internship offering Organization to allocate a mentor to the students to monitor and update the progress of the student and undertake a ground work to make internship more effective. The institute (concerned department) will allocate an internal faculty mentor to the students. The faculty mentor will undertake continuous evaluation of the students and will be responsible for submission of his/her grades. The interactions may be through Email/Skype/ Video Conferencing. etc. or a personal visit by faculty mentor to the internship site, as the need be or the policy of the institute. The student needs to submit the internship joining report duly signed by the mentor from the organization and the mentor from the institute to the department within two weeks from the commencement of the internship.

A. Suggested distribution of Term Work of 100 marks for internship shall be awarded based on:
   - Selection of relevant industry and weekly progress report/ log book: **20 marks**
   - Internal mock assessment as per defined rubrics/parameters: **20 marks**
   - Evaluation/Feedback by industry/employer: **20 marks**
   - Quality of work carried out during Internship and presentation: **20 marks**
   - Quality of internship report and presentation: **20 marks**

B. Suggested distribution of Oral/Practical of 100 marks for internship shall be awarded based on:
   - Selection of relevant industry and its requirements & scope: **20 marks**
   - Quality of work carried out during Internship and presentation: **20 marks**
   - Depth of knowledge, technology used and skills acquired during Internship: **20 marks**
   - Work carried out, achievements and benefits to the company/society: **20 marks**
   - Effectiveness of presentation and response to question(s): **20 marks**

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