

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)



Autonomous Programme
Bachelor of Engineering



Department Of
Information Science and Engineering

SCHEME and SYLLABUS
(2024 Admitted Batch)



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

VISION OF THE INSTITUTE

To be an institute of excellence in engineering education and research, producing socially responsible professionals.

MISSION OF THE INSTITUTE

1. Create conducive environment for learning and research
2. Establish industry and academia collaborations
3. Ensure professional and ethical values in all institutional endeavors

VISION OF THE DEPARTMENT

The department will be a premier centre technology in diverse fields. focusing on knowledge dissemination and generation to address the emerging needs of information

MISSION OF THE DEPARTMENT

1. To make students competent to contribute towards the development of IT field.
2. Promote learning and practice of latest tools and technologies among students and prepare them for diverse career options.
3. Collaborate with industry and institutes of higher learning for Research and Development, innovations and continuing education.
4. Developing capacity of teachers in terms of their teaching and research abilities.
5. Develop software applications to solve engineering and societal problems.



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PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

Graduates will:

- PEO1:** Be successful professionals in IT industry with good design, coding and testing skills, capable of assimilating new information and solve new problems.
- PEO2:** Communicate proficiently and collaborate successfully with peers, colleagues and organizations.
- PEO3:** Be ethical and responsible members of the computing profession and society.
- PEO4:** Acquire necessary skills for research, higher studies, entrepreneurship and continued learning to adopt and create new applications.

PROGRAM OUTCOMES (POs)

1. **Engineering knowledge:** Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
3. **Design/Development of solutions:** Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)
4. **Conduct investigations of complex problems:** Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modeling, analysis & interpretation of data to provide valid conclusions. (WK8).
5. **Engineering tool usage:** Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modeling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)
6. **The engineer and the world:** Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).



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PROGRAM OUTCOMES (POs)

7. **Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
8. **Individual and collaborative team work:** Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary settings.
9. **Communication:** Communicate effectively and inclusively within the community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.
10. **Project management and finance:** Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
11. **Life-long learning:** Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

PROGRAM SPECIFIC OUTCOMES

Upon graduation, students with a degree B.E. in Information Science & Engineering will be able to:

1. Design and develop efficient information systems for organizational needs.
2. Ability to adopt software engineering principles and work with various standards of Computing Systems.

Scheme of Evaluation (Theory Courses)

Assessment	Marks
CIE 1	10
CIE 2	10
CIE 3	10
Activities as decided by course faculty	20
SEE	50
Total	100

Scheme of Evaluation (Laboratory Courses)

Assessment	Marks
Continuous Evaluation in every lab session by the Course Coordinator	10
Record Writing	20
Laboratory CIE conducted by the Course Coordinator	20
SEE	50
Total	100

Examination	Maximum Marks	Minimum marks to qualify
CIE	50	20
SEE	50	20



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COURSE TYPES

Basic Science Course	BSC
Engineering Science Course	ESC
Emerging Technology Course	ETC
Programming Language Course	PLC
Professional Core Course	PCC
Integrated Professional Core Course	IPCC
Professional Core Course Laboratory	PCCL
Professional Elective Course	PEC
Open Elective Course	OEC
Project/Mini Project/Internship	PI
Humanities and Social Sciences, Management Course	HSMC
Ability Enhancement Course	AEC
Skill Enhancement Course	SEC
Universal Human Value Course	UHV
Non-credit Mandatory Course	MC

Malnad College of Engineering, Hassan
I year scheme and syllabus (2024 Admitted Batch)

I Semester: PHYSICS CYCLE STREAMS: E&CE, Civil, CS&E								
Sl. No	Course Code	Course Title	DEPT.	Teaching Hours/Week			Credits	Contact Hours
				L	T	P		
1	MAT4C11/ MAT4S11/ MAT4E11	Mathematics for CV/CS/ECSStream-I	Mathematics	3	1	2	04	06
2	24PHYC12/ 24PHYM12/ 24PHYE12	Physics for CV/ME/EC stream	Physics	3	1	2	04	06
3	24CIV13/ 24BEE13 / 24PPC13	Engg. Mechanics/Basic Electronics/ Principles of Programming using C	CV/EC/CS	3	0	0	03	03
4	24ESC14x	Engineering Science Course-I	Respective Engg. department	3	0	0	03	03
5	24ETC15x	Emerging Technology Course	Any department	3	0	0	03	03
6	24ENG16	Communicative English	Humanities	1	0	0	01	1
7	24KSK17/ 24KBK17	Samskrutika Kannada/ Balake Kannada	Humanities	1	0	0	01	1
8	24IDT18	Innovation and Design Thinking	Mechanical (Coordinating Dept)	0	0	2	01	2
TOTAL				16	04	06	20	

Malnad College of Engineering, Hassan
I year scheme and syllabus (2024 Admitted Batch)

I semester: CHEMISTRY CYCLE STREAMS: Electrical, Mechanical, IS&E, CSBS, AIML								
Sl. No	Course Code	Course Title	DEPT.	Teaching Hours/Week			Credits	Contact hours
				L	T	P		
1	24MATS11	Mathematics for CSE Stream	Mathematics	3	1	2	04	06
2	24CHES12	Chemistry for CSE Stream	Chemistry	3	1	2	04	06
3	24CED13	Computer-Aided Engineering Drawing	ME	2	0	2	03	04
4	24ESC14x	Engineering Science Course-I	Respective Engg. department	3	0	0	03	03
5	24PLC15x	Programming Language Course	MECH	2	0	2	03	04
6	24ENG16	Communicative English	Humanities	1	0	0	01	01
7	24ICO17	Indian Constitution	Humanities	1	0	0	01	01
8	24SFH18	Scientific Foundations of Health	Sports	0	0	2	01	02
TOTAL				16	2	08	20	

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Code	Course Title
24ESC141	Introduction to Civil Engineering
24ESC142	Introduction to Electrical Engineering
24ESC143	Introduction to Electronics Engineering
24ESC144	Introduction to Mechanical Engineering
24ESC145	Introduction to C Programming

(ETC-I) Emerging Technology Courses-I		
Code	Title	Offering Department
24ETC15E	Renewable Energy Sources	Electronics and Electrical Engineering
24ETC15F	Waste Management	Civil Engineering
24ETC15H	Introduction to Internet of Things (IOT)	Electronics and Communication
24ETC15I	Introduction to Cyber Security	Computer Science and Engineering
(PLC-I) Programming Language Courses-I		
24PLC15B -Introduction to Python Programming		Mechanical Engineering

Ist Year HOD
Dr. Kalavathi G

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II Semester: PHYSICS CYCLE STREAMS: Electrical, Computer Science, Mechanical								
Sl. No	Course Code	Course Title	DEPT.	Teaching Hours/Week			Credits	Contact hours
				L	T	P		
1	MAT4S21/MAT4E21 / MAT4M21	Mathematics - II for ME/CS/EE Stream	Mathematics	3	1	2	04	06
2	PHY4S22/ PHY4E22/ PHY4M22	Physics for ME/CS/EE	Physics	3	1	2	04	06
3	PPC423/ EME423/ EEE423	Principles of Programming Using C Elements of Mechanical Engineering Elements of Electrical Engineering	CS/ME/EE	2 3 3	0 0 0	2 0 0	03	04
4	ESC424x	Engineering Science Course-II	Respective Engg. department	3	0	0	03	03
5	ETC425x	Emerging Technology Course	Any department	3	0	0	03	03
6	PWS426	Professional Writing Skills in English	Humanities	1	0	0	01	01
7	KSK427/ KBK427	Samskrutika Kannada/ Balake Kannada	Humanities	1	0	0	01	01
8	IDT428	Innovation and Design Thinking	Physics (Coordinating Dept)	0	0	2	01	02
TOTAL				19	02	08	20	

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II Semester: CHEMISTRY CYCLE STREAMS: Electronics, Computer Science and Civil								
Sl. No	Course Code	Course Title	DEPT.	Teaching Hours/Week			Credits	Contact hours
				L	T	P		
1	MAT4C21/ MAT4S21/ MAT4E21	Mathematics for CV/CS/ECStream-II	Mathematics	3	1	2	04	06
2	CHE4C22/ CHE4M22/ CHE4E22	Chemistry for CV/CS/EC Stream	Chemistry	3	1	2	04	06
3	CED423	Computer-Aided Engineering Drawing	MECH	2	0	2	03	03
4	ESC424x	Engineering Science Course-II	Respective Engg. department	3	0	0	03	03
5	PLC425x	Programming Language Course	MECH	2	0	2	03	04
6	PWS426	Professional Writing Skills in English	Humanities	1	0	0	01	01
7	ICO427	Indian Constitution	Humanities	1	0	0	01	01
8	SFH428	Scientific Foundations of Health	Sports	0	0	2	01	02
TOTAL				19	02	08	20	

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(ESC-II) Engineering Science Courses-II	
Code	Course Title
ESC4241	Introduction to Civil Engineering
ESC4242	Introduction to Electrical Engineering
ESC4243	Introduction to Electronics Engineering
ESC4244	Introduction to Mechanical Engineering

(PLC-II) Programming Language Courses-II	
Code	Course Title
PLC425B	Introduction to Python Programming

(ETC-II) Emerging Technology Courses-II	
Code	Title
ETC425E	Renewable Energy Sources
ETC425F	Waste Management
ETC425I	Introduction to Cyber Security

Ist Year HOD
Dr. Kalavathi G



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Semester-wise Credit Distribution

Curricular Component ↓/ Semester →	I	II	III	IV	V	VI	VII	VIII	Total Credits
Basic Science Course (BSC)	8	8	3	1	-	-	-	-	25
Engineering Science Course (ESC)/ Emerging Technology Course (ETC)/Programming Language Course	9	9	3	3	-	-	-	-	24
Professional Core Course (PCC, IPCC, PCCL)	-	-	13	16	12	11	8	-	55
Professional Elective Course (PEC)	-	-	-	-	3	3	3	3	12
Open Elective Course (OEC)	-	-	-	-	-	3	3	3	9
Project/Mini Project/Internship (PI)	-	-	-	-	1	2	4	10	17
Humanities and Social Sciences, Management Course (HSMC)	1	2	-	-	4	-	-	-	7
Ability Enhancement Course (AEC)/ Skill Enhancement Course (SEC)	2	1	1	1	3	1	-	-	9
Universal Human Value Course (UHV)/SCR	-	-	1	1	-	-	-	-	2
Total Credits	20	20	21	22	23	20	18	16	160



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	THIRD SEMESTER											
Sl. No	Course Category	Course Code	Course Title	Teaching Hours per Semester					Exam Marks			Credits
				L	T	P	TW+SL	Total	CIE	SEE	Total	
1	BSC	24MAIS301	Mathematics for Information Science Engineering	42	28	0	20	90	50	50	100	3
2	IPCC	24IS302	Digital Design & Computer Organization	42	0	28	50	120	50	50	100	4
3	IPCC	24IS303	Operating Systems	42	0	28	50	120	50	50	100	4
4	PCC	24IS304	Data Structures and Applications	42	0	0	48	90	50	50	100	3
5	PCCL	24IS305	Unix Lab	0	0	28	2	30	50	50	100	1
6	ESC	24IS306X	ESC/ETC/PLC	28	0	28	34	90	50	50	100	3
7	SCR	24SCR	Social Connect and Responsibility	0	0	2	10	20	100	-	100	1
8	AEC/SEC	24IS307X	Ability Enhancement Course/Skill Enhancement Course - III		If the course is a Theory				50	50	100	1
				14	0	0	16	30				
					If the course is a laboratory							
				0	0	28	2	30				
9	PCCL	24IS308	Data Structures and Applications laboratory	0	0	28	2	30	50	50	100	1
10	MC	24NYP1	NSS,YOGA,PE	0	0	24	0	24	100	-	100	A
11	BSC	24BCM301	Bridge Mathematics-I (Mandate Audit Course for Diploma entry students)	3	0	0		*3	100	-	100	A
Total								644	600	450	1000	21
	Note: AEC, SEC, ETC courses are to be chosen suitably by the BOS of the programme											

Engineering Science Course (ESC/ETC/PLC)			
24IS306A	OOP with Java	24IS306C	Discrete Mathematical Structures
24IS306B	OOP with C++	24IS306D	Graph Theory and Combinatorics
Ability Enhancement Course – III			
24IS307A	R Programming	24IS307C	Competitive Coding
24IS307B	Data Analytics with Excel	24IS307D	Version Controller with GiT



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	FOURTH SEMESTER											
Sl. No	Course Category	Course Code	Course Title	Teaching Hours per Semester					Exam Marks			Credits
				L	T	P	TW+SL	Total	CIE	SEE	Total	
1	IPCC	24IS401	Software Engineering	42	0	28	50	120	50	50	100	4
2	IPCC	24IS402	Microprocessor and Microcontroller	42	0	28	50	120	50	50	100	4
3	IPCC	24IS403	Database management Systems	42	0	28	50	120	50	50	100	4
4	PCC	24IS404	Design and Analysis of Algorithms	42	0	0	48	90	50	50	100	3
5	ESC	24IS405X	ESC/ETC/PLC	28	0	28	28	90	50	50	100	3
6	UHV	24UHV	Universal Human Values	0	0	28	2	30	50	50	100	1
7	AEC/SEC	24IS406X	Ability Enhancement Course/Skill Enhancement Course - IV	If the course is a Theory					50	50	100	1
				14	0	0	16	30				
				If the course is a laboratory								
				0	0	28	2	30				
8	MC	24NYP2	NSS, YOGA, PE	0	0	24		24	100	-	100	A
9	BSC	24BEIS407	Biology for Engineers	0	0	28	2	30	50	50	100	1
10	PCCL	24IS408	Design and Analysis of Algorithms laboratory	0	0	28	2	30	50	50	100	1
Total								684	550	450	1000	22
	Note: AEC, SEC, ETC courses are to be chosen suitably by the BOS of the programme											

Engineering Science Course (ESC/ETC/PLC)			
24IS405A	C# and .Net Technologies	24IS405C	Optimization Techniques
24IS405B	Internet of Things	24IS405D	Probability, Statistics and queuing
Ability Enhancement Course – III			
24IS406A	Green IT and Sustainability	24IS406C	Introduction to web technology
24IS406B	UI/UX laboratory	24IS406D	Technical writing using LATEX



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FIFTH SEMESTER												
Sl. No	Course Category	Course Code	Course Title	Teaching Hours per Semester					Exam Marks			Credits
				L	T	P	TW+SL	Total	CIE	SEE	Total	
1	IPCC	24IS501	Computer Networks	42	0	28	50	120	50	50	100	4
2	PCC	24IS502	Theoretical Foundations of Computation	28	28	0	34	90	50	50	100	3
3	IPCC	24IS503	Full Stack Development	42	0	28	50	120	50	50	100	4
4	PCCL	24IS504	Data Visualization Lab	0	0	28	2	30	50	50	100	1
5	HSMC	24IS505	Entrepreneurship and Management	42	0	0	48	90	50	50	100	3
6	HSMC	24EVS	Environmental Studies	0	28	0	2	30	50	50	100	1
7	PEC	24IS5XX	Professional Elective Course - I	42	0	0	48	90	50	50	100	3
8	MC	24NYP3	NSS, YOGA, PE	0	0	24	0	24	100	-	100	A
9	PI	24IS506	Mini Project	0	0	28	2	30	50	50	100	1
10	AEC	24RIP	Research Methodology and IPR	42	0	0	48	90	50	50	100	3
Total								714	550	450	1000	23

Professional Elective Course -I			
24IS551	Software Testing and Automation	24IS553	Prompt Engineering
24IS552	Robotic Process Automation	24IS554	Big data Technologies



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SIXTH SEMESTER												
Sl. No	Course Category	Course Code	Course Title	Teaching Hours per Semester					Exam Marks			Credits
				L	T	P	TW+SL	Total	CIE	SEE	Total	
1	PCC	24IS601	Cryptography, Network Security and Cyber Law	42	0	0	48	90	50	50	100	3
2	IPCC	24IS602	Artificial Intelligence and Machine Learning	42	0	28	50	120	50	50	100	4
3	IPCC	24IS603	Cloud Computing	42	0	28	50	120	50	50	100	4
4	PI	24IS604	Main Project Phase - I	0	0	60	0	60	50	50	100	2
5	PEC	24IS6XX	Professional Elective Course - II	28	0	28	34	90	50	50	100	3
6	OEC	24OEIS6X	Open Elective Course - I	28	0	28	34	90	50	50	100	3
7	MC	24NYP4	NSS, YOGA, PE	0	0	24	0	24	100	-	100	A
8	AEC	24ASK	Analytical Ability and Soft Skills	0	0	28	0	28	50	50	100	1
Total								622	450	350	800	20

Professional Elective Course - II			
24IS661	Storage Area Networks	24IS663	Computer Vision and Image Processing
24IS662	Supply Chain Technology	24IS664	Block Chain Technology

Open Elective Course - I			
24OEIS61	Responsible AI	24OEIS63	Introduction to Data Science
24OEIS62	Introduction to Machine Learning	24OEIS64	Prompt Engineering



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SEVENTH SEMESTER												
Sl. No	Course Category	Course Code	Course Title	Teaching Hours per Semester					Exam Marks			Credits
				L	T	P	TW+SL	Total	CIE	SEE	Total	
1	IPCC	24IS701	Deep Learning	42	0	28	50	120	50	50	100	4
2	IPCC	24IS702	Data Science using R	42	0	28	50	120	50	50	100	4
3	PI	24IS703	Main Project Phase - II	0	0	70	50	120	50	50	100	4
4	PEC	24IS7XX	Professional Elective Course - III	28	0	28	34	90	50	50	100	3
5	OEC	24OEISX	Open Elective Course – II	28	0	28	34	90	50	50	100	3
Total								540	250	250	500	18

Professional Elective Course - III			
24IS771	Virtual Reality and Augmented Reality	24IS773	DevOps: Bridging Development and Operations
24IS772	Parallel Computing	24IS774	Generative Artificial Intelligence

Open Elective Course - II			
24OEIS71	Fundamentals of Database Management System	24OEIS73	Fundamentals of Block Chain
24OEIS72	Introduction to Big Data	24OEIS74	Introduction to Data Science



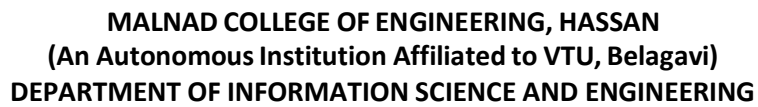
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EIGHTH SEMESTER												
Sl. No	Course Category	Course Code	Course Title	Teaching Hours per Semester					Exam Marks			Credits
				L	T	P	TW+SL	Total	CIE	SEE	Total	
1	PEC	24SW01	Professional Elective (Online Course)	42	0	0	48	90	50	50	100	3
2	OEC	24SW02	Open Elective (Online course)	42	0	0	48	90	50	50	100	3
3	PI	24INT	Internship (Research/Industry) (15-20 weeks)	0	0	12	12	120	100	100	200	10
Total								300	200	200	400	16



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#	Course	Course code	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	Mathematics for Information Science Engineering	24MAIS301	✓	✓			✓							
2	Digital Design & Computer Organization	24IS302	✓		✓		✓							
3	Operating Systems	24IS303	✓	✓	✓		✓							
4	Data Structures and Applications	24IS304	✓	✓			✓						✓	
5	Unix Laboratory	24IS305	✓	✓			✓				✓	✓		
6	Data Structures and Applications laboratory	24IS308		✓	✓									
7	OOP with Java	24IS306A	✓	✓	✓		✓						✓	
8	OOP with C++	24IS306B	✓	✓										
9	Discrete Mathematical Structures	24IS306C	✓	✓										
10	Graph Theory and Combinatorics	24IS306D	✓✓✓	✓										
11	Software Engineering	24IS401	✓	✓	✓	✓	✓		✓	✓	✓	✓		

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Course Title	MATHEMATICS FOR INFORMATION SCIENCE ENGINEERING		
Course Code	24MAIS301	(L-T-P) C	(2-2-0)3
Exam	3hrs	Hours/Week	4
SEE	50	Total Hours	42L+48ABL=90

Course Objective: Students will be able to use appropriate data structures for solving problems.

Course Outcomes: At the end of course, student will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Utilise the concept of consistency of system of equations to solve the engineering application problems and compute the number of linearly independent vectors.	1	-
2	Examine for the existence of diagonalization of matrix, find the suitable matrix of transformations so as to get the required image and analyse the system of equations to compute the number of linearly independent Eigen vectors.	1,2	-
3	Compute Fourier series of a given function, the orthogonal basis, QR factors of Matrices, and solve homogeneous differential equations using matrices	1	-
4	Write the python programme for the mathematical procedures connected with linear algebra, Fourier series and Model the real life problems/engineering application problems	1,2,5	-

MODULE-1

10hrs

Linear Algebra: Importance of Matrices in engineering. Rank of a matrix. Consistency of non homogeneous and homogeneous system of equations, Solution of the system of linear equations by Gauss elimination method and Gauss – Seidel iterative method. Linearly dependent and independent vectors.

Applications of solution of system of equations to balance the chemical equations.

Self-Study--Traffic flow problem, to find the suitable combination of food stuff so as to get the desired nutrients as prescribed by a dietician

MODULE-2

10hrs

Linear algebra: Orthogonal matrices, Gram Schmidt process, QR-factorization, symmetric matrices and quadratic forms, Matrix method to solve homogeneous differential equations of order 2, degree 1. Special matrices-matrix of rotation, reflection, translation. To find the matrix of transformation when the image of some points is given.

Self-study: Linear models in business and engineering. Partition matrices, Matrix factorization, Application to computer graphics.

MODULE-3

10hrs

Linear Algebra: Eigen values and Eigenvectors, properties, Illustrative examples.

Applications-Stretching of an elastic membrane, to determine the growth of a population model. Role of eigen values, eigenvectors in determining natural frequency, Rayleigh power method to find the highest eigen value.

Diagonalization and powers of 3X3 matrices when Eigen values are already given.



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Self-Study-- Stability analysis of differential equations which governs the dynamical systems using the concept of eigen value, eigenvectors. Applications of system of equations, linear transformation in computer science. Application of eigen value eigenvectors in data compression, Signature testing, Face recognition. Google page ranking.

MODULE-4

12hrs

Fourier Series: Periodic functions and their graphical representation, to find the function for standard graphs, to find Fourier series by change of interval method, To represent the experimental data as a Fourier series using the method - Practical harmonic analysis. application of Fourier series in engineering-To represent the signal (wave form) in terms of Fourier series, Fourier series representation for the excitation described by the wave form, graphs of Fourier series approximating the given function.

Self-Study-- Half range series method. Applications of Fast Fourier transforms, Discrete Fourier transforms in information science engineering.

Prescribed Text Book:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Higher Engineering Mathematics Dr. B. S. Grewal	Dr. B. S. Grewal	44th edition	Khanna Publications	2016
02	Advanced Engineering Mathematics	Erwin Kreyszig	8th	Wiley India Pvt. Ltd	2004
03	Calculus	Thomas Finney	9th	Thomas Finney	2002

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Advanced engineering mathematics	R K Jain and S R K Iyengar	2nd	Narosa publishers	2005

EBooks and Online course material:

1. <https://archive.org/details/higher-engineering-mathematics-bs-grewal>

Online course and video lecture:

1. NPTEL IIT Madras 2021 <http://nptel.ac.in/courses.php?disciplineID=111>

Teaching -Learning– Evaluation Scheme:

Sl.No	Teaching and Learning Method	No.of Hours/ Week	No.of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	-	-	-



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3	Activity Based Learning (ABL1&ABL2)	-	-	41
4	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				90

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Three tests conducted for 20 marks each and reduced to 10 marks	30
ACT	Demonstration activity- Assignment ,Quiz and Group activity	20
Total		50

Activity Based Learning (41Hours)

ABL1 (10Hours): Data analysis ,Report writing and presentation	27Hours
ABL2 (31 Hours): Assignment and Quiz	14 Hours
Total Learning Hours/Semester	41

Evaluation of Learning Process (7Hours)

Type of Evaluation	Hours
Test(1,2and3)	3
Presentation	1
Semester End Exam	3
Total	7

Course Articulation Matrix

Course Outcomes	Program Outcomes												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO 1	PSO2
CO1	3												
CO2	3	2											
CO3	3												
CO4	3	2			1								



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Course Title	DIGITAL DESIGN AND COMPUTER ORGANIZATION		
Course Code	24IS302	(L-T-P)C	(3-0-2) 4
Exam	3 Hrs.	Hours/Week	5
SEE	50 Marks	Total Hours	42L+28P+50ABL=120

Course Objective: Students will be able to design synchronous and asynchronous circuits. Also will understand the basic organization of a computer.

Course outcomes: At the end of course, student will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Understand the behavior of basic digital components and apply simplification techniques to design combinational logic circuits.	1	-
2	Comprehend the architecture of computer systems, memory organization and cache mapping techniques, I/O operations and instruction execution mechanisms.	1	-
3	Analyze the functionality/working of data processing circuits, sequential logic circuits, and design combinational logic circuits using gates, multiplexers, and comparators.	1,2	-
4	Carry out the implementation of combinational and sequential logic circuits from the functional description of digital systems.	5	-

MODULE-1

11 Hrs.

Digital Logic: Overview of Basic Gates and Universal Logic Gates, AND-OR-Invert Gates, Positive and Negative Logic. Combinational Logic Circuits: Boolean Laws and Theorems, Sum-of-Products Method, Truth Table to Karnaugh Map, Pairs, Quads, and Octets, Karnaugh Simplifications, Don't Care Conditions, Product-of-Sums method, Sum-of-Products method Simplification by Quine-McCluskey Method

Data-Processing Circuits: Multiplexers, Demultiplexers, EX-OR gates, Parity Generators and Checkers

MODULE-2

10 Hrs.

Data-Processing Circuits (contd.): Magnitude Comparator.

Arithmetic Circuits: Arithmetic Building Blocks, **Flip-Flops:** RS Flip-Flops, Gated Flip-Flops, Edge-triggered RS, D, JK Flip-Flops, JK Master-Slave Flip-Flops, Various Representations of Flip-Flops, **Registers:** Registers: Types of Registers, Serial In-Serial Out, Serial In-Parallel Out, Parallel In-Serial Out, Parallel In-Parallel Out.

Counters: Asynchronous Counters.

MODULE-3

10 Hrs.

Basic Structure of Computers: Basic Operational Concepts, Numbers, Arithmetic Operations and Characters, Memory Location and Addresses.

Input/Output Organization: Interrupts – Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices. Direct Memory Access, Standard I/O Interfaces – PCI Bus, USB.

MODULE-4

11 Hrs

Memory System: Basic Concepts, Semiconductor RAM Memories (till Asynchronous DRAMS), Read Only Memories, Cache Memories – Mapping Functions.

Arithmetic: Multiplication of positive numbers, Signed Operand Multiplication, Fast multiplication-Bit pair recoding of multipliers, Integer Division.

Basic Processing Unit: Some Fundamental Concepts, Execution of a Complete Instruction.



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Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Digital Principles and Applications	Donald P Leach, Albert Paul Malvino and Goutam Saha	8th	McGrawHill	2017
2	Computer Organization and Embedded Systems	Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Naraig Manjikian	6th	Tata McGraw Hill	2012

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Computer Organization & Architecture	William Stallings	7th	PHI	2006
2	Computer Organization and Design	David A Patterson, John L Hennessy - the Hardware/software Interface ARM Edition	4th	Elsevier	2009

EBooks and Online course material:

1. <https://www.v2vclass.com/images/coursepdf/bsc-cssem1/bsc-cssem1/co/fy-cs.pdf>

Online course and video lecture:

1. https://onlinecourses.nptel.ac.in/noc21_cs61/preview

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	2	14	28
3	Evaluation of Learning Process	-	-	10
4	Activity Based Learning (ABL1)	-	-	40
Total Learning Hours/Semester				120



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Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Three tests conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Lab Conduction ABL1	15 05
Total		50

Integrated Lab Component (28Hours)

#	Programs List	Hours
1.	Realize the behavior of following gates: i) AND ii) OR 3) NOT 4) NOR 5) NAND	4
2.	Design and implement BCD to Excess-3 code converter	2
3.	Simplify and realize given Boolean expressions using logic gates ($y = C' + A'D' + B'D'$).	4
4.	Design and implement a Full Adder using 4:1 multiplexer.	2
5.	Given any 4-variable logic expression ($y = C' + A'D' + B'D'$), simplify using a Karnaugh Map and realize the simplified logic expression using 8:1 Multiplexer IC	2
6.	Design and implement a Johnson Counter using 4-bit Shift Register IC.	2
7.	Design and implement a 3 stage Asynchronous Counter using J-K flip flops to count down from 7 to n .	4
8.	Design and implement: i) 4:1 Multiplexer ii) 2:4 Decoder using NAND gates	4
9.	Demonstrate all logic gates, Multiplexers, Demultiplexers, Half Adders, Full adders, Shift registers, Counters, and Flip-flops using a simulator (e.g., Logisim).	4
Total		28

Activity Based Learning (40Hours)

ABL1 (40Hours): Students engage in a hands-on exploration of circuits using an interactive simulator.		Hours
1.	Evaluate understanding of designing circuits and truth tables.	15
2.	Students present their designed circuits, explaining the logic and functionality.	15
3.	Discuss challenges faced during simulation and how they were overcome.	10
Total		40



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Evaluation of Learning Process (10Hours)

Type of Evaluation	Hours
Test (1,2 and 3)	3
Lab program Execution & Demonstration of an Activity	4
Semester End Exam	3
Total	10

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3												
CO2			3										
CO3	3												
CO4					3								



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Course Title	OPERATING SYSTEMS		
Course Code	24IS303	(L-T-P)C	(3-0-2) 4
Exam	3 Hours	Hours/Week	5
SEE	50 Marks	Total Hours	42L+28P+50ABL=120
Course Objective: Students will be able to implement different components of operating systems.			
Course outcomes: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Describe various concepts and functionalities of operating systems	1,2	-
2	Apply different Process scheduling, CPU scheduling algorithms and synchronization problems.	3	-
3	Analyze different mechanisms for handling deadlocks and memory management Algorithms	3	-
4	Implement various disk scheduling, page replacement algorithm	2,3,5,8	-
MODULE-1			11Hrs.
Introduction to Operating Systems, System Structures: What Operating Systems Do? Computer System Architecture; Operating System Structure; Operating System Operations; Operating System Services; System Calls; Types of System Calls; System Programs, Process Management: Process Concept; Operations on Processes; Inter-Process Communication. Multi-Threaded Programming: Overview; Multithreading Models.			
MODULE-2			10 Hrs.
Process Management (contd.): Process Scheduling: Basic Concepts; Scheduling Criteria; Scheduling Algorithms; Process Synchronization: The Critical Section Problem; Peterson's Solution; Synchronization Hardware; Semaphores; Classic problems of Synchronization, Monitors- Usage, Dining-Philosophers solution using monitors.			
MODULE-3			10 Hrs.
Deadlocks: System Model; Deadlock Characterization; Methods for Handling Deadlocks; Deadlock Prevention; Deadlock Avoidance; Deadlock Detection and Recovery from Deadlock. Memory Management: Memory Management Strategies: Background; Swapping; Contiguous Memory Allocation; Paging; Structure of Page Table; Segmentation.			
MODULE-4			11Hrs
Virtual Memory Management: Background; Demand Paging; Page Replacement. Storage Management: Secondary Storage Structures, Protection: Mass Storage Structures; Disk Structure; Disk Scheduling; Swap Space Management. Protection: Goals of Protection, Principles of Protection, Domain of Protection-Domain Structure, Access Matrix, Implementation of Access Matrix. Real time OS: Docker, FreeRTOS, Azure RTOS, RTEMS.			



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Prescribed Text Book:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Operating System Concepts	Abraham Silberschatz, Peter Baer Galvin, Greg Gagne	9th Edition	John Wiley & Sons	2018

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Modern Operating Systems - A Concept Based Approach	Andrew.S.Tanenbaum	4th Edition	Addison Wesley	2015
2	Introduction to Operating Systems: Concepts and Practice	P.C.P. Bhatt	2nd Edition	PHI	2008
3	Operating Systems Internals and Design Principles	William Stallings	8th Edition	Tata McGraw-Hill Education	2007

EBooks and Online course material:

1. https://archive.org/details/operating-system-concepts-9th-edition?utm_source=chatgpt.com

2) https://os-book.com/OS9/index.html?utm_source=chatgpt.com

Online course and video lecture:

1. <https://nptel.ac.in/courses/106/105/106105214/>
2. <https://www.youtube.com/watch?v=9hOSkx9jWPQ>

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	2	14	28
3	Evaluation of Learning Process	-	-	09
4	Activity Based Learning (ABL1 & ABL2)	-	-	41
Total Learning Hours/Semester				120



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Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Three tests conducted for 20 marks each and reduced to 10 marks	30
Activity Details	1) Lab Program Execution-10Marks 2) Mini projects-10Marks	20
Total		50

Integrated Lab Component (28Hours)

Sl. No	Program Details	Hours
1.	Write a C program for performing the following file handling operations a. Creation of the new file b. Opening an existing file c. Reading from the file d. Writing to the file e. Appending the file f. Copying the file g. Renaming the file	4
2.	Design and develop C program for implementing first come first serve and shortest jobfirst algorithm	4
3.	Design and develop C program for implementing round robin scheduling algorithms.	2
4.	Design and develop C program to implement first in first out and optimal page Replacement algorithm.	4
5.	Design and develop C program to implement the producer consumer program using semaphore.	4
6.	Design and develop C program to simulate banker's algorithm to avoid a deadlock.	2
7.	Design and develop C program to simulate the best fit and the worst fit contiguous memory allocation techniques.	4
8.	Design and develop C program to simulate the following disk scheduling algorithms a. FCFS b. SCAN c. SSTF d. LOOK	4
Total		28



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Activity Based Learning (41 Hours)

ABL (41Hours): To enable students to understand, design, implement, and visualize Operating System algorithms by applying them in a real-time scenario using a programming language and simulation tools.		Hours
1.	Conduct a survey on various OS algorithms (e.g., CPU Scheduling, Deadlock Avoidance, Memory Management, Paging, File Systems)	8
2.	Meeting and discussing with the faculty and fixing the problem statement.	5
3.	Prepare a design document including flowcharts, architecture, and data structures.	5
4.	Code the application in a selected language (e.g., implement Round Robin Scheduling or Least Recently Used Paging).	8
5.	Use simulation tools to visually demonstrate algorithm behavior (e.g., Gantt charts for CPU scheduling, memory blocks for paging).	8
6.	Presentation and submitting the final report.	7
Total Learning Hours/Semester		41

Evaluation of Learning Process (9 Hours)

Type of Evaluation	Hours
Test (1,2 and 3)	3
Lab program Execution and Mini Project	3
Semester End Exam	3
Total	9

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
COs													
CO1	3	3											
CO2			3										
CO3			3										
CO4			3		3			3					



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Course Title	DATA STRUCTURES AND APPLICATIONS		
Course Code	24IS304	(L-T-P)C	(3-0-0) 3
Exam	3 Hrs.	Hours/Week	3
SEE	50 Marks	Total Hours	42L+48ABL=90
Course Objective: Students will be able to use appropriate data structures for solving problems. Course outcomes: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Describe various operations on data structures like Arrays, Lists, Stacks, Queues and Trees.	1	-
2	Apply linear and non-linear data structures for solving problems.	2	1
3	Design solutions for problems using appropriate data structures.	2	1
4	Develop programs to solve a problem using data structures like stack, queue, list and tree.	2,5	2
MODULE – 1			11 Hrs.
Introduction to Data Structures: Definition, Classification of Data Structures, Dynamic Memory Allocation – Introduction, Dynamic memory allocation, malloc, calloc, free and realloc. The Stack - Definition and examples: Primitive operations, Example. Representing stacks in C: Implementing the pop operation, testing for exceptional conditions, implementing the push operation. Infix, postfix and prefix: Basic definitions and examples, evaluating a postfix expression, Program to evaluate a postfix expression, converting an expression from infix to postfix, Program to convert an expression from infix to postfix.			
MODULE – 2			10 Hrs.
Recursion: Recursive definition and processes: Factorial function, Multiplication of natural numbers, Fibonacci sequence, Binary search, Properties of recursive definition or algorithm. Recursion in C: Factorial of a number, generation of Fibonacci numbers, Binary searching, Concept of Recursive chains, Towers of Hanoi problem, Queues and lists: The queue and its sequential representation: C implementation of queues, Priority queue, Array implementation of a priority queue. Linked lists: Inserting and removing nodes from a list, Linked Implementation of stacks. Getnode and freenode operations.			
MODULE -3			11 Hrs.
Lists in C: Array implementation of lists, Limitations of array implementation, allocating and freeing dynamic variables, linked lists using dynamic variable, Queues as lists in C, Examples of list operations in C, Non integer and non-homogeneous lists. Other list structures: Circular lists, Stack as a circular list, Queue as a circular list.			
MODULE -4			10 Hrs.
Trees - Binary trees: Operations on binary trees, Applications of binary trees. Binary tree representation: Node representation of binary tree, Internal and external node, Implicit array representation of binary trees, choosing a binary tree representation, Binary tree traversals in C, Threaded binary trees.			



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Prescribed Text Book:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Data structures using C and C++, PHI,	Yedidyah Langsam and Moshe J. Augenstein and Aaron M.Tenanbaum,	2nd	Pearson Education	2015

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Data Structures: A Pseudo-code approach with C	Gilberg and Forouzan	2nd	Cengage Learning	2014
2	Programming techniques through C - A beginner's companion,	M.G.Venkateshmurthy ,	2nd	Pearson Education	2002
3	An Introduction to Data Structures with Applications	Jean-Paul Tremblay & Paul G. Sorenson,.	2nd	McGraw Hill	2013

EBooks and Online course material:

1. https://www.cet.edu.in/noticefiles/280_DS%20Complete.pdf

Online course and video lecture:

1. <https://nptel.ac.in/courses/106/102/106102064/>

Teaching -Learning- Evaluation Scheme:

Sl.No	Teaching and Learning Method	No.of Hours/ Week	No.of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	-	-	-
3	Activity Based Learning (ABL1&ABL2)	-	-	41
4	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				90



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Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Three tests conducted for 20 marks each and reduced to 10 marks	30
AAT	Demonstration activity- 1) Visualizing Data Structures through Real-Life Activities-15Marks 2) Applied Problem Solving through Competitive Programming Platforms - 5Marks	20
Total		50

Activity Based Learning (41 Hours)

ABL1 (10Hours): Students will understand and implement key data structure concepts such as Stack, Queue, Linked List, and Binary Tree by performing real-life simulation activities that reflect their practical applications	Hours
In this activity, students will demonstrate concepts of Stack, Tree constructions, Queues & Linked List , etc., using real Life activities.	10
Total	10
ABL2 (31 Hours): Applied Problem Solving through Competitive Programming Platforms	Hours
Various problem solve in any registered website	31
Total Learning Hours/Semester	41

Evaluation of Learning Process (7Hours)

Type of Evaluation	Hours
Test(1,2and3)	3
Presentation	1
Semester End Exam	3
Total	7

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3												
CO2		3										2	
CO3		3										2	
CO4		2			3								2



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Course Title	UNIX LABORATORY		
Course Code	24IS305	(L-T-P) C	(0-0-2) 1
Exam	3Hrs.	Hours/Week	2Hrs
SEE	50Marks	Total Hours	28P + 2E= 30

Course Objective: The course provides a comprehensive introduction to UNIX user commands and utilities and students will develop Shell Programming and Vi editing skills.

Course outcomes : At the end of course, student will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Demonstrate and interpret UNIX commands to perform file handling	1 ,2	2
2.	Design and develop shell scripts to automate system tasks and user operations	1 ,2,3	2
3.	Exhibit skills in identifying errors, verifying functionality, and creating AWK scripts.	1,2,	2

Teaching -Learning– Evaluation Scheme

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Laboratory Sessions	2	14	28
2	Evaluation of Learning Process	-	-	02
Total Learning Hours/Semester				30

Sl. No.	Experiments	Hours
1	Executed Fundamental UNIX shell Script commands: ls , cat, cd ,od , mkdir,echo ,date , mv , cal ,wc,pwd,rmdir,rm ,touch,sort ,read, clear,ps-u , ps whoami, alias , find ,test,expr,set,shift ,type ,grep ,sed,awk,tr,chmod,job,cut,paste,top,env,Bash	2
2	Write a shell script that takes a valid directory name as an argument and recursively descends all sub-directories, finds the maximum length of any file, and prints it.	2
3	Write a shell script that accepts a pathname and creates all the components in that pathname as directories (e.g., mpc a/b/c/d).	2
4	Write a shell script that accepts two filenames as arguments, checks if their permissions are identical, and outputs either the common permissions or each filename with its permissions.	2
5	Create a script file called file-properties that reads a filename entered by the user and outputs its properties.	1
6	Write a shell script that accepts one or more filenames as arguments and converts all of them to uppercase if they exist in the current directory.	1
7	Write a shell script that accepts a filename as an argument and displays its creation time if	2



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	the file exists, otherwise shows an error message.	
8	Write a shell script that, when executed, displays “Good Morning”, “Good Afternoon”, or “Good Evening” depending on the current time.	2
9	Write a shell script that accepts a filename, starting, and ending line numbers as arguments, and displays all lines between the given line numbers.	2
10	Write an AWK script to compute gross salary based on: - If basic < 10000: HRA=15%, DA=45% - If basic $\geq$ 10000: HRA=20%, DA=50%	2
11	Write an AWK script to delete duplicate lines from a text file while maintaining original order.	2
12	Create a shell script that functions as a countdown timer.	2
13	Write a Bash script that prompts the user to enter a number and displays its multiplication table from 1 to 10.	2
14	Create a shell script that displays all the command-line arguments passed to it.	2
15	Create a shell script to show a real-time digital clock in the terminal.	2
Total		28

Prescribed Textbook:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	UNIX :Conceptsand Applications	Sumitabha Das	4th	Tata McGraw-Hill,	2021.

Proposed Assessment Plan (for 50 marks of CIE):

Assessment	Marks
Continuous Evaluation in every lab session by the course coordinator	10
Record Writing	20
Laboratory CIE conducted by the course coordinator	20
Total	50

Course Articulation Matrix:

Course Outcomes	Program Outcomes [POs]												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2											2
CO2	3	1			2								3
CO3	3								3	3			2



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Course Title	OBJECT ORIENTED PROGRAMMING with JAVA		
Course Code	24IS306A	(L-T-P)C	(2-0-2) 3
Exam	3 Hours	Hours/Week	5
SEE	50 Marks	Total Hours	28L+28P+ 34ABL=90

Course Objective: Students will be able to implement different components of operating systems.

Course outcomes: At the end of course, student will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Comprehend the fundamental concepts of Object Oriented Programming	1, 2	1
2.	Apply Object Oriented constructs for program development	2	1
3.	Develop computer programs to solve real world problems in Java	3,5	1
4.	Implement advanced object-oriented features such as inheritance, interfaces, exception handling, and multithreading to develop robust and efficient Java applications.	5	1

MODULE-1			7 Hrs.
An Overview of Java: Object-Oriented Programming (Two Paradigms, Abstraction, The Three OOP Principles), Data Types, Type-Conversion and Casting, Automatic Type Promotion in Expressions, Arrays, Introducing Type Inference with Local Variables. Operators: The ? Operator. Control Statements: Java's Selection Statements (if, The Traditional switch), Iteration Statements (for, The For-Each Version of the for Loop, Local Variable Type Inference in a for Loop, Nested Loops), New Features in Java SE 8: Lambda Expressions, Functional Interfaces, Stream API, Default and Static Methods in Interfaces, Method References, Optional Class, New Date and Time API, Nashorn JavaScript Engine, Repeating Annotations, Type Annotations			
MODULE-2			7 Hrs.
Introducing Classes: Class Fundamentals, Declaring Objects, Assigning Object Reference Variables, Introducing Methods, Constructors, The this Keyword, Garbage Collection. Methods and Classes: Overloading Methods, Objects as Parameters, Argument Passing, Returning Objects, Access Control, Understanding static, Introducing final, Introducing Nested and Inner Classes			
MODULE-3			7 Hrs.
Inheritance: Inheritance Basics, Using super, Creating a Multilevel Hierarchy, When Constructors Are Executed, Method Overriding, Dynamic Method Dispatch, Using Abstract Classes, Using final with Inheritance. Packages, Access Protection, Importing Packages, Interfaces, The Object Class.			
MODULE-4			7 Hrs
Interfaces: Interfaces, Default Interface Methods, Use of Static Methods in an Interface. Exception Handling: Exception-Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch Clauses, throw, Java's Built-in Exceptions, Customized Exceptions. Multithreaded Programming: The Java Thread Model, The Main Thread, Creating a Thread, Creating Multiple Threads, Using isAlive() and join().			



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Prescribed Text Book:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Java the Complete Reference	Herbert Schildt	13th	Tata McGraw Hill	2024

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Introduction to JAVA Programming, Brief Version	Y. Daniel Liang	9th	Pearson Education	2019
2.	Programming with Java: A Primer	E. Balagurusamy	5th Edition	McGraw Hill Education	2014

EBooks and Online Course Material:

- <https://archive.org/details/java-the-complete-reference-11th-edition-herbert-schildt>
- <https://www.bluej.org/objects-first/>
- <https://www.murach.com/books/java.htm>

Online Course and Video Lecture:

- <https://nptel.ac.in/courses/106/105/106105191/>
- <https://www.youtube.com/watch?v=GGkBhB1ITlc>
- <https://www.coursera.org/learn/java-programming>

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	2	14	28
2	Integrated Lab Component	2	14	28
3	Activity Based Learning (ABL)	1	14	26
4	Evaluation of Learning Process	-	-	08
Total Learning Hours/Semester				90



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Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Three tests conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Lab Program Execution-15 Marks ABL-05Marks	20
Total		50

Integrated Lab Component (28 Hours)

Sl. No.	Program Description	Total Hours
1	Write a Java Program that grades multiple-choice tests. Suppose there are 'm' students and 'n' Questions, and the answers are stored in a two-dimensional array. Each row records a student's answers to the questions. The answer key is stored in a one-dimensional array. The program grades the test and displays the result.	4
2	Write a Java program to count the number of occurrences of each letter in a string regardless of case.	2
3	Write a Java program that ignores non-alphanumeric characters in checking whether a string is a palindrome.	2
4	How can a functional interface be implemented using a lambda expression in Java to enable concise and functional-style programming	3
5	Create a Class Vehicle. Demonstrate method overriding by considering any two types of vehicles.	3
6	Create a super class called Figure that stores the dimensions of a two-dimensional object. Using Dynamic polymorphism in Java, compute the area of any three two-dimensional figures.	4
7	Write a Java program to demonstrate use of interfaces for computing the Net balance Amount after considering Gross income and expenditures in an Employee of an organization.	3
8	Write a program to demonstrate use of extending interfaces.	3
9	Write a java program to demonstrate handling of Array Index Out Of Bounds Exception and Arithmetic Exception.	4
Total		28



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Activity Based Learning (26 Hours)

ABL (26 Hours): Design and implement a real-time application demonstrating the working and effectiveness of an JAVA		Hours
1.	Study the basics of Object-Oriented Programming (OOP) and core Java concepts.	4
2.	Held a discussion with the faculty to finalize the application's problem statement (e.g., Library Management System, Student Information System).	3
3.	Planned and implemented the application utilizing key OOP principles such as Classes, Objects, Inheritance, Polymorphism, Encapsulation, and Abstraction.	12
4.	Performed testing and debugging to identify and fix issues, followed by refining the application to improve its overall functionality.	4
5.	Compiled a detailed project report and delivered a final presentation/demo to showcase the developed application.	3
Total		26

Evaluation of Learning Process (8 Hours)

Type of Evaluation	Hours
Test (1,2 and 3)	3
Lab program Execution	2
Semester End Exam	3
Total	8

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2										3	
CO2		3										3	
CO3			2		3							3	
CO4					3							3	



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Course Title	OBJECT ORIENTED PROGRAMMING WITH C++		
Course Code	24IS306B	(L-T-P)C	(2-0-2)3
Exam	3Hrs	Hours/Week	4
SEE	50 Marks	Total Hours	28L+28P+ 34ABL=90
Course Objective : Students will be able to apply object oriented programming concepts in development of applications. Course outcomes: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Describe all concepts of OOPs	1	
2.	Conduct experiments to demonstrate OOPs concepts	2	1
3.	Develop solutions to problems using OOPs principles	2	1
4.	Apply Object-Oriented Programming principles using C++ to build modular, reusable, and maintainable software components.	2	
MODULE – 1			7 Hrs.
Principles of Object Oriented Programming: Object Oriented Programming Paradigm; Basic concepts of Object Oriented Programming; A Simple C++ Program; More C++ Statements; An Example with Class; Structure of C++ Program; Creating the Source File; Compiling and linking. Functions in C++: Introduction; The Main Function; Function Prototyping; Call by Reference; Return by Reference; Inline Function; Default Arguments; Const Arguments; Functions Overloading;			
MODULE – 2			7 Hrs.
Classes and Objects: Specifying a Class; Defining Member Functions; A C++ Program with Class; Making an Outside Function Inline; Nesting of Member Functions; Memory Allocation for Objects; Static Data Members; Static Member Functions; Array of Objects; Objects as Function Arguments; Constructors and Destructors: Introduction; Constructors; Parameterized Constructors; Destructors.			
MODULE -3			7 Hrs.
Operator Overloading and Type Conversions: Introduction; Defining Operator Overloading; Overloading Unary Operators; Overloading Binary Operators; Manipulation of String Using Operators; Rules for Overloading Operators; Inheritance; Extending Classes; Introduction; Defining derived Classes; Single Inheritance; Making a Private Member Inheritable; Multilevel Inheritance; Hierarchical Inheritance; Hybrid Inheritance;			
MODULE -4			7 Hrs.
Templates: Introduction; Class Templates; Class Templates with Multiple Parameters; Function Templates; Function Templates with Multiple Parameters; Exception Handling: Introduction; Basic of Exception Handling; Exception Handling Mechanism; Throwing Mechanism; Catching Mechanism; Rethrowing an Exception; Specifying Exceptions.			



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Prescribed Text Book:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Object- oriented programming with C++,	E Balguruswamy	6th	Tata McGraw Hill	2014

Reference Book:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	The Complete Reference C++,	Herbert Scheldt	4th	Tata McGraw Hill	2012

EBooks and Online course material:

1. [the CompleteReference c++](#)

Online course and video lecture:

1. https://onlinecourses.nptel.ac.in/noc19_cs38/preview

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Three tests conducted for 20 marks each and reduced to 10 marks	30
AAT	Lab Conduction-15Marks ABL-05Marks	20
Total		50



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Laboratory Plan:

Sl. No.	Program Description	Total Hours
1	Implement a simple C++ program to create a class with two data members and three member functions, create objects of this class and call the functions	4
2	Using reference variables and inline functions, Implement a C++ program to find the average of three real numbers.	4
3	Using function overloading concept, Implement a C++ program to a. add/ subtract two complex numbers and b. add/ subtract a real number to a complex number.	4
4	Using template function, Perform a generic sorting program and demonstrate the same for integers and real numbers.	3
5	Overloading the operators ++ and --, Implement a C++ program to create a stack of integers and demonstrate the push and pop operations.	4
6	Overloading the operators + and -, write a C++ program to a. Subtract two given dates and find the difference in days. b. Add given number of days to a given date	3
7	Using friend function concept, demonstrate a C++ program	3
8	Create a class called A and derive two classes B and C from this. Demonstrate single inheritance with suitable functions.	3
	Total	28

Activity Based Learning (26 Hours)

ABL(26 Hours): Design and implement a real-time application demonstrating the working and effectiveness of an C++ .		Hours
1.	Literature review on Object-Oriented Programming (OOP) principles and Java fundamentals.	4
2.	Meeting with faculty to finalize the problem statement (e.g., Library System, Student Info System).	3
3.	Designing and developing the application using core OOP concepts: Classes, Objects, Inheritance, Polymorphism, Encapsulation, and Abstraction.	12
4.	Testing, Debugging, and Enhancing the functionality of the application.	4
5.	Preparing a report and giving a final presentation/demo.	3
Total		26

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Course Title	DISCRETE MATHEMATICAL STRUCTURES AND COMBINATORICS		
Course Code	24IS306C	L-T-P	(3-0-0)3
Exam	3 Hrs.	Hours/Week	4
SEE	50 Marks	Total Hours	42L+48ABL=90
Course Objective: Introduction of Discrete structures and principle of Combinatorics which may be employed as tools in the applications of Computer Science & Information Technology.			
Course outcomes: At the end of course, student will be able to:			
#	Course outcomes	Mapping to PO's	Mapping to PSO's
1	Apply logical notation to define and reason about fundamental mathematical concepts such as sets, relations, functions, and integers	1,2	-
2	Apply induction hypotheses, various methods of proof methods in decision taking problems.	1,2	-
3	Solve combinatorial problems using counting principles.	1,2	-
4	Apply graph concepts to model and analyse problems of information science & engineering	1,2	-
MODULE-1			11 Hrs.
Set theory: A review of set operations, statements of laws of set theory, verification of set identities using Venn diagrams and Membership table. Illustrated examples. Counting principles: Rule of addition, multiplication principle. Inclusion and Exclusion Principle for 2 and 3 sets, principles of permutation, combination, generalized permutation and generalized combination principle. Illustrative examples			
MODULE-2			10 Hrs.
Fundamentals of logic: Basic logic connectives and truth tables. Logical equivalence and Tautologies. Statement of laws of logic. Logic implication - Rules of inference theory. Methods of proof: Using rules of inference theory, methods of direct and indirect proof.			
MODULE-3			11 Hrs.
Relations: Cartesian products and relations, computer representation of a relation and directed graph, properties of relations, equivalence relations and partitions. Partially ordered set and Hasse diagram. Functions: Definition, various types of functions - one to one function, onto function, bijective function, invertible functions and function composition Application of Stirling numbers of second kind.			
MODULE-4			10 Hrs.
Graph theory: Basic terminologies of a graph. Discussion of connected and disconnected graphs, Euler and Hamilton graphs, Planar graphs and Graph colouring. Trees: Definition, properties of a tree. Weighted trees, prefix codes and biconnected components. Modelling of real-life problems using graphical approach and their analysis.			



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Prescribed Text Book:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Discrete and Combinatorial Mathematics	R C Grimaldi	5th	Pearson's publications	2007

Reference Book:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Discrete Mathematical Structures	D. S. Malik & M. K. Sen	1st	Thomson's Publications	2006

EBooks and Online course material:

1. <https://archive.org/details/discretemat0000mali>

Online course and video lecture:

1. https://onlinecourses.nptel.ac.in/noc22_cs33/preview

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Classroom Teaching & Learning	3	14	42
2	Evaluation of Learning Process	-	-	07
3	Activity Based Learning	-	-	41
Total Learning Hours/Semester				90

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Three tests conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Activity Based Learning1 – 10 Marks Activity Based Learning2– 10 Marks	20
Total		50



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Course Title	GRAPH THEORY AND COMBINATORICS		
Course Code	24IS306D	L-T-P	(3-0-0)3
Exam	3 Hrs.	Hours/Week	4
SEE	50 Marks	Total Hours	42L+48ABL=90
Course Objective: Students will be able to understand combinatorics, graphs, trees and their applications.			
Course outcomes: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Identify and explain the properties of various types of graphs	1, 2	
2	Construct different types of trees, identify biconnected components and articulation points	1, 2	
3	Apply the generalized principle of Inclusion and Exclusion theorem	1, 2	
4	Apply the concept of generating functions to solve the given problems of counting theory	1, 2	
MODULE – 1			
			10 Hrs.
Introduction to Graph Theory: Definitions and Examples, Sub-graphs, Complements, and Graph Isomorphism, Vertex Degree, Euler Circuits and Trails. Planar Graphs & Graph Coloring: Definition and Examples, A Discussion on Kuratowski Graphs, Detection of Planarity of a Graph.			
MODULE – 2			
			11 Hrs.
Dual Graphs and Properties of a Dual Graph with Respect to a Planar Graph: Chromatic Number and Chromatic Polynomial of a Graph. Trees: Definition, Properties, and Examples. Rooted Trees and Binary Trees, Weighed Trees and Prefix Codes. Optimization and Matching: Transport Networks - Max-Flow Min-cut Theorem.			
MODULE -3			
			10 Hrs.
Fundamentals of Counting: The Rules of Sum and Product, Permutations, Combinations – The Binomial Theorem, Combinations with Repetition. The Catalan Numbers. Pigeon Hole Principle, Advanced Counting Techniques: The Principle of Inclusion and Exclusion – Definition and Illustrative Examples, Generalizations of the Principle			
MODULE -4			
			11 Hrs.
Derangements – Nothing Is In Its Right Place, Rook Polynomials, Arrangements with Forbidden Positions, Generating functions, introductory examples, Definition and examples. Computational Techniques, Partitions of Integers, the Exponential Generating Function, the Summation Operator.			



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Prescribed Text Book:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Discrete and Combinatorial Mathematics	R C Grimaldi	5th	Pearson's publications	2007

Reference Book:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Narsing Deo, Graph Theory with Applications to Engineering and Computer Science	PHI Publications	4th	Tata McGraw-Hill Publications	2006

EBooks and Online course material:

1. <https://archive.org/details/discretemat0000mali>

Online course and video lecture:

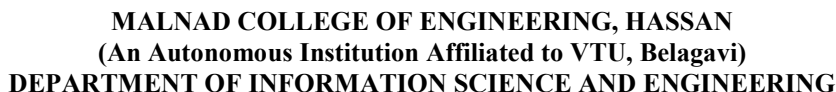
1. https://onlinecourses.nptel.ac.in/noc22_cs33/preview

Teaching -Learning- Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Classroom Teaching & Learning	3	14	42
2	Evaluation of Learning Process	-	-	07
3	Activity Based Learning	-	-	41
Total Learning Hours/Semester				90

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Three tests conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Activity Based Learning1 – 10 Marks Activity Based Learning2 – 10 Marks	20
Activity Based Learning (48 Hours)	Total	50



ABL1 (30Hours): Each student selects a real-life scenario where entities and their connections can be represented as a graph. Using graph theory concepts, students will model the scenario and perform relevant analysis (e.g., shortest path, connectivity, cycles, or optimization).		Hours
1.	Problem statement	8
2.	Develop analytical and logical reasoning using discrete concepts.	6
3.	Enhance problem-solving through abstract mathematical thinking.	12
4.	Conclusion and preparing a report.	6
Total		30
ABL2 (11 Hours): Statistical Data Visualization from Real-Life Dataset		Hours
Collect any real-world dataset (e.g., marks of students, rainfall, sales data) and represent it using Bar chart, Histogram , Pie chart ,Box plot and Line graph.		11
Total Learning Hours/Semester		41

Type of Evaluation	Hours
Test(1,2and3)	3
Presentation	1
Semester End Exam	3
Total	7

[illegible]



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Course Title	R PROGRAMMING		
Course Code	24IS307A	(L-T-P) C	(0-0-2) 1
Exam	3Hrs.	Hours/Week	2Hrs
SEE	50Marks	Total Hours	28P + 2E = 30

Course Objective: Students will be able to learn and practice programming techniques using R programming.

Course out comes: At the end of course, student will be able to:

#	Course Outcomes	Mapping to PO's	Mappi ng to PSO's
1.	The fundamental syntax of R data types, expressions and the usage of the R-Studio IDE.	1	-
2.	Develop a program in R with programming constructs: conditionals, looping and functions.	3	-
3.	Apply the list and data frame structure of the R programming language.	2	-
4.	Use visualization packages and file handlers for data analysis.	3	-

Teaching -Learning– Evaluation Scheme

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Laboratory Sessions	2	14	28
2	Evaluation of Lab Work	-	-	02
Total Learning Hours/Semester				30

Sl.No	Experiments	Hours
1.	Demonstrate the steps for installation of Rand R Studio. Perform the following: a) Assign different type of values to variables and display the type of variable. Assign different types such as Double, Integer, Logical, Complex and Character and understand the difference between each data type. b) Demonstrate Arithmetic and Logical Operations with simple examples. c) Demonstrate generation of sequences and creation of vectors. d) Demonstrate Creation of Matrices e) Demonstrate the Creation of Matrices from Vectors using Binding Function. f) Demonstrate element extraction from vectors ,matrices and arrays Suggested Reading – Text Book 1 – Chapter 1 (What is R, Installing R, Choosing an IDE – R Studio, How to Get Help in R, Installing Extra Related Software), Chapter 2 (Mathematical Operations and Vectors, Assigning Variables, Special Numbers, Logical Vectors), Chapter 3 (Classes, Different Types of Numbers, Other Common Classes, Checking and Changing Classes, Examining Variables)	3



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2.	Assess the Financial Statement of an Organization being supplied with 2 vectors of data: Monthly Revenue and Monthly Expenses for the Financial Year. You can create your own sample data vector for this experiment) Calculate the following financial metrics: - Profit for each month. - Profit after tax for each month (Tax Rate is 30%). - Profit margin for each month equals to profit after tax divided by revenue. - Good Months – where the profit after tax was greater than the mean for the year. - Bad Months – where the profit after tax was less than the mean for the year. - The best month – where the profit after tax was max for the year. - The worst month – where the profit after tax was min for the year. Note: - All Results need to be presented as vectors - Results for Dollar values need to be calculated with \$0.01 precision, but need to be presented in Units of \$1000 (i.e. 1k) with no decimal points - Results for the profit margin ratio need to be presented in units of % with no decimal point. - It is okay for tax to be negative for any given month (deferred tax asset) - Generate CSV file for the data. Suggested Reading – Text Book 1 – Chapter 4 (Vectors, Combining Matrices)	3
3.	Develop a program to create two 3 X 3 matrices A and B and perform the following Operations a) Transpose of the matrix b) addition c) subtraction d) multiplication Suggested Reading – Text Book 1 – Chapter 4 (Matrices and Arrays – Array Arithmetic)	3
4.	Develop a program to find the factorial of given number using recursive function calls. Suggested Reading – Reference Book 1 – Chapter 5 (5.5 – Recursive Programming) Text Book 1 – Chapter 8 (Flow Control and Loops – If and Else, Vectorized If, while loops, for loops), Chapter 6 (Creating and Calling Functions, Passing Functions to and from other functions)	3
5.	Develop an R Program using functions to find all the prime numbers up to a specified number by the method of Sieve of Eratosthenes. Suggested Reading – Reference Book 1 - Chapter 5 (5.5 – Recursive Programming)Text Book 1 – Chapter 8 (Flow Control and Loops – If and Else, Vectorized If, while loops, for loops), Chapter 6 (Creating and Calling Functions, Passing Functions to and from other functions)	3
6.	The built-in data set mammals contain data on body weight versus brain weight. Develop R commands to: - Find the Pearson and Spearman correlation coefficients. Are they similar? - Plot the data using the plot command. Plot the logarithm (log) of each variable and see if that makes a difference. Suggested Reading – Text Book 1 –Chapter 12 – (Built-in Datasets) Chapter 14 – (Scatter plots) Reference Book 2 – 13.2.5 (Covariance and Correlation)	3
7.	Let us use the built-in dataset air quality which has Daily air quality measurements in New York, May to September 1973. Develop R program to generate histogram by using appropriate arguments for the following statements. - Assigning names, using the air quality data set. - Change colors of the Histogram - Remove Axis and Add labels to Histogram - Change Axis limits of a Histogram	4



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	e) Add Density curve to the histogram Suggested Reading –Reference Book 2 – Chapter 7 (7.4 – The ggplot2 Package), Chapter 24 (Smoothing and Shading)	
8.	Design a data frame in R for storing about 20 employee details. Create a CSV file named “input.csv” that defines all the required information about the employee such as id, name, salary, start date, dept. Import into R and do the following analysis. a) Find the total number rows & columns b) Find the maximum salary c) Retrieve the details of the employee with maximum salary d) Retrieve all the employees working in the IT Department. e) Retrieve the employees in the IT Department whose salary is greater than 20000 and write these details into another file “output.csv” Suggested Reading – Text Book 1 – Chapter 12(CSV and Tab Delimited Files)	3
9.	Using the built in dataset mt cars which is a popular dataset consisting of the design and fuel consumption patterns of 32 different automobiles. The data was extracted from the 1974 Motor Trend US magazine, and comprises fuel consumption and 10 aspects of automobile design and performance for 32 automobiles (1973-74 models). Format A data frame with 32 observations on 11 variables : [1] mpg Miles/(US) gallon, [2] cyl Number of cylinders [3] disp Displacement (cu.in.), [4] hp Gross horsepower [5] drat Rear axle ratio,[6] wt Weight (lb/1000) [7] qsec 1/4 mile time, [8] vs V/S, [9] am Transmission (0 = automatic, 1 = manual), [10] gear Number of forward gears, [11] carb Number of carburetors. Develop R program, to solve the following:	3
Total		28

Prescribed Text Book:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Learning R: a step by step function guide to data analysis	Cotton	1st	O’ reilly Media Inc	2017

Proposed Assessment Plan (for 50marks of CIE):

Assessment	Marks
Continuous Evaluation in every lab session by the course coordinator	10
Record Writing	20
Laboratory CIE conducted by the course coordinator	20
Total	50



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Course Title	DATA ANALYTICS WITH EXCEL		
Course Code	24IS307B	(L-T-P)C	(0-0-2) 1
Exam	3 Hrs.	Hours/Week	2 Hrs
SEE	50 Marks	Total Hours	28P+2E=30

Course Objective: To learn and practice various Data analytics using Excel tool.

Course outcomes: Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	To understand the mathematical calculation performed in Excel.	1,2	-
2	To apply sorting, Filtering and condition format for the various problems.	2,3,5	-
3	Gain insights into making data-driven decisions using Excel's analytical tools and present the findings in a clear, professional manner	5,7,8,9,10	-

Sl. No	Teaching and Learning Method	No. of Hours/Week	No.of weeks	Hours/ Semester		
1	Laboratory Sessions	2	14	28		
2	Evaluation of Learning Process	2	-	02		
			Total	30		
Sl. no	Program details			Hours		
1.	In a company, 30 employee details (Name, Date of joining, Qualification and salary) are stored in Microsoft Access database and text file. Using Excel tool import the data from different sources for analysis.			2		
2.	Suppose a class of size 40 having SGPA of 8 semesters between 5 to 10. Calculate the CGPA of each student in below Grade form.			2		
	O	S	A	B	C	
	100>=9	8-8.9	7-7.9	6-6.9	5-5.9	
3.	Create 10 students name in the form of First name, Middle name and Last name. Concatenate all the names and store in one column and also find the length of each name.			4		
4.	Suppose your customer survey results from the east and west regions, month wise are.			4		
	MONTH	EAST	WEST	LOW(<50%)	MEDIUM (50%-80%)	HIGH(>80%)
	15-Apr	86.40%	63.00%	50%	30%	20%
	15-May	45.80%	58.90%	50%	30%	20%
	15-Jun	44.10%	81.60%	50%	30%	20%
	15-Jul	77.60%	86.10%	50%	30%	20%
	15-Aug	80.70%	95.00%	50%	30%	20%
	For the above date, display customer satisfaction survey using Band Chart.					
5.	There is a loan of 5,000,000 for tenure of 30 years. You want to know the monthly payments (EMI) for varied interest rates. You also might be interested in knowing the amount of interest and Principal that is paid in the second year			4		



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6.	Suppose there is a bookstore that has 100 books in storage. The original price of the book is 250 and certain number of books was sold at that price. Later, the bookstore announced a 10% discount on that book and cleared off the stock. You might want to know how many books are sold at the original price to obtain total revenue of 24,500.	2
7.	Suppose you want to have a report displaying the following – - Data for five disciplines - Archery, Diving, Fencing, Figure Skating and Speed Skating. - Regions that scored more than 80 medals in these 5 disciplines. - The count of medals in each of the five disciplines in each of these regions. Total count of medals for the five disciplines in each of these regions.	4
8.	Consider the data of 20 employee are stored into two different tables. first table consists of name,employee id and second table consists of employee id ,salary.Find the employee salary using lookup table from second table to first.	2
9.	In Olympic, 20 countries participated and won various medals by male and female in equal propositions. Display the medal count for each country with power view charts (Pie,Column,Bar,Line,Scatter, and Bubble).	2
10.	Consider the sequence of the data from 1 to 100 where male 48% and female 52% in the data. For the given data, create male vs female info-graphic chart .	2
Total		28

Proposed Assessment Plan (for 50 marks of CIE):

Assessment	Marks
Continuous Evaluation in every lab session by the course coordinator	10
Record Writing	20
Laboratory CIE conducted by the course coordinator	20
Total	50

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]												
COs	PO1	PO 2	PO3	PO4	PO 5	PO6	PO 7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3											
CO2		2	3		3								
CO3					3		3	3	3	3			



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Course Title	COMPETITIVE CODING		
Course Code	24IS307C	(L-T-P) C	(0-0-2) 1
Exam	3Hrs.	Hours/Week	2Hrs
SEE	50Marks	Total Hours	28P+ 2E = 30

Course Objective: Apply algorithmic thinking to analyze and solve computational problems efficiently.

Course outcomes: At the end of course, student will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Analyze the time and space complexity of algorithms and select the most efficient approach for given problems.	1,2	-
2.	Implement standard algorithms and data structures (e.g., sorting, searching, recursion, dynamic programming, graph traversal) using programming languages such as C++, Java, or Python.	1,3	-
3.	Design, implement, and debug solutions under time constraints typical of programming contests.	2,3	-
4.	Demonstrate improved coding accuracy, speed, and logical reasoning suitable for technical interviews and contests.	2,3	-

Teaching -Learning– Evaluation Scheme

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Laboratory Sessions	2	14	28
2	Evaluation of Learning Process	-	-	02
Total Learning Hours/Semester				30

Sl. NO	Experiments	Hours
1.	Introduction & Basics Overview of competitive programming platforms.	4
2.	String-Based Question	4
3.	Recursion Basics of recursion,	4
4.	Stack-Based Questions	4
5.	Queue-Based Questions	4
6.	Linked List-Based Questions	4
7.	Tree-Based Questions Binary search and applications	4
Total		28



Assessment	Marks
Continuous Evaluation in every lab session by the course coordinator	10
Record Writing	20
Laboratory CIE conducted by the course coordinator	20
Total	50

[illegible]



MALNAD COLLEGE OF ENGINEERING, HASSAN
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DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

Course Title	VERSION CONTROLLER WITH GIT		
Course Code	24IS307D	(L-T-P) C	(0-0-2) 1
Exam	3 Hrs.	Hours/Week	2 Hrs
SEE	50 Marks	Total Hours	28 P+ 2 E = 30

Course Objective: Students will be familiarized with basic commands of Git and understand how to collaborate and work with Remote Repositories.

Course outcomes: At the end of course, student will be able to:

#	Course Outcomes	Mappin gto PO's	Mappin gto PSO's
1.	Use the basics commands related to git repository	1	-
2.	Create and manage the branches	1	-
3.	Apply commands related to Collaboration and Remote Repositories	2,5	-
4.	Use the commands related to Git Tags, Releases and advanced git operations, Analyse and change the git history	1,2	-

Teaching -Learning– Evaluation Scheme

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Laboratory Sessions	2	14	28
2	Evaluation of Learning Process	-	-	02
Total Learning Hours/Semester				30

Sl.NO	Experiments	Hours
1.	Setting Up and Basic Commands Initialize a new Git repository in a directory. Create a new file and add it to the staging area and commit the changes with an appropriate commit message.	2
2.	Creating and Managing Branches Create a new branch named "feature-branch." Switch to the "master" branch. Merge the "feature-branch" into "master."	4
3.	Creating and Managing Branches Write the commands to stash your changes, switch branches, and then apply the stashed changes.	2
4.	Collaboration and Remote Repositories Clone a remote Git repository to your local machine.	2
5.	Collaboration and Remote Repositories Fetch the latest changes from a remote repository and rebase your local branch onto the updated	2



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	remote branch.	
6.	Collaboration and Remote Repositories Write the command to merge "feature-branch" into "master" while providing a custom commitmessage for the merge.	2
7.	Git Tags and Releases Write the command to create a lightweight Git tag named "v1.0" for a commit in your local repository.	2
8.	Advanced Git Operations Write the command to cherry-pick a range of commits from "source-branch" to the current branch.	2
9.	Analysing and Changing Git History Given a commit ID, how would you use Git to view the details of that specific commit, including the author, date, and commit message?	2
10.	Analysing and Changing Git History Write the command to list all commits made by the author "JohnDoe" between "2023-01-01" and "2023-12-31."	2
11.	Analysing and Changing Git History Write the command to display the last five commits in the repository's history.	2
12.	Analysing and Changing Git History Write the command to undo the changes introduced by the commit with the ID "abc123".	4
Total		28

Prescribed Text Book:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Version Control with Git	Prem Kumar Ponuthurai, Jon Loeliger	3rd	O'Reilly Media	2017

Proposed Assessment Plan (for 50 marks of CIE):

Assessment	Marks
Continuous Evaluation in every lab session by the course coordinator	10
Record Writing	20
Laboratory CIE conducted by the course coordinator	20
Total	50



MALNAD COLLEGE OF ENGINEERING, HASSAN
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DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

Course Title	DATA STRUCTURES AND APPLICATION LABORATORY		
Course Code	24IS308	(L-T-P)C	(0-0-2) 1
Exam	3 Hrs.	Hours/Week	2 Hrs
SEE	50 Marks	Total Hours	28P+2E=30

Course Objective: This laboratory course enables students to get practical experience in design, develop, implement, analyze.

Course outcomes: At the end of course, student will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Analyze various linear and non-linear data structures	2	
2	Demonstrate the working nature of different types of data structures and their applications	2,3	
3	Apply the appropriate data structure for solving real world problems	2,3	1

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	2	14	28
2	Evaluation of Learning Process	-	-	02
Total Learning Hours/Semester				30
ABL1:Lab based learning(28 Hrs)				

Sl.No	Program deatils	hours
1.	Design and Implement a menu driven Program in C for the following Arrayoperations: 1.Creating an Array of N Integer Elements 2.Display of Array Elements with Suitable Headings 3.Inserting an Element (ELEM) at a given valid Position (POS) 4.Deleting an Element at a given valid Position (POS)	4
2.	Illustrate the concepts of malloc(), calloc(),realloc() for the dynamic allocation of memory	2
3.	Write a C Program to create a class called STACK to store Integers for the following operations (Array Implementation of Stack with maximum size MAX) a. Push an Element on to Stack b. Pop an Element from Stack c. Demonstrate Overflow and Underflow situations on Stack	2
4.	Write recursive C Programs for 1. Searching an element in a given list of integers using the Binary searchmethod. 2. Solving the Towers of Hanoi problem.	2



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5.	Develop a Program in C for converting an Infix Expression to Postfix Expression. Program should support for both parenthesized and free parenthesized expressions with the operators: +, -, *, /, % (Remainder), ^ (Power) and alphanumeric operands.	4
6.	Create a Queue, perform different operations such as Insert, Delete and Display.	2
7.	Write a menu driven C Program to simulate the working of a Circular Queue of integers using an array. Provide the following operations: a. Insert b. Delete c. Display	2
8.	Write a menu driven C Program using dynamic variables and pointers, to construct a Singly linked list of integers and perform insertion and deletion operations.	2
9.	Write a menu driven C Program using dynamic variables and pointers to construct a Stack of integers using Singly linked list and to perform the following operations: a. Push b. Pop c. Display	4
10.	Write a menu driven C Program 1. To construct a binary search tree of integers. 2. To traverse the tree using all the methods i.e., In-order, Pre-order and Post-order.	4
TOTAL		28

Proposed Assessment Plan (for 50 marks of CIE):

Assessment	Marks
Continuous Evaluation in every lab session by the course coordinator	10
Record Writing	20
Laboratory CIE conducted by the course coordinator	20
Total	50

Prescribed Text Book:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Data structures using C and C++, PHI,	Yedidyah Langsam and Moshe J. Augenstein and Aaron M.Tenanbaum,	2nd	Pearson Education	2015



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Course Title	SOCIAL CONNECT & RESPONSIBILITY		
Course Code	24SCR	L-T-P	(0-0-2)1
Exam	3 Hrs.	Hours/Week	2
CIE	100 Marks	Total Hours	20 hours
Course Objective: Provide a formal platform for students to communicate and connect with their surroundings and create a responsible connection with society.			
Course outcomes: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to PO's	
1	Describe societal challenges and build solutions to alleviate these complex social problems through immersion, design & technology.	3,5,6	
2	Communicate and connect with their surroundings.	7,11	
MODULE – 1			
Plantation and adoption of a tree: Plantation of a tree that will be adopted by a group of students. They will also make an excerpt either as a documentary or a photo blog describing the plant's origin, its usage in daily life, and its appearance in folklore and literature.			
MODULE – 2			
Heritage walk and crafts corner: Heritage tour, knowing the history and culture of the city, connecting to people around through their history, knowing the city and its craftsman, photo blog and documentary on evolution and practice of various craft forms.			
MODULE -3			
Organic farming and waste management: Usefulness of organic farming, wet waste management in neighboring villages, and implementation in the campus.			
MODULE -4			
Water Conservation: knowing the present practices in the surrounding villages and implementation in the campus, documentary or photo blog presenting the current practices. Food Walk City's culinary practices, food lore, and indigenous materials of the region used in cooking.			
Course Conduction			
A total of 15-20 hours engagement per semester is required for the course. Students will be divided into teams and each team will be handled by two faculty mentors . Faculty mentors will design the activities for evaluation.			
Guideline for Assessment Process:			
Continuous Internal Evaluation (CIE)			
After completion of, the social connect, the student shall prepare, with daily diary as reference, a comprehensive report in consultation with the mentor/s to indicate what he has observed and learned in the social connect period. The report should be signed by the mentor. The report shall be evaluated on the basis of the following criteria and/or other relevant criteria pertaining to the activity completed.			
• Dairy recording the details of activity conducted • Planning and scheduling the social connect • Information/Data collected during the social connect • Analysis of the information/data and report writing Considering all above points allotting the marks as mentioned below			
Excellent	80 to 100		
Good	60 to 79		
Satisfactory	40 to 59		
Unsatisfactory and fail	<=39		



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Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1			3		2	3							
CO2							3				3		



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Course Title	NATIONAL SERVICE SCHEME(NSS)		
Course Code	24NYP1	(L-T-P)C	(0-0-2)
Exam	-	Hours/Week	2
SEE	-	Total Hours	24

Course Outcomes :At the end of the course, the student will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Understand the importance of his/her responsibilities towards society	6	
2	Analyze the environmental and societal problems/issues and will be able to design solutions for the same.	3,6	
3	Evaluate the existing system and to propose practical solutions for the same for sustainable development.	3,6	
4	Implement government or self-driven projects effectively in the field.	11	
5	Develop capacity to meet emergencies and natural disasters & practice national integration and social harmony in general.	11	

MODULE-1	8 Hrs.
Organic farming, Indian Agriculture(Past, Present and Future)Connectivity for marketing	
MODULE-2	8Hrs.
Waste management–Public, Private and Govt.organization,5R's.	
MODULE-3	8 Hrs.
Setting of the information imparting club for women leading to contribution in social and economic issues.	

Suggested Learning Resources:

Books:

1. NSS Course Manual, Published by NSS Cell, VTU Belagavi.
2. Government of Karnataka ,NSS cell, activities reports and its manual.
3. Government of India, NSS cell, Activities reports and its manual.



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Course Title	PHYSICAL EDUCATION(PE)		
Course Code	24NYP1	(L-T-P)C	(0-0-2)
Exam	-	Hours/Week	2
SEE	-	Total Hours	24

Course Outcomes: At the end of the course, the student will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Understand the Fundamental concepts and skills of Physical Education, Health, Nutrient ion and Fitness	9,10,12	
2	Familiarization of health –related Exercises, Sports for over all growth and development	9,12	
3	Create a foundation for the professionals in Physical Education and sports	12	
4	Participate in the competition at regional/state/national/international levels.	9,10,12	
5	Create consciousness among the students on Health,fitness and Wellness in developing and maintain g a healthy lifestyle	9,10,12	

MODULE-1	4 Hrs.
Orientation- Lifestyle ,Health & Wellness, Pre-Fitness test.	
MODULE-2	4Hrs.
General Fitness & Components of Fitness –Warming up(Free Hand exercises),Strength–Push-up/Pull-ups, Speed – 30 mtr Dash	
MODULE-3	16Hrs.
Specific games(Any one to be selected by the student)	
1. Kabaddi– Hand touch, Toe Touch, Thigh Hold, Ankle hold and Bonus.	
2. Kho-Kho– Giving Kho, Single Chain, Poledive, Poleturning,3-6Up.	



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Course Title	YOGA		
Course Code	24NYP1	(L-T-P)C	(0-0-2)
Exam	-	Hours/Week	2
SEE	-	Total Hours	24

Course Outcomes: At the end of the course, the student will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Understand the Philosophical and Scientific Basis of Yoga	12	-
2	Demonstrate Proficiency in Basic Yoga Practices	9	-
3	Analyze the Role of Yoga in Managing Stress and Enhancing Lifestyle	7,12	-
4	Apply Yoga Principles for Personal and Professional Growth	10,12	-

MODULE-1		8 Hrs.
Introduction of Yoga		
Aim and Objectives of yoga, Prayer, Brief introduction of yogic practices for common man, Rules and regulations, Misconceptions of yoga		
MODULE-2		8Hrs.
Suryanamaskara		
Suryanamaskar prayer and its meaning, Need, importance and benefits of Suryanamaskar 12 count, 2 rounds		
MODULE-3		8 Hrs.
Different types of Asanas		
a. Sitting 1. Padmasana 2. Vajrasana b. Standing 1. Vrikshana 2. Trikonasana c. Prone 1. Bhujangasana 2. Shalabhasana d. Supine 1. Uttitadvipadasana 2. Ardhalasana		



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Course Title	SOFTWARE ENGINEERING		
Course Code	24IS401	(L-T-P)C	(3-0-2) 4
Exam	3 Hrs.	Hours/Week	5
SEE	50 Marks	Total Hours	50(36L+14P)
Course Objective: Use software engineering principles for application development. Course Outcomes: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Analyze a system for identifying the software requirements	2	2
2.	Differentiate process models to judge which process model has to be adopted for the given scenarios.	3	2
3.	Apply different approaches of verifying and validating a software product and analyze the agile methodology.	1,4,5	2
4.	Illustrate the role of project planning and quality management in software development.	3,7,8,9,10	2
MODULE – 1			9 Hrs.
Introduction: Professional Software Development, Software Engineering Ethics. Case studies, Software Processes: Software Processes models, Process activities, coping with change, The Rational Unified Process. Agile Software Development: Agile Methods, Plan-driven and Agile Development, Extreme programming. Agile Project Management. Scaling Agile Methods. Case Studies- A patient information system for mental health care, A wilderness weather station			
MODULE – 2			9 Hrs.
Requirements Engineering: Functional and non-functional requirements. The software Requirements Document. Requirements Specification, Requirements Engineering Processes. Requirements Elicitation and Analysis. Requirements validation. Requirements Management. System Models: Context models. Interaction models. Structural models. Behavioral models. Model-driven engineering.			
MODULE -3			9 Hrs.
Design and Implementation: Object-oriented design using the UML, Design patterns, Implementation issues, Open source development. Software Testing: Development testing, Test-driven development, Release testing, User testing. Software Evolution: Evolution processes, Program evolution dynamics. Software maintenance, Legacy system management. Designing UML diagrams			
MODULE -4			9 Hrs.
Software Project Management: Software Project Management Complexities, Responsibilities of a software project Manager, Project Planning, Metrics for project size estimation, Project estimation techniques, Empirical estimation techniques, Scheduling, Organization and Team Structures, Staffing, Risk Management. COCOMO, ISO9000, SEI Capability Maturity Model, Six Sigma.			



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Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Software Engineering	Ian Sommerville	10th	Pearson Education	2017
2	Fundamentals of Software Engineering	Rajib Mall	4th	Prentice-Hall Of India Pvt. Ltd., ISBN(Chapters: 3)	2015

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Software Engineering - A Practitioners Approach	Roger S. Pressman	7th	McGraw-Hill,	2009
2	Software Engineering Principles and Practice	Waman S. Jawadekar	4th	Tata McGraw-Hill	2004
3	A Concise introduction to Software Engineering	Pankaj Jalot	3rd	Springer	2008

E-Book and online course material:

- 1) <https://engineering.futureuniversity.com/BOOKS%20FOR%20IT/Software-Engineering-9th-Edition-by-Ian-Sommerville.pdf>

Online Course and Video Lecture:

- 1) <https://nptel.ac.in/courses/106/105/106105182>

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Program Execution 2) Quiz	20
Total		50



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Laboratory Plan:

Sl. No	Program Details
1	Discuss success and failure stories of software, software ethical practices and Laws for IT industry in India.
2	Case study to understand the SDLC on video doorbell.
3	Create JIRA (similar tool) account and learn interface
4	Organize role play for requirement activities for Zomato and Identify a problem and prepare requirement document or Epics and user stories.
5	Configure JIRA for managing the project to solve the identified problem.
6	Draw UML diagram for given use case using Draw.io tool
7	Create Git (Similar tool) account and configure repository.
8	Create Sitemap and Wireframe for the user stories. (Using Figma tool)

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1		2											2
CO2			3										2
CO3	2			2	2								2
CO4			2				2	3	2	3			2



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Course Title	MICROPROCESSOR AND MICROCONTROLLER																						
Course Code	24IS402	(L-T-P)C	(3-0-2)4																				
Exam	3 Hrs.	Hours/Week	5																				
SEE	50 Marks	Total Hours	50 (36L+14P)																				
Course Objective: To get acquainted with the importance and applications of Microprocessor and Microcontroller. Course outcomes: At the end of course, student will be able to: <table> <tr> <th>#</th><th>Course Outcomes</th><th>Mapping to PO's</th><th>Mapping to PSO's</th></tr> <tr> <td>1</td><td>Describe the complete architecture of the 8086 processor and the Segmented memory management.</td><td>1</td><td>-</td></tr> <tr> <td>2</td><td>Develop and analyze assembly language programs using the 8086/8088 instruction set and assembler directives</td><td>3</td><td>-</td></tr> <tr> <td>3</td><td>Differentiate between microprocessors and microcontrollers, and explain the fundamentals of ARM architecture and embedded system components</td><td>2,5</td><td>-</td></tr> <tr> <td>4</td><td>Apply ARM instruction set to write and optimize assembly language programs using performance-aware techniques such as profiling and instruction scheduling..</td><td>3,5</td><td>-</td></tr> </table>				#	Course Outcomes	Mapping to PO's	Mapping to PSO's	1	Describe the complete architecture of the 8086 processor and the Segmented memory management.	1	-	2	Develop and analyze assembly language programs using the 8086/8088 instruction set and assembler directives	3	-	3	Differentiate between microprocessors and microcontrollers, and explain the fundamentals of ARM architecture and embedded system components	2,5	-	4	Apply ARM instruction set to write and optimize assembly language programs using performance-aware techniques such as profiling and instruction scheduling..	3,5	-
#	Course Outcomes	Mapping to PO's	Mapping to PSO's																				
1	Describe the complete architecture of the 8086 processor and the Segmented memory management.	1	-																				
2	Develop and analyze assembly language programs using the 8086/8088 instruction set and assembler directives	3	-																				
3	Differentiate between microprocessors and microcontrollers, and explain the fundamentals of ARM architecture and embedded system components	2,5	-																				
4	Apply ARM instruction set to write and optimize assembly language programs using performance-aware techniques such as profiling and instruction scheduling..	3,5	-																				
MODULE – 1			09 Hrs.																				
The 8086/8088 Processors: Register Organization of 8086, Architecture, Signal descriptions of 8086, Physical memory organization, General bus operation, I/O Addressing capability, Special processor activities, 8086 Machine language Instruction formats, addressing modes of 8086, Instruction set of 8086/8088.																							
MODULE – 2			09 Hrs.																				
8086/8088 Instruction Set & Assembler Directives: Assembler Directives and Operators. Instruction Set. The art of Assembly Language Programming with 8086/8088: A few machine level programs, Machine coding the programs.																							
MODULE -3			09 Hrs.																				
Microprocessors versus Microcontrollers, ARM Embedded Systems: The RISC design philosophy, The ARM Design Philosophy, Embedded System Hardware, Embedded System Software. ARM Processor Fundamentals: Registers, Current Program Status Register, Pipeline, Exceptions, Interrupts, and the Vector Table.																							
MODULE -4			09 Hrs.																				
Introduction to the ARM Instruction Set: Data Processing Instructions, Programme Instructions, Software Interrupt Instructions, Program Status Register Instructions, Coprocessor Instructions, Loading Constants. ARM programming using Assembly language: Writing Assembly code, Profiling and cycle counting, instruction scheduling, Register Allocation.																							



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Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Advanced Microprocessors and Peripherals	Ajoy Kumar Ray & Kishor M Bhurchandi,	3rd	McGraw Hill publication	2018
2.	ARM system developer's guide,	Andrew N Sloss, Dominic Symes and Chris Wright,	3rd	Kaufman publishers	2008

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Microprocessors and Interfacing Programming and Hardware	Douglas V. Hall,	2nd	McGra Hill publication	2018
2	Microcontroller (ARM) and Embedded System	Raghunandan G.H	2nd	Cengage learning Publication	2019
3.	The Insider's Guide to the ARM7 Based Microcontrollers, Ltd	Trevor Martin	1st	Hitex Publication	2005

E-Book and online course material:

- 1) https://www.mheducation.co.in/advanced-microprocessor-and-peripherals-9781259006135-india?utm_source=chatgpt.com

Online Course and Video Lecture:

- 1) https://onlinecourses.nptel.ac.in/n oc22_ee09/preview

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Program Execution	20
Total		50



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Laboratory Plan:

Sl. No	Program Details
PART -A: Conduct the following 8086 Microprocessor experiments by writing program using MASM.	
1	Write a program to find factorial of a number.
2	Performing binary search on given 'n' 8 - bit and 16 - bit numbers.
3	Reversing a given string and check whether it is a palindrome or not.
4	Generating and print the first n Fibonacci numbers.
5	Performing the bubble sort on given n 8-bit numbers.
6	Finding out whether given sub string is present or not in main string of characters.
7	Computing Binomial coefficient using recursive procedure; assume n and r are non-negative integers.
8	Developing macros, to read a character from the key board in a module and to display a character from the module.
PART –B: Conduct the following experiments on an ARM7TDMI/LPC2148 evaluation board using evaluation version of Embedded 'C' & Keil Uvision-4 tool/compiler.	
1	Display “Hello World” message using Internal UART.
2	Interface and Control a DC Motor.
3	Interface a Stepper motor and rotate it in clockwise and anti-clockwise direction.
4	Determine Digital output for a given Analog input using Internal ADC of ARM controller.
5	Interface a DAC and generate Triangular and Square waveforms.
6	Interface a 4x4 keyboard and display the key code on an LCD.
7	Demonstrate the use of an external interrupt to toggle an LED On/Off.
8	Display the Hex digits 0 to F on a 7-segment LED interface, with an appropriate delay in between.



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Course Articulation Matrix

Course Outcomes	Program Outcomes[PO's]												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3												
CO2			2										
CO3		2			3								
CO4			3		3								



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Course Title	DATABASE MANAGEMENT SYSTEMS		
Course Code	24IS403	(L-T-P)C	(3-0-2) 4
Exam	3 Hrs.	Hours/Week	5
SEE	50 Marks	Total Hours	50 (36L+14P)
Course Objective: Students will acquire the concepts of database, and application of SQL for solving problem. Course outcomes: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Explain the fundamental concepts and applications of Database Management Systems.	1	-
2.	Design Entity-Relationship diagrams for real-world applications and construct appropriate SQL queries.	2, 3, 5	1, 2
3.	Apply normalization techniques and analyze transaction management concepts including concurrency and recovery mechanisms.	1, 2, 4	-
4.	Compare traditional relational databases with NoSQL systems and demonstrate basic CRUD operations in MongoDB.	5, 11	2
MODULE-1			9 Hrs.
Introduction: Introduction, an example, Characteristics of Database approach, Actors on the Screen Workers Behind the Scene, Advantages of Using DBMS Approach. Data Models, Schemas and Instances, Three-schema Architecture and Data Independence, Database Languages and Interfaces The Database System Environment. Entity-Relationship Model: Using High-Level Conceptual Data Models for Database Design, An Example Database Application, Entity Types, Entity Sets, Attributes and Keys, Relationship Types Relationship Sets, Roles and Structural Constraints, Weak Entity Types, Refining the ER Design ER Diagrams, Naming Conventions and Design Issues.			
MODULE-2			9 Hrs.
Relational Model and Relational Algebra: Relational Model Concepts, Relational Model Constraints and Relational Database Schemas, Update Operations, Transactions and Dealing with Constraint Violations, Unary Relational Operations: SELECT and PROJECT, Relational Algebra Operations from Set Theory, Binary Relational Operations: JOIN and DIVISION, Additional Relational Operations, Examples of Queries in Relational Algebra, Relational Database Design Using ER- to-Relational Mapping. SQL: SQL Data Definition and Data Types, Specifying Basic Constraints in SQL, Basic Queries in SQL.			
MODULE-3			9 Hrs.
SQL(contd.): More Complex SQL Queries, Insert Delete and Update Statements in SQL, Specifying Constraints as Assertion and Trigger, Views (Virtual Tables) in SQL, Schema Change Statements in SQL.			



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Database Design: Informal Design Guidelines for Relation Schemas, Functional Dependencies, Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form

MODULE-4

9 Hrs

Transaction Management: The ACID Properties, Transactions and Schedules, Concurrent Execution of Transactions, Lock - Based Concurrency Control, Performance of Locking, Transaction Support in SQL, Introduction to Crash Recovery. Crash Recovery: Introduction to ARIES

NoSQL: An overview of NoSQL, Characteristics of NoSQL, NoSQL storage types, Advantages and Drawbacks of NoSQL. Overview of MongoDB- what is MongoDB?, MongoDB Architecture, DBcollection and document structures, BSON format, CRUD operations.

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Fundamentals of Database Systems	Elmasri and Navathe	7th Edition	Addison-Wesley	2015
2	Database Management Systems	Raghu Ramakrishnan and Johannes Gehrke	3rd Edition	McGrawHill	2007

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Database System Concepts	Silberschatz, Korth and Sudarshan	6th	Mc-Graw Hill	2010
2	Introduction to Database Systems	C.J. Date, A. Kannan, S. Swamynatham	8th	Pearson Education	2006

E-Books-and-online-course-materials:

- 1) <https://nptel.ac.in/courses/106105175>
- 2) https://www.tutorialspoint.com/mongodb/mongodb_overview.html

Online Courses and Video Lectures:

- 1) <https://www.youtube.com/watch?v=JSV7xjlikwg>
- 2) <https://www.youtube.com/watch?v=f-Id5Ct3Qvk>



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Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Program Execution	20
Total		50

Laboratory Plan:

Note: The following list of programs is intended for execution in the laboratory sessions. For the CIE, similar but modified questions will be given.

Sl. No	Program Details
1	Introduction to DBMS & ER Modeling Objective: Understand the DBMS environment, schemas, and ER modeling. Task: Design an ER diagram for the following system: Scenario: College Management System - The system maintains data about students, courses, departments, faculty, and enrollments. - A department has a unique department ID and name. - A course has a course ID, title, credits, and is offered by a department. - Each faculty member belongs to one department and can teach multiple courses. - Students have a USN, name, semester, and email. - Students enroll in courses; enrollment includes the grade obtained. Instructions: - Design the ER diagram using high-level conceptual modeling. - Convert the ER diagram to a relational schema. - Identify keys, weak entities, relationships, and appropriate constraints. Discuss concepts of schema, instance, and three-schema architecture.
2	Table Creation and Basic SELECT Queries Objective: Practice DDL and basic DML commands. Task: - Create tables from Lab 1 relational schema. - Insert at least 5 records in each table. Write queries to: - Retrieve names of all students from semester 5. - Find all faculty teaching more than one course. - Get all courses offered by the "ISE" department. - Display students along with the courses they are enrolled in and their grades.
3	Constraints, Views, and Triggers



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	Objective: Understand and apply schema constraints, views, and triggers. Task: Given Schema: • EMPLOYEE(EmpID, FullName, Salary, DeptCode) • DEPARTMENT(DeptCode, DeptName, OfficeLocation) • PAYROLL_LOG(EmpID, PreviousSalary, RevisedSalary, ModifiedDate) Instructions: • Apply appropriate constraints: NOT NULL, UNIQUE (on FullName), CHECK (e.g., Salary > 10000), DEFAULT (OfficeLocation = 'Hassan') • Create the following views: ○ Employees with salary above 50000 ○ Departments and number of employees in each • Triggers: ○ On salary update, insert into PAYROLL_LOG
4	SQL Joins Objective: Demonstrate the use of JOIN operations in SQL. Scenario: Use the schema: • CUSTOMER(CustomerID, CustomerName, RegionID) • REGION(RegionID, RegionName) • PURCHASE(CustomerID, ProductID) • PRODUCT(ProductID, ProductName, RegionID) Insert at least 5 rows for each table Queries to Perform: 1. INNER JOIN to get customers and their regions 2. LEFT OUTER JOIN to list all customers and their purchases (even if not purchased) 3. RIGHT OUTER JOIN to list all products and customers (even if product not purchased) 4. FULL OUTER JOIN to get complete listing of customers and products with purchase info
5	Joins with Aggregates and Grouping Objective: Apply JOINS in combination with GROUP BY, HAVING, and aggregate functions. Scenario: Extend the schema used in LAB 4. Queries to Perform: 1. Find the total number of purchases made by each customer. 2. List regions with average product price greater than a specified amount. 3. Retrieve customers who have purchased more than 2 different products (use GROUP BY and HAVING). 4. Display the product name and total quantity sold for each product (assume PURCHASE includes Quantity). 5. Find the region with the highest total purchase volume. Note: This lab reinforces advanced SQL skills through analytical queries.



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6

MongoDB Basics and CRUD Operations

Objective: Introduce document-based storage and perform full CRUD operations in MongoDB.

Task:

Create a database `retail\_store` with collections `customers`, `staff`, and `products`

Operations:

- Create:
 - Insert documents using `insertOne()` and `insertMany()` into each collection
- Read:
 - Use `find()`, `find({criteria})` to:
 - Get all customers from a specific city
 - List all products sold by a particular staff member
 - Display all products priced above a certain value
- Update:
 - Update a customer's phone number or address
 - Update product price or quantity
- Delete:
 - Delete a customer by ID
 - Remove discontinued products from the collection

7

Object-Oriented Database Concepts

Objective: Explore Object-Oriented features in database design and implementation.

Task:

- Design a class hierarchy for a Vehicle Rental System:
 - `Vehicle` (VehicleID, Make, Model, Year)
 - `Car` (inherits Vehicle, has additional fields: SeatingCapacity, FuelType)
 - `Bike` (inherits Vehicle, has additional fields: GearType)
 - `Customer` (CustomerID, Name, LicenseNo)
 - `Rental` (RentalID, CustomerID, VehicleID, StartDate, EndDate)

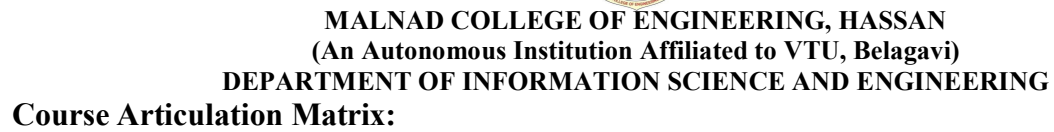
Instructions:

- Use PostgreSQL (with object-relational extensions) or Oracle to:
- Define object types and typed tables
- Create table of objects using `CREATE TYPE` and `UNDER` keyword (if supported)
- Simulate inheritance and demonstrate object attributes access

Perform:

- Insertion and retrieval of object data

Querying with path expressions to access nested attributes

[illegible]



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Course Title	DESIGN AND ANALYSIS OF ALGORITHMS		
Course Code	24IS404	(L-T-P)C	(3-0-0)3
Exam	3hrs	Hours/Week	3
SEE	50 Marks	Total Hours	40

Course Objective: Students will be able to design algorithms using various strategies and analyze it mathematically.

Course outcomes: At the end of course, student will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Apply various algorithm design techniques to solve the given problem.	3	1
2.	Analyze the time complexity of the algorithm using asymptotic notations.	2	1
3.	Differentiate tractable & intractable problems & apply techniques that help to cope up with limitation of algorithm power.	3	1
4.	Conduct experiments to implement the designed algorithms.	3	1

MODULE 1	10 Hrs.
Introduction: Notion of Algorithm, Fundamentals of algorithmic problem solving. Fundamentals of the Analysis of Algorithm Efficiency: Analysis framework, Asymptotic notations and Basic efficiency classes, Mathematical analysis of Recursive and Non-recursive algorithms, Examples. Brute Force: Selection Sort and Bubble Sort, Sequential Search and String Matching, Exhaustive search.	
MODULE 2	10 Hrs.
Divide-and-Conquer: Binary Search, Merge Sort, Quick Sort, Binary tree traversals and related properties, Multiplication of large integers, Strassen's Matrix multiplication. Decrease-and-Conquer: Insertion Sort, Depth First and Breadth First Search, Topological sorting, Algorithms for generating combinatorial objects.	
MODULE 3	10 Hrs.
Transform-and-Conquer: Pre-sorting, Balanced Search Trees, Heaps and Heap Sort, Problem reduction. Space and Time Trade-off: Sorting by counting, Input enhancement in string Matching (only Horspool), Hashing. Dynamic Programming: Computing a Binomial coefficient, Warshall's Algorithm, Floyd's algorithms, The Knapsack problem.	
MODULE -4	10 Hrs.
Greedy Technique: Prim's algorithm, Kruskal's algorithm, Dijkstra's algorithm, Huffman trees, Limitations of Algorithm Power: Lower-bound arguments, Decision trees, P, NP and NP-Complete Problems, coping with the Limitations of Algorithm Power: Backtracking, Branch-and-bound.	



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Prescribed Text Book:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Introduction to the Design and Analysis of Algorithms	Anany Levitin	3rd Edition	Pearson Education	2017.

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Introduction to Algorithms	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest	4rd Edition	PHI	2022
2.	Computer Algorithms	Horowitz E., Sahani S., Rajasekharan S	2nd Edition	Galgotia Publications	2018

E-Book and online course material:

- 1) https://archive.org/details/introductiontode0000levi?utm_source=chatgpt.com

Online Course and Video Lecture:

- 1) <https://nptel.ac.in/courses/106/106/106106131/>

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20marks each and reduced to 10 marks	30
Activity Details	Applying algorithm for any real world problem	20
Total		50



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Course Title	C# AND .NET TECHNOLOGIES		
Course Code	24IS405A	(L-T-P)C	(2-0-2) 3
Exam	3 Hrs	Hours/Week	4
SEE	50 Marks	Total Hours	40(26L + 14P)

Course Objective: Students will be able to apply Object Oriented Programming concepts for designing Applications using language C# and IDE – Visual Studio.

Course outcomes: At the end of course, student will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Develop C# programs using Visual Studio IDE.	1,2	-
2	Apply Object Oriented Programming concepts in C# programming language	2,3	-
3	Interpret Interfaces and define custom interfaces for application.	3,5	-
4	Analyze a C# program for identifying bugs.	3,5	-

MODULE – 1	7Hrs.
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Introducing Microsoft Visual C# and Microsoft Visual Studio 2015: Welcome to C#, working with variables, operators, and expressions, writing methods, and applying scope, using decision statements, using compound assignment and iteration statements, Managing errors and exceptions.

MODULE – 2	7Hrs.
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Understanding the C# object model: Creating and Managing classes and objects, understanding values and references, creating value types with enumerations and structures, Using arrays.

MODULE -3	6Hrs.
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Understanding parameter arrays, working with inheritance, creating interfaces and defining abstract classes, Using garbage collection and resource management.

MODULE -4	6Hrs.
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Defining Extensible Types with C#: Implementing properties to access fields, introducing generics, Using collections, Operator overloading.



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Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Microsoft Visual C# Step by Step	John Sharp	8th Edition	PHI Learning Pvt. Ltd	2016

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Inside C#	Tom Archer, Andrew Whitechapel	2nd	WP Publishers	2012
2	The Complete Reference C# 3.0	Herbert Schildt	3rd	Tata McGraw Hill Education Private Limited	2007

E-Book and online course material:

- 1) https://www.ebooks.com/en-in/book/2256092/microsoft-visual-c-step-by-step/john-sharp/?utm_source=chatgpt.com

Online Course and Video Lecture:

- 1) <https://www.coursera.org/learn/intro-to-dotnet-core>

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Program Execution	20
Total		50



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Laboratory Plan:

Sl. No	Program Details
1	Develop a C# program to simulate simple arithmetic calculator for Addition, Subtraction, Multiplication, Division and Mod operations. Read the operator and operands through console.
2	Develop a C# program to print Armstrong Number between 1 to 1000.
3	Develop a C# program to list all substrings in a given string. [Hint: use of Substring() method]
4	Develop a C# program to demonstrate Division by Zero and Index Out of Range exceptions.
5	Develop a C# program to generate and print Pascal Triangle using Two Dimensional arrays.
6	Develop a C# program to generate and print Floyds Triangle using Jagged arrays.
7	Develop a C# program to read a text file and copy the file contents to another text file.
8	Design a class “Complex” with data members, constructor and method for overloading a binary operator ‘+’. Develop a C# program to read Two complex number and Print the results of addition

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3											
CO2		3	3										
CO3			3		2								
CO4			3		2								



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Course Title		INTERNET OF THINGS	
Course Code	24IS405B	(L-T-P)C	(2-0-2)3
Exam	3 Hrs.	Hours/Week	4
SEE	50 Marks	Total Hours	40(26L+14P)
Course Objective: Students will be able to develop IOT applications. Course Outcomes: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Understand the fundamentals and applications of IoT, its Architecture, Design Principles and Standards	1	-
2.	Apply programming skills to design IoT applications	3	-
3.	Appraise the role of IoT protocols for efficient network communication.	2	2
4.	Design and Implement applications of IoT and make presentation in team	5, 10	2
MODULE-1			7 Hrs
Introduction to Internet of Things: Definition and characteristics of IoT, Physical design of IoT, Things in IoT, IoT Protocols, Logical Design, IoT functional blocks, IoT communication Models, IoT communication API's, IoT enabling Technologies Wireless sensor networks, Cloud Computing, Big Data Analytics, Communication protocols, embedded systems. IoT levels and deployment template Domain specific IoTs, - IoT levels, Introduction, Home Automation; Cities; Environment; Energy; Retail; Logistics; Agriculture; Industry; Health & Lifestyle.			
MODULE-2			7 Hrs
IoT and M2M IoT System management with NETCONF-YANG Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT- Software defined networking, network function virtualization Need for IoT Systems management; SNMP; Network Operator Requirements; NETCONF; YANG; IoT Systems management with NETCONFYANF; NETOPE IoT platform Design Methodology - IoT Design Methodology; Introduction; Case Study on IoT System for Weather Monitoring,			
MODULE-3			6 Hrs
IoT Physical Devices and End points - What is an IoT device; Exemplary Device- Raspb erry Pi, Linux on Raspberry Pi, Raspberry Pi Interfaces, Other IoT devices. IoT Physical Servers & Cloud Offerings: Amazon Web Services for IoT, AmazonEC2, AmazonS3, Amazon RDS.			
MODULE-4			6 Hrs
Case studies illustrating IoT Design: Introduction to IOT Design, Home Automation, Smart Lighting, Home Intrusion Detection, Cities, Smart Parking. Data Analytics for IOT- Apache Hadoop, Using Hadoop Map Reduce for Batch Data Analysis.			



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Prescribed Text Book:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Internet of Things - A Hands on Approach	Arshdeep Bahga and Vijay Madiseti	1st	Universities Press	2015

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	The Internet of Things: Key Applications and Protocols	Olivier Hersent, David Boswarthick, Omar Elloumi,	2nd	Wiley	2012
2	Internet of Things: A Hands-On Approach Vijay Madiseti	Vijay Madiseti, ArshdeepBahga	1st	Orient Blackswan	2014

E-Book and online course material:

- 1) https://www.scribd.com/document/513453064/Internet-of-Things-a-Hands-On-Approach-by-Arshdeep-Bahga-Vijay-Madiseti?utm_source=chatgpt.com

Online Course and Video Lecture:

- 1) <https://nptel.ac.in/courses/108/108/108108098/>

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Program Execution 2) Mini Project	20
Total		50



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Laboratory Plan:

Sl. No	Program Details
1	To interface LED / Buzzer with Arduinio / raspberry Pi and write a program to turn on LED for one seconds after every two seconds.
2	To interface push button Digital sensor(IR/LDR)with Arduinio / raspberry Pi and write a program to turn on LED when push button is pressed or at sensor detection.
3	How do you display text on a 16*2 LED screen using potentiometer.
4	How do you read input from a push button and display the status on the serial monitor.
5	To interface DHT level sensor with Arduinio / raspberry Pi and write a program to print temperature and humidity readings.
6	To interface motor using relay with Arduinio / raspberry Pi and write a program to turn on motor when push button is pressed.
7	Write an Arduino program to interface an MQ-2 gas sensor with an LED and a buzzer to indicate the presence of combustibile gases
8	Implement an Arduino-based air drum kit that uses motion sensors (e.g., ultrasonic or IR sensors) to detect hand movements and trigger corresponding drum sounds or LED indicators for each drum hit.

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3												
CO2			2										
CO3		2											3
CO4					3					3			3



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Course Title	OPTIMIZATION TECHNIQUES		
Course Code	24IS405C	(L-T-P)C	(2-0-2)3
Exam Hrs.	3	Hours / Week	4
SEE	50 Marks	Total Hours	40
Course Objective: Solve optimization problems using various methods Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping To POs	Mapping To PSOs
1.	Develop mathematical model for a given problem.	1	-
2.	Apply techniques of Operations Research.	2	-
3.	Solve prediction and estimation problems.	1, 2	-
4.	Expose to the significance of various scientific tools.	5	-
MODULE – 1			10 Hrs
Introduction : Introduction: The origin, nature and impact of OR; Overview of the Operations Research Modeling Approach: Defining the Problem and Gathering Data; Formulating a Mathematical Model; Deriving Solutions from the Model; Testing the Model; Preparing to Apply the Model; Implementation Linear Programming – 1 : Prototype example; The Linear Programming (LP) Model, Assumptions of LP, Additional Examples			
MODULE – 2			10 Hrs
Simplex Method - 1 : The Essence of the Simplex Method; Setting up the Simplex Method; The Algebra of the Simplex Method; The Simplex Method in Tabular Form; Tie Breaking in the Simplex Method Simplex Method – 2 : Adapting to other Model Forms; Post Optimality Analysis, Computer implementation.			
MODULE – 3			10 Hrs
Revised Simplex Methods: Foundations of the Simplex Method, The revised simplex method, A Fundamental Insight Duality Theory: The Essence of Duality Theory; Economic Interpretation of Duality. Primal-Dual Relationships , Adapting to other primal forms, The role of duality in sensitive analysis; The essence of sensitivity analysis; Applying sensitivity analysis, The dual simplex method ; Parametric linear programming; The upper bound technique.			
MODULE – 4			10 Hrs
Transportation Model: Definition of the Transportation Model, Nontraditional Transportation Models, The Transportation Algorithm. Assignment Model and Network Models : The Assignment Model, CPM and PERT			



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Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Introduction to Operations Research	Frederick S. Hillier and Gerald J. Lieberman	9th Edition	Tata McGrawHill	2012
2	Operations Research: An Introduction	Hamdy A Taha,	8th Edition	Prentice Hall India,	2005

Reference Book:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Operations Research Applications and Algorithms”,	Wayne L. Winston	4th Edition	Thomson Course Technology,	2003

E-Book and online course material:

- 1) https://archive.org/details/introduction-to-operations-research?utm_source=chatgpt.com

Course Articulation Matrix

Course Outcome	Program Outcomes [POs]												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2												
CO2		3											
CO3	3	2											
CO4					2								



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Course Title	PROBABILTIY, STASTISTICS AND QUEING		
Course Code	24IS405D	(L-T-P)C	(3-0-0)3
Exam	3 Hrs.	Hours/Week	3 Hrs
SEE	50 Marks	Total Hours	40
Course Objective: To study the basics of statistics, measure central tendency and dispersion.			
Course outcomes: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Understand the basics of probability, sample space, events, statistics and apply them to real life problems	1	-
2.	Distinguish probability density and distribution functions for single and multiple random variables.	1	-
3.	Use the probability, moment generating functions and characteristic functions.	1	-
4.	Formulate, analyze and validate models applicable to practical problems.	2	-
MODULE – 1			10 Hrs.
Probability Theory: Definition of probability: classical, empirical and axiomatic approach of probability, Addition theorem of probability, Multiplication theorem of probability, Bayes theorem of inverse probability, Properties of probabilities with proofs, Examples.			
MODULE – 2			10 Hrs.
Random Variable and Mathematical Expectation: Definition of random variables, Probability distributions, Probability mass function, Probability density function, Mathematical expectation, Join and marginal probability distributions, Properties of expectation and variance with proofs, Examples.			
MODULE -3			10 Hrs.
Correlation: Introduction, Types of correlation, Correlation and causation, Methods of studying correlation, Karl Pearson's correlation coefficient, Spearmans rank correlation, Coefficient, Properties of Karl Pearson's correlation coefficient, Properties of Spearmans rank correlation coefficient, Probable errors, Examples.			
MODULE -4			10 Hrs.
Linear Regression Analysis: Introduction, Linear and non-linear regression, Lines of regression, Derivation of regression lines of y on x and x on y, Angle between the regression lines, Coefficients of regression, Theorems on regression coefficient, Properties of regression coefficient, Examples.			



Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Fundamentals of Statistics	S. C. Gupta	46th Edition,	Himalaya Publishing House	-
2	Probability and Random Processes	G. V. Kumbhojkar	14th Edition	C. Jamnadas and co.	-

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Probability, Statistics with Reliability Queuing and Computer Science Applications	Kishor S. Trivedi	2nd Edition,	Wiley India Pvt. Ltd.	-
2	An Introduction To Probability And Statistics	A. K. Md. Ehsanes Saleh	3 rd Edition	Wiley Publication.	-

1) https://books.google.co.in/books/about/Fundamentals_of_Statistics.html?id=zMUouAAACAAJ&redir_esc=y

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MALNAD COLLEGE OF ENGINEERING, HASSAN
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DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

Course Title	GREEN IT AND SUSTAINABILITY		
Course Code	24IS406A	(L-T-P)C	(2-0-0)1
Exam	3 Hrs.	Hours/Week	2 Hrs
SEE	50 Marks	Total Hours	28
Course Objective: Students will be able to use appropriate data structures for solving problems. Course Outcomes: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Understand the fundamental concepts of Green IT and assess the environmental impacts of IT systems and practices.	1	-
2.	Analyze the lifecycle of IT hardware and evaluate sustainable practices such as reuse, recycling.	2	-
3.	Identify efficient software design principles and assess their impact on IT system energy consumption	2,6,7	-
4.	Develop strategies for implementing Green IT initiatives and outline the transformation roadmap for sustainable enterprise IT operations.	2,6,7	-
MODULE – 1			7 Hrs.
Green IT: An Overview Green IT fundamentals - Environmental Impacts of IT - Green IT standards - Applying IT for enhancing environmental sustainability			
MODULE – 2			7Hrs.
Green Devices And Hardware Life cycle of a device or hardware - Reuse, Recycle and dispose. Green software - Energy saving software techniques, Green information systems, evaluating software impact to platform power.			
MODULE -3			7 Hrs.
Managing Green IT Implementation of Green IT, Information Assurance and communication - Green Enterprise transformation roadmap -Green compliance.			
MODULE -4			7 Hrs.
Law, Standards and Protocols Regulatory environment and IT manufacturers, Non regulatory government initiatives, Green building standards, Green data centers.			



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Prescribed Text Book:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Green IT Strategies and Applications-Using Environmental Intelligence	Bhuvan Unhelkar	3 rd Edition	CRC Press,	June 2014

References Book:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Harnessing Green IT Principles and Practices Green Home computing for dummies	Woody Leonhard, Katherine Murray	-	Wiley Publication	August 2012.

E-Book and online course material:

- 1) https://archive.org/details/greenitstrategie0000unhe?utm_source=chatgpt.com

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3												
CO2		2											
CO3		2				2	2						
CO4		2				2	2						



MALNAD COLLEGE OF ENGINEERING, HASSAN
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DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

Course Title	UI/UX LABORATORY		
Course Code	24IS406B	(L-T-P)C	(0-0-2)1
Exam Hrs.	3	Hours / Week	2
SEE	50 Marks	Total Hours	28

Course Objective: To gain a solid understanding of fundamental UI/UX principles, including visual design, user-centered design, usability, and user experience.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Apply design principles and guidelines to create visually appealing and user-friendly interfaces for websites and mobile applications.	3	-
2.	Develop wire frames and interactive prototypes using design tools to visualize and communicate interface concepts and user flows.	3,5	-

Sl. No	Program Details
1	Designing a Login Form: Design a user-friendly login form for a mobile app. Consider the layout, input fields, button design, and error handling to create an intuitive and visually appealing login experience.
2	Creating a Navigation Menu: Design a navigation menu for a website that includes dropdown menus and a responsive design. Ensure the menu is easy to navigate and visually consistent across different screen sizes.
3	Redesigning a Landing Page: Redesign a landing page for a product or service. Improve the visual hierarchy, use compelling imagery, and optimize the layout to encourage user engagement and conversions.
4	Creating a Contact Form: Design a contact form for a website that captures essential user information. Consider input validation, error messages, and a confirmation message to enhance the user experience.
5	Designing a Product Card: Create a visually appealing product card for an e-commerce website. Include product images, title, price, and call-to-action buttons to entice users to learn more and make a purchase.
6	Improving Form Usability: Evaluate an existing form on a website for usability issues and propose improvements. Focus on optimizing the form's layout, labeling, and input validation to enhance user comprehension and completion rates.
7	Enhancing Mobile App On boarding: Design an on boarding experience for a mobile app. Create a series of screens that introduce users to the app's features and guide them through the setup process in a clear and engaging manner.
8	Redesigning a Checkout Process: Redesign the checkout process for an e-commerce Website. Simplify the steps, provide clear instructions, and optimize the layout and form inputs to streamline the purchasing experience.



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9	Designing an Error Page: Design a visually appealing and helpful error page for a website. Consider the tone of the message, provide relevant information or suggestions, and include navigational elements to guide users back on track.
10	Creating an Interactive Prototype: Use a prototyping tool to create an interactive Prototype for a mobile app or website. Design key screens and transitions to showcase the user flow and interactions within the interface.

Scheme of Evaluation (Laboratory)

Assessment	Marks
Continuous Evaluation in every lab session by the course coordinator	10
Record Writing	20
Laboratory CIE conducted by the course coordinator	20
Total	50

Course Articulation Matrix

Course Outcomes	Program Outcomes[PO's]												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1			3										
CO2			3		3								



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DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

Course Title	INTRODUCTION TO WEB TECHNOLOGY		
Course Code	24IS406C	(L-T-P)C	(0-0-2)1
Exam	3 Hrs.	Hours/Week	2
SEE	50 Marks	Total Hours	28

Course Objectives: Initially Students will be taught the basic concepts about XHTML, Javascript, PHP, MYSQL and following programming exercises are carried out to understand the concepts.

Course Outcomes: At the end of the course, student will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Understand the fundamentals of HTML, XHTML, Javascript, PHP and MYSQL	1	-
2.	Design and develop programs using JavaScript and PHP to implement interactive websites.	2, 3	-

Sl. No	Program Details
1	Develop and demonstrate a XHTML document that illustrates the use of external style sheet, ordered list, table, borders, padding, color, and the tag.
2	Develop and demonstrate, using JavaScript script, a XHTML document that contains three short paragraphs of text, stacked on top of each other, with only enough of each showing so that the mouse cursor can be placed over some part of them. When the cursor is placed over the exposed part of any paragraph, it should rise to the top to become completely visible.
3	Using JavaScript script, develop a XHTML document that collects the USN (the valid format is: A digit from 1 to 4 followed by two upper-case characters followed by two digits followed by two upper-case characters followed by three digits; no embedded spaces allowed) of the user. Event handler must be included for the form element that collects this information to validate the input. Messages in the alert windows must be produced when errors are detected.
4	Design an XML document to store information about a student in an engineering college affiliated to VTU. The information must include USN, Name, Name of the College, Brach, Year of Joining, and e-mail id. Make up sample data for 3 students. Create a CSS style sheet and use it to display the document.
5	Write a PHP program to store current date-time in a COOKIE and display the 'Last visited on' date- time on the web page upon reopening of the same page.
6	Write a PHP program to store page views count in SESSION, to increment the count on each refresh, and to show the count on web page.
7	Using PHP and MySQL, develop a program to accept book information viz. Accession Number, Title, Authors, Edition and Publisher from a web page and store the information in a database and to search for a book with the title specified by the user and to display the search results with proper headings.



Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Programming the World wide web	Robert W Sebesta	8 th Edition	Pearson Education	-

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Web Programming building internet applications	Chris Bates	3 rd Edition	Wiley India	-
2	Open Source Web Development with LAMP	James Lee, Brent Ware	-	Pearson Education	-

Assessment	Marks
Continuous Evaluation in every lab session by the course coordinator	10
Record Writing	20
Laboratory CIE conducted by the course coordinator	20
Total	50

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DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

Course Title		TECHNICAL WRITING USING LATEX		
Course Code	24IS406D	(L-T-P)C	(0-0-2)1	
Exam	3 Hrs	Hours/Week	2 Hrs	
SEE	50 marks	Total Hours	28 Hrs	
Course Objective: To introduce the basic syntax and semantics of the LaTeX scripting language				
Course outcomes: At the end of course, student will be able to:				
#	Course Outcomes	Mapping to PO's	Mapping to PSO's	
1.	Demonstrate the ability to set up a LaTeX environment and create structured documents using article and book classes.	1	-	
2.	Customize document layout by applying page formatting techniques such as margin setting, headers/footers, multi-column layouts, and error resolution.	2,5	-	
3.	Apply document content effectively using text styling, color customization, list structures, and the integration of mathematical expressions.	1	-	
4.	Construct well-organized tables and insert and manipulate images with properties like scaling and rotation in LaTeX documents.	2,10	-	
MODULE – 1			7 Hrs.	
Introduction: Introduction to LaTeX, its installation, and different IDEs. Creating the first document using LaTeX, organizing content into sections using article and book class of LaTeX.				
MODULE – 2			7 Hrs.	
Styling Pages: Reviewing different paper sizes, examining packages, formatting the page by setting margins, customizing header and footer, changing the page orientation, dividing the document into multiple columns, reading different types of error messages.				
MODULE -3			7 Hrs.	
Formatting Content: Formatting text (styles, size, alignment), adding colors to text and entire page, and adding bullets and numbered items, writing complex mathematics.				
MODULE -4			7 Hrs.	
Tables and Images: Creating basic tables, adding simple and dashed borders, merging rows and columns, and handling situations where a table exceeds the size of a page, adding an image, exploring different properties like rotate, scale.				



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Prescribed Text Book:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Technical Writing: A Practical Guide for Engineers and Scientists	Phillip A Laplante	1st Edition	CRC Press	2011
2	Introduction to LATEX	Tobias Oetiker		Pepperdine edu	2022

Scheme of Evaluation (Laboratory):

Assessment	Marks
Continuous Evaluation in every lab session by the course coordinator	10
Record Writing	20
Laboratory CIE conducted by the course coordinator	20
Total	50

Course Articulation Matrix

Course Outcomes	Program Outcomes[PO's]												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3												
CO2		3			3								
CO3	3												
CO4		3								3			



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DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

Course Title	BIOLOGY FOR ENGINEERS		
Course Code	24BEIS407	(L-T-P)C	(0-0-2)1
Exam	3 Hrs.	Hours/Week	2
SEE	50 Marks	Total Hours	28
Course Objective: Realization of relation between Natural Engineering and man-made Engineering. Course outcomes: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	To familiarize engineering students with basic biological concepts	1	-
2	To involve students in an interdisciplinary vision of biology and engineering	2	-
3	To gain an appreciation for how biological systems can be designed and engineered to substitute natural system	2	-
4	To develop biological models using AI tools	3	-
MODULE – 1			6 Hrs.
Introduction to Human Anatomy: Overview of human anatomy, Structural organization of the human body- cardiovascular system, endocrine system, digestive system, respiratory system, excretory system, lymphatic system, nervous system, muscular system and skeletal system.			
MODULE – 2			8 Hrs.
Bioinspired Engineering based on human physiology: Circulatory system (artificial heart, pacemaker, stents), Nervous system (Artificial neural network).			
MODULE -3			8 Hrs.
Bioinspired Algorithms and Applications: Genetic algorithm, Gene expression modelling. Parallel Genetic Programming: Methodology, History, and Application to Real-Life Problems. Dynamic Updating DNA Computing Algorithms. Beehive: New Ideas for Developing Routing Algorithms Inspired by Honey Bee Behaviour.			
MODULE -4			6 Hrs.
Artificial Intelligence and Biology: Applications of AI in medical imaging, neural engineering, systems biology, microbiome and data mining.			

Prescribed Text Books:

Sl. No	Book Title	Authors	Publisher	Year
1	Bioinspired Engineering	Jenkins, C.H.	NY: Momentum press	2012
2	A Practical Guide to Bio-inspired Design,	Hashemi Farzaneh, Helena, Lindemann, Udo, Springer	Springer link	2019

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References Book:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Bio inspired Engineering	Jenkins, C.H.	1st	NY: Momentum press	2012

E-Book and online course material:

- 1) https://archive.org/details/bioinspiredengin0000jenk?utm_source=chatgpt.com

Online Course and Video Lecture:

- 1) https://onlinecourses.nptel.ac.in/noc19_g e31/preview

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Two tests conducted for 20 marks each	40
AAT	Presentation on Biology Topics	10
Total		50

Course Articulation Matrix

[illegible]



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DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

Course Title	UNIVERSAL HUMAN VALUES		
Course Code	24UHV	(L-T-P)C	(0-0-2)1
CIE	50 marks	Hours/Week	2 Hrs
SEE	50 marks	Total Hours	28 Hrs
Course Objective: The course aims at the development of the value education by the right understanding through the process of self-exploration (about themselves), family, society and nature/existence. Strengthening of self-reflection by development of commitment and courage to act are presented as the prime focus throughout the course towards qualitative transformation in the life of the student.			
Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes		Mapping to POs
1.	Start exploring themselves, get comfortable with each other and with the teacher and they start appreciating the need and relevance for the course. Also they are able to note that the natural acceptance (intention) is always for living in harmony.		6, 7, 8, 9
2.	Differentiate between the characteristics and activities of different orders and study the mutual fulfillment among them and need to take appropriate steps to ensure right participation (in terms of nurturing, protection and right utilization) in the nature.		6, 7, 8, 9
3.	Present sustainable solutions to the problems in society and nature. They are also able to see that these solutions are practicable and draw roadmaps to achieve them.		6, 7, 8, 9
MODULE - 1			8 Hrs
Introduction to Value Education : Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Right Understanding, Relationship and Physical Facility, Happiness and Prosperity – Current Scenario, Method to Fulfill the Basic Human Aspirations.			
MODULE– 2			6 Hrs
Harmony in the Human Being : Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self Lecture, Understanding Harmony in the Self Tutorial, Harmony of the Self with the Body to ensure self-regulation and Health.			



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MODULE-3	8 Hrs
Harmony in the Family, Nature and Existence: Harmony in the Family – the Basic Unit of Human Interaction, Values in Human-to-Human Relationship, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Understanding Harmony in the Society, Vision for the Universal Human Order. Whole existence as Coexistence: Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature recyclability and self-regulation in nature. Include practice sessions to discuss human being as cause of imbalance in nature (film “Home” can be used), pollution, depletion of resources and role of technology etc	
MODULE-4	6 Hrs
Implications of the Holistic Understanding – a Look at Professional Ethics: Natural Acceptance of Human Values, Definiteness of (Ethical) Human Conduct A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics, Holistic Technologies, Production Systems and Management Models, Typical Case Studies, Strategies for Transition towards Value-based Life and Profession.	

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	A Foundation Course in Human Values and Professional Ethics	R R Gaur, R Asthana, G P Bagaria	2nd Revised Edition	Excel Books, New Delhi	2019
2	The Teacher's for a Foundation Course in Human Values and Professional Ethics	R R Gaur, R Asthana, G P Bagaria	2nd Revised Edition	Excel Books, New Delhi	2019

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Jeevan Vidya	EkParichaya, A Nagaraj, Jeevan Vidya Prakashan	-	Amarkantak	1999.
2	Human Values,	A.N. Tripathi	-	New Age Intl. Publishers	2004.



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Proposed Assessment Plan (for 50 marks of CIE):

CIE	Schedule	Assessment Method	Marks	Duration (Min.)
CIE I	At the end of 8 weeks	Objective Questions	20	60
CIE II	At the end of 11 weeks	Objective Questions	20	60
Activity	After CIE 2	Presentation/Role Play/Prototype development	10	-

Course Articulation Matrix

Course Outcomes	Program Outcomes[PO's]												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1						2	1	3	2				
CO2						2	1	3	2				
CO3						2	1	3	2				



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DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

Course Title	DESIGN AND ANALYSIS OF ALGORITHMS LABARATORY		
Course Code	24IS408	(L-T-P)C	(0-0-2) 1
Exam	3 Hrs.	Hours/Week	2 Hrs
SEE	50 Marks	Total Hours	28

Course Objective: To design and implement various algorithms in C/C++ programming using suitable development tools to address different computational challenges. Students will be able to design algorithms using various strategies and analyze it mathematically.

Course outcomes: At the end of course, student will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Design algorithms using appropriate design techniques.	3	1
2	Implement a variety of algorithms such assorting, graph related, combinatorial etc., in a high level language.	5	1
3	Analyze and compare the performance of algorithms using language features.	2	1
4	Apply and implement learned algorithm design techniques and data structures to solve real-world problems.	3,5	1

Sl. No	Program Details
1	Employees in an organization need to be grouped for a tournament based on their ages. Sort the ages using Merge sort and find the time required to perform the sorting.
2	Students in a department need to be selected for a high jump competition based on their height (integer values only). Sort the heights of students using Quick sort and find the time required for the sorting.
3	Print all the nodes reachable from a given starting node in agraph using Depth First Search method and Breadth First Search. Also check whether a graph is connected.
4	Obtain the topological ordering of vertices in a given digraph.
5	Implement Horspool algorithm for String Matching.
6	Sort a given set of elements using the Heap sort method.
7	Implement Floyd's algorithm and Warshall's algorithm for a given graph.



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8	There are n different routes from hostel to college. Each route incurs some cost. Find the minimum cost route to reach the college from the hostel using Prim's algorithm.
9	Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm
10.	Implement 0/1 Knapsack problem using dynamic programming.
11.	Implement N Queen's problem using Backtracking.

Scheme of Evaluation (Laboratory)

Assessment	Marks
Continuous Evaluation in every lab session by the course coordinator	10
Record Writing	20
Laboratory CIE conducted by the course coordinator	20
Total	50

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1			3									3	
CO2					3							3	
CO3		3										3	
CO4			3		3							3	



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Course Title	National Service Scheme(NSS)		
Course Code	24NYP2	(L-T-P)C	(0-0-2)
Exam	-	Hours/Week	2
SEE	-	Total Hours	24

Course Outcomes: At the end of the course, the student will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Understand the importance of his/her responsibilities towards society	6	-
2	Analyze the environmental and societal problems/issues and will be able to design solutions for the same.	3,6	-
3	Evaluate the existing system and to propose practical solutions for the same for sustainable development.	3,6	-
4	Implement government or self-driven projects effectively in the field.	11	-
5	Develop capacity to meet emergencies and natural disasters & practice national integration and social harmony in general.	11	-

MODULE-1

8 Hrs.

Water conservation techniques –Role of different stakeholders–Implementation.

MODULE-2

8Hrs.

Preparing an action able business proposal for enhancing the village in come and approach for implementation.

MODULE-3

8 Hrs.

Helping local schools to achieve good results and enhance their enrolment in Higher/technical/vocational education.

Suggested Learning Resources:

Books:

1. NSS Course Manual, Published by NSS Cell, VTU Belagavi.
2. Government of Karnataka, NSS cell , activities reports and its manual.
3. Government of India, NSS cell, Activities reports and its manual.



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Course Title	Physical Education(PE)		
Course Code	24NYP2	(L-T-P)C	(0-0-2)
Exam	-	Hours/Week	2
SEE	-	Total Hours	24
Course Outcomes: At the end of the course, the student will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Understand the fundamental concepts and skills of Physical Education, Health, Nutrition and	6	-
2	Analyze the environmental and societal problems/issues and will be able to design solutions for the same.	3,6	-
3	Evaluate the existing system and to propose practical solutions for the same for sustainable development.	3,6	-
4	Implement government or self-driven projects effectively in the field.	11	-
5	Develop capacity to meet emergencies and natural disasters & practice national integration and social harmony in general.	11	-
MODULE-1			4 Hrs.
Ethics and Moral Values Ethics in Sports, Moral Values in Sports and Games			
MODULE-2			16Hrs.
Specific games(Any one to be selected by the student) 1. Volleyball–Attack, Block , Service, Upper Hand Pass and Lower hand Pass. 2. Athletics (Track Events)–Any event as per availability of Ground.			
MODULE-3			4 Hrs.
Role of Organization and administration			



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Course Title	Yoga		
Course Code	24NYP2	(L-T-P)C	(0-0-2)
Exam	-	Hours/Week	2
SEE	-	Total Hours	24
Course Outcomes: At the end of the course, the student will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Understand the Philosophical and Scientific Basis of Yoga	12	-
2	Demonstrate Proficiency in Basic Yoga Practices	9	-
3	Analyze the Role of Yoga in Managing Stress and Enhancing Lifestyle	7,12	-
4	Apply Yoga Principles for Personal and Professional Growth	10,12	-
MODULE-1			8 Hrs.
Patanjali's Ashtanga Yoga Yama : Ahimsa, satya, asteya, brahmacharya, aparigraha Niyama: shoucha, santosh, tapa, svaadhyaya, Eshvarapranidhan			
MODULE-2			8Hrs.
Different types of Asanas a. Sitting: 1. Sukhasana 2.Paschimottanasana b. Standing: 1.ArdhakatiChakrasana 2 .ParshvaChakrasana c. Proneline: 1. Dhanurasana d. Supineline: 1.Halasana2.KarnaPeedasana			
MODULE-3			8 Hrs.
Kapalabhati Pranayama 1. Suryanuloma–Viloma 2. Chandranuloma-Viloma 3. Suryabhedana 4. ChandraBhedana 5. Nadishodhana			



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#	Course	Course code	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PS01	PSO2
1	Computer Networks	24IS501	√	√	√	√	√								
2	Theoretical Foundations of Computation	24IS502	√		√		√			√					
3	Full Stack Development	24IS503	√	√	√		√						√	√	√
4	Data Visualization Lab			√	√		√							√	
5	Entrepreneurship and Management	24IS505	√	√				√					√		√
6	Mini Project	24IS506	√	√	√		√			√	√	√	√	√	√
7	Software Testing & Automation	24IS551	√	√	√		√				√	√		√	
8	Research Methodology and IPR	24RIP		√	√	√							√		
9	Environmental Studies	24EVS						√	√	√	√				
10	Cryptography, Network Security and Cyber Law	24IS601	√	√			√			√					
11	Artificial Intelligence and Machine Learning	24IS602		√	√		√				√	√		√	√
12	Cloud Computing	24IS603		√	√		√			√					
13	Main Project Phase-1	24IS604	√	√	√		√			√	√	√	√		√
14	Block Chain Technology	24IS664	√			√	√	√		√			√		



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Course Title		COMPUTER NETWORKS		
Course Code	24IS501	(L-T-P)C	(3-0-2)4	
Exam	3 Hrs.	Hours/Week	5	
SEE	50 Marks	Total Hours	(42L+28P+50ABL)120	
Course Objective: Students will gain the basic knowledge of data communication and computer networks.				
Course Outcomes: At the end of course, student will be able to:				
#	Course Outcomes	Mapping to POs	Mapping to PSOs	
1.	Explain the Ethernet Standard and Networking devices Connecting devices and different protocols at the network transport and application layers.	1	-	
2.	Apply suitable subnetting and IP addressing for a given Requirement. Switching techniques as per need.	2	-	
3.	Analyze different protocols at MAC sub-layer, Network and Transport Layers	2,5	-	
4.	Design networks applying Internetworking concepts and appropriate IP addressing for a given problem	3,4,5	-	
MODULE-1			10 Hrs	
Introduction: Data Communications, Network Types, Network Models:, TCP/IP Protocol Suite, The OSI Model. Introduction to Physical Layer: Data and Signals, Periodic Analog Signals, Digital Signals, Transmission Impairment, Data Rate L limits, Performance. Digital Transmission: Digital-to-Digital Conversion - Line Coding, Line Coding Schemes. Transmission Media: Introduction, Guided Media, Unguided Media: Wireless. Transmission Media.				
MODULE-2			11 Hrs	
Switching: Introduction, Circuit-Switched Networks, Packet Switching, Structure of a Switch. Introduction to Data-Link Layer: Introduction, Link-Layer Addressing (up to ARP). Error Detection and Correction: Introduction, Block Coding, Cyclic Codes (up to Cyclic code encoder using Polynomials) Data Link Control: DLC Services, Data-Link Layer Protocols				
MODULE-3			10 Hrs	
Introduction to Network Layer: Network Layer Services, Packetizing, Routing and Forwarding, Packet Switching, Network Layer Performance, IPV4 Addresses – Address Space, Classful Addressing, Classless Addressing, DHCP message format Introduction. Routing Algorithms, Distance vector routing, link state routing, Path vector routing. Multicast Routing: Introduction, Multicasting Basics. Next Generation IP: IPV6 Addressing, The IPv6 protocol, Transition from IPv4 to IPv6				
MODULE-4			11 Hrs	
Transport-Layer: Introduction, Transport-Layer Services, Transport Layer Protocols - Simple Protocol, TL Protocols: Introduction, User Datagram Protocol, and Transmission Control Protocol – up to A TCP Connection (Excluding: State Transition Diagram). Introduction to Application Layer: Introduction, Client-Server Programming, Standard Client Server Protocols: World Wide Web and HTTP				



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Prescribed Text Book:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Data Communications and Networking	Behrouz A. Forouzan	6th	Tata McGraw- Hill	2022

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	“Communication Networks - Fundamental Concepts and Key Architectures”	Alberto Leon-Garcia and Indra Widjaja,	2nd	Tata McGraw- Hill	2004
2	Data and Computer Communication	William Stallings	9th	Pearson Education	2014

E-Book and online course material:

1. <https://dpvipracollege.in/wp-content/uploads/2023/01/Data-Communications-and-Networking-By-Behrouz->

Online Course and Video Lecture:

1. <https://www.my-mooc.com/en/mooc/computer-networking--ud436>
2. [https://onlinecourses.nptel.ac.in/noc23_cs35/pre view](https://onlinecourses.nptel.ac.in/noc23_cs35/preview)

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	2	14	28
3	Evaluation of Learning Process	-	-	10
4	Activity Based Learning(ABL)	-	-	40
Total Learning Hours/Semester				120



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Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20marks each and reduced to 10 marks	30
Activity Details	Lab Conduction + ABL	15+05=20
Total		50

Integrated Lab Component (28 Hours)

Sl. No	Program Details	Hours
1	Write and execute a program for distance vector algorithm to find the suitable path for transmission between sender and receiver.	2
2	Write and execute a program to find 16-bit and 32-bit checksum Fletcher and Adler checksum methods	2
3	Using TCP/IP sockets, write a client – server program to make the client send the file name and to make the server send back the contents of the requested file if present.	2
4	Suppose Alice wants her friends to encrypt email messages before sending them to her. Write a program to help her friends to encrypt and decrypt the data. (RSA algorithm).	2
5	Implement three nodes point – to – point network with duplex links between them. Set the queue size, vary the bandwidth and find the number of packets dropped.	2
6	Simulate a four node point-to-point network with the links connected as follows: n0 – n2, n1 – n2 and n2 – n3. Apply TCP agent between n0-n3 and UDP between n1-n3. Apply relevant applications over TCP and UDP agents changing the parameter and determine the number of packets sent by TCP / UDP.	2
7	Simulate the transmission of ping messages over a network topology consisting of 6 nodes	4
8	Simulate an Ethernet LAN using n nodes, change error rate and data rate and compare throughput.	4
9	Simulate an Ethernet LAN using n nodes and set multiple traffic nodes and plot congestion window for different source / destination.	4
10	Simulate simple ESS and with transmitting nodes in wire-less LAN by simulation and determine the performance with respect to transmission of packets.	4
Total		28



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Activity Based Learning (40 Hours):

ABL (40 Hours): Hands-on tasks such as network simulation using Cisco Packet Tracer, protocol analysis with Wireshark		Hours
1.	Signal generation and analysis	10
2.	Implementation of CRC error detection and basic ARP simulation using Cisco Packet Tracer.	10
3.	Simulation of routing algorithms (Distance Vector/Link State) using Cisco Packet Tracer.	10
4.	Development of a TCP/UDP client-server application	10
Total Learning Hours/Semester		40

Evaluation of Learning Process (10 Hours)

Type of Evaluation	Hours
Test (1,2 and 3)	3
Lab program Execution & Demonstration of an Activity	4
Semester End Exam	3
Total	10

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3												
CO2	3												
CO3		2			2								
CO4			3	2	3								



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DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

Course Title	THEORETICAL FOUNDATIONS OF COMPUTATION		
Course Code	24IS502	(L-T-P)C	(2-2-0) 3
Exam	3 Hrs	Hours/Week	4
SEE	50 Marks	Total Hours	(28L+28T+34ABL)90

Course Objective: The course provides a fundamental understanding of the Theory of Computation, enabling students to design and analyze various types of automata, formal languages, grammars, Pushdown Automata, Turing Machine, and to understand undecidable problems.

Course outcomes: At the end of course, student will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Identify and differentiate key models of computation such as DFA, NFA, Epsilon-Transitions and regular expressions.	1	-
2.	Examine and evaluate the equivalence, minimization, and ambiguity of automata and grammars in formal language theory.	3	-
3.	Design and implement PDA, and Turing Machines to recognize and process formal languages.	3	-
4.	Construct and simulate computational models to solve language recognition and decision problems in theoretical computer science.	3,5,8	-

MODULE – 1			7 Hrs.
Introduction to Finite Automata: The Central Concepts of Automata Theory, Deterministic Finite Automata (DFA), Nondeterministic Finite Automata (NFA), Epsilon-Transitions, Equivalence of NFA and DFA.			
Regular Expressions and Languages: Regular Expressions, Finite Automata and Regular Expressions			
MODULE – 2			7 Hrs.
Regular Expressions and Languages (Contd.): Pumping lemma for regular languages, Applications of Regular Expressions, Equivalence and Minimization of Automata.			
Context-Free Grammars and Languages: Context-Free Grammars, Parse Trees, Applications of Context Free Grammars, Ambiguity in Grammars.			
MODULE -3			7 Hrs.
Pushdown Automata: Introduction and construction of Pushdown Automata, Acceptance by final state and empty stack , Equivalence of PDA's and CFG's, Chomsky Normal Forms for Context-Free Grammars			
Turing Machines: Introduction to Turing Machine, Construction of Turing Machine.			
MODULE -4			7 Hrs.
Turing Machines (contd.): Programming Techniques for Turing Machines, Restricted Turing machines, Turing Machines and Computers, The Universal Turing Machine, Introduction to undecidable problems, Post's Correspondence Problem.			



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Prescribed Text Book:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Introduction to Automata Theory, Languages and Computation	John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman: education	3rd	Pearson Education	2013

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Introduction to Languages and Theory of Computation	John Martin	4th	Tata McGraw-Hill	2010
2.	An Introduction to Formal Languages and Automata	Peter Linz	5th	Narosa publishing house	2012

E-Books and online course material:

- 1) <https://freecomputerbooks.com/compscCategory.html>

Online Courses and Video Lectures:

- 1) https://onlinecourses.nptel.ac.in/noc25_cs70/preview?utm_source=chatgpt.com
- 2) https://onlinecourses.nptel.ac.in/noc21_cs19/preview

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	2	14	28
2	Tutorial class	2	14	28
3	Evaluation of Learning Process	-	-	10
4	Activity Based Learning(ABL1+ABL2)	-	-	24
Total Learning Hours/Semester				90

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Three tests conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Concept/problem presentation and demonstration using JFLAP tool – 10 marks 2) Problem solving test – 10 marks	20
Total		50



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Activity Based Learning (24 Hours)

ABL1 (20 Hours): Students will select a suitable topic using the JFLAP tool, design and implement the solution, analyze the results with proper documentation, and present the concept and outcomes as part of the activity.		Hours
1.	Topic Selection and Approval: Students will select a suitable topic using the JFLAP tool and present it to the faculty for discussion and approval.	4
2.	Design and Implementation: After approval, students will design and implement the solution using JFLAP, demonstrating the required concepts.	8
3.	Analysis and Documentation: Students will analyze the results and prepare a structured report explaining the design and outcomes.	4
4.	Concept/Problem Presentation: Students will present their work, highlighting the approach, implementation, and results.	4
ABL2 (4 Hours): A set of 10 questions covering all four modules will be given, and students are required to solve the problems and answer the multiple choice questions.		4
Total		24

Evaluation of Learning Process (10 Hours)

Type of Evaluation	Hours
Test (1,2 and 3)	3
Demonstration and Presentation using JFLAP tool	3
Problem solving test	1
Semester End Exam	3
Total	10

Course Articulation Matrix

Course Outcomes	Program Outcomes[PO's]												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3												
CO2			3										
CO3			3										
CO4			3		3			3					



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Course Title	FULL STACK DEVELOPMENT		
Course Code	24IS503	(L-T-P) C	(3-0-2) 4
Exam	3 Hrs	Hours/Week	5
SEE	50 Marks	Total Hours	(42L+28P +50ABL)120

Course Objective: The primary objective of this course is to equip students with comprehensive skills in full stack web development using the Django framework. Students will learn the Model-View-Template (MVT) architecture, design models and forms, and utilize Django's template system and generic views. The course also aims to teach students to generate various content types and manage user authentication, enabling them to create dynamic and scalable web applications.

Course outcomes: At the end of course, student will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Understand the working of MVT-based full stack web development using Django and Visual Studio Code.	1,5,11	-
2.	Design Django models and forms for the rapid development of dynamic web pages.	3,5,11	1
3.	Analyze the role of template inheritance and generic views in building scalable full stack applications.	1,2,5,11	2
4.	Apply Django libraries to render non-HTML content such as CSV and PDF documents	1,3,5,11	2

MODULE - 1	10 Hours
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Fundamentals of Web: A Brief Introduction to the Internet, The World Wide Web, Web Browsers, Web Servers, Uniform Resource Locators **XHTML:** Origins and Evolution of HTML and XHTML, Basic Syntax, Standard XHTML Document Structure, Basic Text Markup.

MODULE - 2	10 Hours
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MVC based Web Designing: Web framework, MVC Design Pattern, Django Evolution, Views, Mapping URL to Views, Working of Django URL Confs and Loose Coupling, Errors in Django, Wild Card patterns in URLS.

MODULE - 3	11 Hours
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Django Templates and Models: Template System Basics, Using Django Template System, Basic Template Tags and Filters, MVT Development Pattern, Template Loading, Template Inheritance, MVT Development



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Pattern. Configuring Databases, Defining and Implementing Models, Basic Data Access, Adding Model String Representations, Inserting/Updating data, Selecting and deleting objects, Schema Evolution.

MODULE - 4

11 Hours

Django Admin Interfaces and Model Forms: Activating Admin Interfaces, Using Admin Interfaces, Customizing Admin Interfaces, Reasons to use Admin Interfaces. Form Processing, Creating Feedback forms, Form submissions, custom validation, creating Model Forms, URLConf Ticks, Including Other URLConfs.

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Programming the World Wide Web	Robert W. Sebesta	8th	Pearson Education.	2014
2	The Definitive Guide to Django: Web Development Done Right	Adrian Holovaty, Jacob Kaplan Moss	2nd	Springer-Verlag Berlin and Heidelberg GmbH & Co. KG Publishers	2009

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Django Java Script Integration: AJAX and jQuery	Jonathan Hayward	1st	Pack Publishing	2011
2	Django 3 Web Development Cookbook	Aidas Bendroraitis, Jake Kronika	4th	Pack Publishing	2020

Books and online course materials:

1. https://www.mooc-list.com/tags/full-stack#google_vignette
2. <https://nptel.ac.in/courses/106106222>

Online Courses and Video Lectures:

1. <https://books.google.com.jm/books?id=h2tR8p4a9QC&printsec=copyright#v=onepage&q&f=false>



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Teaching - Learning – Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. Of Hours/ Week	No. of Weeks	Hours/ Semester
1	Classroom Teaching & Learning	3	14	42
2	Integrated Lab Component	2	14	28
3	Activity Based Learning	-	-	42
4	Evaluation of Learning Process	-	-	08
Total Learning Hours / Semester				120

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Integrated Laboratory	Continuous evaluation will be done in the laboratory for 10 Marks. Laboratory CIE will be conducted for 10 Marks. Total 30 marks, reduced to 10 marks.	10
Activity Details	Activity: Micro Project: Evaluated for 20 marks and reduced to 10 marks	10
Total		50

Integrated Lab Component (28Hours):

Sl. No	Program Details	Hours
1	Installation of Python, Django and Visual Studio code editors can be demonstrated.	4
2	Creation of virtual environment, Django project and App should be demonstrated	2
3	Develop a Django app that displays current date and time in server	2
4	Develop a Django app that displays date and time four hours ahead and four hours before as an offset of current date and time in server	2
5	Develop a simple Django app that displays an unordered list of fruits and ordered list of selected students for an event	2
6	Develop a layout.html with a suitable header (containing navigation menu) and footer with copyright and developer information. Inherit this layout.html and create 3 additional pages: contact us, About Us and Home page of any website.	2



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7	Develop a Django app that performs student registration to a course. It should also display list of students registered for any selected course. Create students and course as models with enrolment as Many To Many field.	4
8	For student and course models created in Lab experiment for Module2, register admin interfaces, perform migrations and illustrate data entry through admin forms.	4
9	Develop a Model form for student that contains his topic chosen for project, languages used and duration with a model called project.	2
10	For students enrolment developed in Module 2, create a generic class view which displays list of students and detail view that displays student details for any selected student in the list.	2
11	Develop example Django app that performs CSV and PDF generation for any models created in previous laboratory component.	2
Total		28

Activity Based Learning: 42Hours

As part of the course, students must design and implement a mini project using Django. This activity is aimed at reinforcing practical knowledge and end-to-end application development skills.

- Students will develop a full-stack web application using Django as the backend framework and appropriate frontend technologies (HTML, CSS, Bootstrap, JavaScript, etc.).
- The project should demonstrate integration of models, views, templates, forms, and database operations.
- Each student/team must:
 - Identify a problem statement
 - Design the database schema and architecture
 - Develop and test the application
 - Present a live demonstration
 - Submit a detailed project report (including system design, code snippets, screenshots, challenges, and future scope)

The mini project will carry weightage in internal assessment and is a mandatory component of the course.



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Activity-Based Learning: Mini Project Time Allocation

Sl. No.	Activity Phase	Description	Hours
1	Introduction & Group Formation	Briefing about project, tools, expectations, and formation of student groups	3
2	Problem Identification & Topic Presentation	Selection of problem statement, feasibility study, and topic presentation	5
3	System Design & Architecture	Database design, architecture planning, UI design, and design presentation	8
4	Implementation	Development using Django (backend), frontend integration, testing & debugging	15
5	Report Preparation	Documentation including design, code, outputs, challenges, and future scope	6
6	Final Demonstration & Evaluation	Live demo, presentation, and viva evaluation	5
	Total		42

Evaluation of Learning Process (8 Hours):

Type of Evaluation	Hours
Test (1, 2 and 3)	3
Laboratory CIE	2
Semester End Exam	3
Total	8

Course Articulation Matrix:

Course Outcomes	Program Outcomes [POs]												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3				2						2		
CO2			3		2						2	3	
CO3	2	2			2						1		2
CO4	3		2		3						1		2



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Course Title	DATA VISUALIZATION LAB		
Course Code	24IS504	(L-T-P)C	(0-0-2)1
Exam Hrs.	3	Hours/Week	2
SEE	50 Marks	Total Hours	(28P+2E)30
Course Objective: The course aims to equip students with fundamental skills in data visualization using Python, utilizing libraries such as Matplotlib, Seaborn, Bokeh, and Plotly. Students will develop the ability to create various visualizations, analyze and interpret data, and apply these skills to support decision-making processes. Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Demonstrate the use of IDLE or PyCharm IDE to create Python Applications	5	-
2.	Utilize Python libraries (Matplotlib, Seaborn, Bokeh, and Plotly) to create a variety of visualizations, analyze and interpret data to derive meaningful insights, and support decision-making.	2,3,5	1
3.	Use Python programming constructs to develop programs for solving real- world problems.	3,5	-

Sl. No	Teaching and Learning Method	No. of Hours/Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching& Learning	2	14	28
2	Evaluation of Learning Process	-	-	02
Total Learning Hours/Semester				30
ABL: Lab Based Learning(28Hrs)				
Sl. No	Program Details			Hours
1	a. Write a python program to find the best of two test average marks out of three test's marks accepted from the user. b. Develop a Python program to check whether a given number is palindrome or not and count the number of occurrences of each digit in the input number.			4
2	a. Defined as a function F as $F_n = F_{n-1} + F_{n-2}$. Write a Python program which accepts a value for N (where $N > 0$) as input and pass this value to the function. Display suitable error message if the condition for input value is not followed. b. Develop a python program to convert binary to decimal, octal to hexadecimal using functions.			2
3	a. Write a Python program that accepts a sentence and find the number of words, digits, uppercase letters and lowercase letters. b. Write a Python program to find the string similarity between two given strings			2



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4	a. Write a Python program to Demonstrate how to Draw a Bar Plot using Matplotlib. b. Write a Python program to Demonstrate how to Draw a Scatter Plot using Matplotlib.	2
5	a. Write a Python program to demonstrate how to draw a Histogram Plot using Matplotlib. b. Write a Python program to demonstrate how to draw a Pie Chart using Matplotlib.	2
6	a. Write a Python program to illustrate Linear Plotting using Matplotlib. b. Write a Python program to illustrate liner plotting with line formatting using Matplotlib.	4
7	Write a Python program which explains uses of customizing seaborn plots with Aesthetic functions.	2
8	a. Write a Python program to explain working with bokeh line graph using Annotations and Legends. b. Write a Python program for plotting different types of plots using Bokeh.	4
9	a. Write a Python program to draw 3D Plots using Plotly Libraries.	2
10	a. Write a Python program to draw Time Series using Plotly Libraries. b. Write a Python program for creating Maps using Plotly Libraries.	4
Total		28

Note: The first three programs are for practice only.

Proposed Assessment Plan (for 50 marks of CIE)

Assessment	Marks
Continuous Evaluation in every lab session by the course coordinator	10
Record Writing	20
Laboratory CIE conducted by the course coordinator	20
Total	50

Evaluation of Learning Process (2 Hours)

Type of Evaluation	Hours
Program Execution	02
Total	02



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Course Title	ENTREPRENEURSHIP AND MANAGEMENT		
Course Code	24IS505	(L-T-P)C	(3-0-0) 3
Exam	3 Hrs.	Hours/Week	3
SEE	50 Marks	Total Hours	(42L+48ABL)90
Course Objective: Students will Analyze various concepts of different styles of motivation, company leadership, power and patent aspects. Course Outcome: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1	Describe the functions of management activities such as planning, Organization and staffing, directing and controlling.	1,2,11	-
2	Identify and appreciate the ethical issues in management decision areas.	2,11	-
3	Examine the importance of entrepreneurship and entrepreneurial Process.	2, 11	2
4	Prepare a project report for a given business requirement.	6	-
MODULE-1			11 Hrs.
Management: Introduction - Meaning - Nature and Functions of Management, Importance & Definition of Management, Management Functions, Roles of a Manager, Levels of Management, Managerial Skills, Management & Administration, Management as a Science, Actor Profession– Development of Management Thought-Early Management Approaches, Modern Management Approaches Planning: Nature, Importance and Forms of Planning, Types of Plans, Steps in Planning, Limitations of Planning, Making Planning Effective–Decision Making–Meaning, Types of Decisions, Steps in Decision Making, Common Difficulties in Decision – Making.			
MODULE-2			10 Hrs.
Organization and Staffing: Meaning and Process of Organizing - Principles of Organizing - Types of Organization - Departmentalization - Committees. Centralization Vs Decentralization of Authority and Responsibility, Nature and Importance of Staffing - Process of Selection & Recruitment (in brief). Directing Controlling: Requirements of Effective Direction, Motivation Theories, Communication– Importance, Purpose- Leadership Styles, Meaning and Steps in Controlling, Need for Control, Essentials of Effective Control System.			
MODULE-3			11 Hrs.
Motivation: Concept, types of motivation, theories of motivation, Leadership definition, principles, leadership styles, Communication: meaning ,nature, communication process, types of communication, barriers to communication			
MODULE-4			10 Hrs.
Entrepreneur: Meaning of Entrepreneur: Importance of an Entrepreneur, Functions of an Entrepreneur, Types of Entrepreneurs, Concept of Entrepreneur, Concept of Entrepreneurship – Evolution Entrepreneurship Development of Entrepreneurship, Stages in Entrepreneurial Process, Role of Entrepreneurs in Economic Development, Entrepreneurship in India, Entrepreneurship-Its Barriers Institutional support: Introduction, Institutional Finance, Different Schemes–SSIDC, DIC.			



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Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Principles of Management	P. C. Tripathi, P.N. Reddy	7th	Tata Graw H	2021
2	Dynamics of Entrepreneurial Development & Management	Vasant Desai	6th	Himalaya Publishing House	2011

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Entrepreneurship development and management	Dr R K Singal	2nd	S S Kataria	2013
2	Principles and practice of management	RSN Pillai	3rd	S Chand	2012

E Books:

1. [https://www.scribd.com/document/438914396/principles-of-management-p-c-tripathi-p-n-reddy-pdf-By- EasyEngineering-net-pdf](https://www.scribd.com/document/438914396/principles-of-management-p-c-tripathi-p-n-reddy-pdf-By-EasyEngineering-net-pdf)

MOOC Course:

1. https://onlinecourses.swayam2.ac.in/cec 23_mg11/preview

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Evaluation of Learning Process	-	-	10
3	Activity Based Learning(ABL)	-	-	38
Total Learning Hours/Semester				90



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Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Three tests conducted for 20 marks each and reduced to 10 marks	30
AAT (Visiting Start up industry)	1) Group of 3/4 visit the industry/Start up industry - 10M 2) Preparation of the report-5M 3) Presentation – 5M	20
Total		50

Activity Based Learning (38 Hours)

Activity Based Learning(38 Hours)		Hours
1.	Industry/Start-up Visit (Group of 3–4 students): Students will visit an industry or start-up to observe business operations, management practices, and entrepreneurial strategies.	20
2.	Report Preparation: Students will prepare a detailed report documenting their observations, analysis, and key learnings from the visit.	10
3.	Presentation: Students will present their findings, highlighting insights related to entrepreneurship and management practices.	8
Total		38

Evaluation of Learning Process (9 Hours)

Type of Evaluation	Hours
Test (1,2 and 3)	3
Visiting the Industry & Presentation	4
Semester End Exam	3
Total	10

Course Articulation Matrix:

Course Outcomes	Program Outcomes [POs]												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3									3		
CO2		2									2		
CO3		2									2		2
CO4						2							



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Course Title	SOFTWARE TESTING AND AUTOMATION		
Course Code	24IS551	(L-T-P) C	(3-0-0)3
Exam	3 Hrs	Hours/Week	3
SEE	50 Marks	Total Hours	(42L+48ABL)90

Course Objective: Students will be able to understand the concept of software testing, and its applications.

Course outcomes: At the end of course, student will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Illustrate the fundamental concepts, objectives, and importance of software testing in the software development lifecycle.	1,3	1
2.	Distinguish between different levels and types of software testing and apply appropriate techniques for various testing scenarios.	2	1
3.	Design, develop, and execute effective test cases and test plans based on software requirements.	3	1
4.	Analyze and use manual and automated testing tools to efficiently perform functional and non-functional testing.	3,5,9,10	1

MODULE – 1	11Hrs.
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A Perspective on Testing: Examples, Basic definitions, Test cases, Insights from a Venn diagram, Identifying test cases, Error and fault taxonomies, Levels of testing, Examples: Generalized pseudo code, The triangle problem, The NextDate function, The Foodies-Wish- List Online Shopping Application, Boundary Value Testing: Boundary value analysis, Robustness testing, Worst-case testing, Special value testing, Examples, Random Testing, Guidelines for Boundary value testing.

MODULE – 2	10Hrs.
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The Equivalence Class Testing, Decision Table-Based Testing: Equivalence classes, Traditional equivalence class testing Improved Equivalence Class Testing, Equivalence test cases for the triangle problem, NextDate function, Equivalence Class Test Cases for the complete Order Method, Edge Testing, Guidelines and observations. Decision tables, Decision Table techniques, Test cases for the triangle problem NextDate function Cause and Effect Graph, Guidelines and observations.

MODULE -3	10Hrs.
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Code based testing: Program Graphs, DD paths, Code coverage metrics, E. F. Miller's Coverage Metrics, Basis path testing, guidelines and observations. Testing Object-Oriented Software: Unit Testing Frameworks, Mock Objects and Automated Object Mocking, Data Flow Testing, Beyond Unit Testing: Life Cycle-Based Testing, Traditional Waterfall Testing, Testing in Iterative Lifecycles, Agile Testing, Software Testing Integration: Decomposition-Based Integration, Call Graph-Based Integration

MODULE -4	11Hrs.
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Automation Testing Tools: Selenium–Open-source tool for automating web browsers, Katalon Studio Automation tool supporting web, API, mobile, and desktop apps. Appium – Open-source tool for mobile application testing. Apache JMeter – Open-source tool for performance and load testing. JUnit – Popular unit testing framework for Java. TestSigma - NLP-based test creation, self-healing tests, impact analysis



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Prescribed Text Book:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Software Testing: A Craftsman's Approach	Paul C. Jorgensen and Byron DeVries	5th Edition	CRC Press	2021
2	Software Engineering – A Practitioners approach,	Roger. S. Pressman, Bruce R. Maxim,	9th Edition,	Tata- McGraw Hill.	2020, (Unit V)
3	Web Links for Tools: 1. https://www.selenium.dev/documentation/ 2. https://katalon.com/katalon-studio 3. https://appium.io/docs/en/latest/ 4. https://jmeter.apache.org/usermanual/ 5. https://junit.org/junit5/docs/current/user-guide/ 6. https://testsigma.com/docs/				

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Software Testing techniques,	Boris Beizer,	Second	Dreamtech publication	2018
2	Foundations of Software Testing	Aditya P Mathur,	First	Pearson Education	2011

E-Books and online course materials:

- NPTEL Link: https://onlinecourses.nptel.ac.in/noc18_cs42/

Online Course and Video Lecture:

- https://onlinecourses.nptel.ac.in/noc24_cs17

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	-	-	-
3	Activity Based Learning (ABL1&ABL2)	-	-	41
4	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				90



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Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Three tests conducted for 20 marks each and reduced to 10 marks	30
AAT	Demonstration activity- 1) Simulation using software tools	20
Total		50

Student Self Learning and Activity Based Learning (48Hours)

ABL1 (41 Hours): Students will apply software testing concepts, including manual testing, automation, API testing, performance testing, and defect management, to real-world applications. They will develop practical skills in designing test cases, executing tests, automating processes, and analyzing software quality.		Hours
1.	Identify a real-world application, define testing scope, and finalize problem statement with faculty	6
2.	Design and develop detailed test cases and perform manual testing with defect documentation	12
3.	Learn automation tools, set up environment, and implement automated test scripts	11
4.	Perform API testing and basic performance/load testing with analysis	6
5.	Defect tracking, report preparation, and final presentation	6
Total		41
Total Learning Hours/Semester		41

Evaluation of Learning Process (7Hours):

Type of Evaluation	Hours
Test(1,2 and 3)	3
Presentation	1
Semester End Exam	3
Total	7



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Course Articulation Matrix:

Course Outcomes	Program Outcomes [POs]												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
COs													
CO1	2		3									2	
CO2		2										3	
CO3			3									2	
CO4			2		3				2	2		2	



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Course Title		ROBOTIC PROCESS AUTOMATION		
Course Code	24IS552	(L-T-P)C	(3-0-0)3	
Exam	3 Hrs.	Hours/Week	3	
SEE	50 Marks	Total Hours	(42L+48ABL)90	
Course Objective: Students will be able to Deploy and control Bots with UiPath Orchestrator .				
Course Outcomes: At the end of course, student will be able to:				
#	Course Outcomes	Mapping to POs	Mapping to PSOs	
1.	Understand RPA and Learn UiPath programming techniques to deploy robot configurations and explore data extraction techniques	1	-	
2.	Describe the different types of variables, Control Flow and data manipulation techniques	2	-	
3.	Use about integrations with various popular applications such as SAP and MS Office	3,4	-	
4.	Debug a programmed robot including logging and exception handling Maintain code version and source control	3,5,9	2	
MODULE-1			10 Hrs	
What is Robotic Process Automation? What is Robotic Process Automation? Scope and techniques of automation Robotic process automation, About UiPath, The future of automation. Record and Play: Record and Play, UiPath stack, Downloading and installing UiPath Studio, Learning UiPath Studio.				
MODULE-2			11 Hrs	
Sequence, Flowchart, and Control Flow: Sequence, Flowchart, and Control Flow, Sequencing the workflow, Activities, Control flow, various types of loops, and decision making, Step-by-step example using Sequence and Flowchart, Step-by-step example, using Sequence and Control flow.				
Data Manipulation: Data Manipulation, Variables and scope, Collections, Arguments – Purpose and use Data table usage with examples, Clipboard management, File operation with step-by-step example.				
MODULE-3			10 Hrs	
Taking Control of the Controls: Taking Control of the Controls, Finding and attaching windows, Finding the control, Techniques for waiting for a control, Act on controls – mouse and keyboard activities, Working with UiExplorer, Handling events, Revisit recorder, Screen Scraping,				
Tame that Application with Plugins and Extensions: Tame that Application with Plugins and Extensions, Terminal plugin, SAP automation, Java plugin.				
MODULE-4			11 Hrs	
Handling User Events and Assistant Bots: Handling User Events and Assistant Bots, What are assistant bots? Monitoring system event triggers, Monitoring image and element triggers, Launching an assistant bot on a keyboard event. Exception Handling, Debugging, and Logging: Exception Handling, Debugging, and Logging, Exception handling Managing and Maintaining the Code: Managing and Maintaining the Code, Project organization				



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Prescribed Text Book:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Learning Robotic Process Automation: Create Software robots and automate business processes with the leading RPA tool – Ui Path	AlokMani Tripathi,	--	Packtpub	March 2018.

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Learning Service Now	Tim Woodruff	-	Packtpub	2017

E-Book and online course material:

1.<https://www.ebooks.com/en-in/book/96159153/learning-robotic-process-automation/alok-mani-tripathi/?srsltid=AfmBOoq3RU9R2vwgLFZFfflu>

Online Course and Video Lecture:

1.<https://www.uipath.com/rpa/academy>

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	-	-	-
3	Evaluation of Learning Process	-	-	07
4	Activity Based Learning(ABL)	-	-	41
Total Learning Hours/Semester				90

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20marks each and reduced to 10 marks	30
Activity Details	An automation project by students in a group of 2-4 students	20
Total		50



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Activity Based Learning (41Hours):

ABL (41Hours): Design and Development of Smart Academic Automation System		Hours
1.	Institutional Process Automation	10
2.	Smart Eligibility & Reporting System	10
3.	Dynamic Website Data Extraction Bot	10
4.	Smart File Processing & Notification Bot	11
Total Learning Hours/Semester		41

Evaluation of Learning Process (7 Hours)

Type of Evaluation	Hours
Test (1,2 and 3)	3
Project Demo + Presentation	1
Semester End Exam	3
Total	7

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3												
CO2		3											
CO3			3	3									
CO4			3		3				3				3



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Course Title		PROMPT ENGINEERING	
Course Code	24IS553	(L-T-P)C	(3-0-0)3
Exam	3Hrs.	Hours/Week	3
SEE	50Marks	Total Hours	(42L+48ABL)90
Course Objective: To provide an overview of prompt engineering concepts, techniques, and applications for designing effective AI prompts and optimizing human-AI interaction. Course outcomes: At the end of course, students will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Understand the of importance and benefits prompt engineering	1,2	1
2.	Apply the techniques involved and monitor the prompt for Generative AI	1,2,3,4	1
3.	Compute the functions and feedback for ChatGPT prompt and identify the framework to find out the Quality prompt.	1,2,3,4	1
4.	Analyze the effective output for the quality prompt and evaluate the various advanced prompt engineering techniques	1,2,3,4,11	1,2
MODULE-1			11Hrs.
Introduction to Prompt Engineering: Prompts- Types of Prompts – works of prompt engineering – Evaluating and validating prompts - Role of prompts in AI models – Importance of effective prompts – Techniques in Prompt engineering - Ethical considerations in prompt engineering– Benefits in prompt engineering.			
MODULE-2			10Hrs.
Prompt Engineering – Generative AI: Generative language models- NLP and ML foundations, common NLP task , Optimizing prompt-based models, Tuning and optimization techniques , Pre-training and transfer learning – Designing effective prompts – prompt generation strategies – Monitoring prompt effectiveness.			
MODULE-3			11Hrs.
ChatGPT: Reinforcement Learning from Human Feedback- The Process of Building a Model- Moving from Instruct GPT to ChatGPT- Instruct GPT- ChatGPT- The Changing API- Chat Completion API- Moving Away from Chat-Moving Beyond Chat to Functions- Prompt Engineering as Play Writing. A Framework for Effective AI Communication: The CLEAR Framework - Concise and Logical Prompt Crafting - Explicit Prompt Crafting - Adaptive Prompt Crafting - Reflective Prompt Crafting - The Relationship Between Prompts And Outputs - Quality Prompts - A Systematic Approach.			
MODULE-4			10Hrs.
Advanced Prompt Engineering: Chain-of-Thought (CoT) Prompting, Tree-of-Thoughts (ToT) Prompting, Active prompting, Reason and Act (ReAct), Expert Prompting, Automatic Prompt Engineering (APE).			



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Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Prompt Engineering for Generative AI	James Phoenix, Mike Taylor	-	O'Reilly Media	2024

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	The Art of Prompt Engineering with Chatgpt: A Hands-On Guide: 3	Nathan Hunter	-	Nathan Hunter (Independent Publisher)	2023
2.	Prompt Engineering: The Art of Asking Hardcover	Yaswanth SaiPalaghat	-	Notion Press	2023

E Books and online course materials:

1. https://www.thepromptindex.com/ebookdownload.html?utm_source=chatgpt.com
2. https://www.kdnuggets.com/2023/04/free-ebook-mastering-generative-ai-prompt-engineering.html?utm_source=chatgpt.com

Online Courses and Video Lectures:

1. https://www.courseera.org/learn/prompt-engineering?utm_source=chatgpt.com

Teaching - Learning – Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	-	-	-
3	Student Study Hours–Self Learning	-	-	02
4	Activity Based Learning (ABL1 & ABL2)	-	-	40
5	Evaluation of Learning Process	-	-	06
Total Learning Hours/Semester				90



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Proposed Assessment Plan(for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Threetestsconductedfor20markseachand reducedto10marks	30
AAT	Details of activities to be conducted Activity 1: Prompt Design & Optimization Lab Activity 2: Mini Project – AI Application using Prompt Engineering)	20
Total		50

Activity Based Learning (40 Hours)

ABL1(25Hours):Prompt Design & Optimization Lab		Hours
Prompt Design & Optimization Lab	Students will be given real-world tasks (chatbot, summarization, coding assistance)	5
	They will design prompts, compare outputs, and optimize results	15
	Submit report with prompt iterations and analysis	5
Total		25
ABL 2(15Hours):Mini Project – AI Application using Prompt Engineering		Hours
Mini Project – AI Application using Prompt Engineering	Students will select a real-world application (e.g., resume generator, Q&A bot, code assistant) and design a solution using prompt engineering.	5
	They will develop and optimize prompts using techniques like zero-shot, few-shot, role prompting, and CoT	5
	Final evaluation includes demonstration of the prototype and presentation of results	5
Total		40

Evaluation of Learning Process (6 Hours)

Type of Evaluation	Hours
Test(1,2and3)	3
Semester End Exam	3
Total	6

Course Outcomes	Program Outcomes[POs]												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3										2	
CO2	3	3	3	3								2	
CO3	3	3	3	3								2	
CO4	3	3	3	3							3	2	2



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Course Title	BIG DATA TECHNOLOGIES		
Course Code	24IS554	(L-T-P) C	(3-0-0) 3
Exam	3 Hours	Hours/Week	3
SEE	50 Marks	Total Hours	(42L+48ABL)90

Course Objective: Students will be able to acquire knowledge, skills and tools to manage big data.

Course outcomes: At the end of course, students will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Describe big data concepts, database models and big data techniques	1	-
2.	Analysis architectural elements of HDFS, Map Reduce, YARN, Spark and Storm	1	-
3.	Apply big data concepts and techniques to address issues in a given scenario	1	1
4.	Design Map reduce solution for a real world application	3,5	1

MODULE-1	11 Hrs.
Introducing Hadoop and Seeing What It's Good for – Big Data and the Need for Hadoop, The Origin and Design of Hadoop, Examining the Various Hadoop Offerings. Use Cases for Big Data in Hadoop – The Keys to Successfully Adopting Hadoop, Log Data Analysis, Data Warehouse Modernization, Fraud detection, Risk modeling, Social Sentiment Analysis, Image Classification, Graph Analysis, To Infinity and Beyond. The Hadoop Distributed System – Data Storage in HDFS, Sketching Out the HDFS Architecture, HDFS Federation, HDFS High Availability	

MODULE-2	10 Hrs.
MapReduce Programming – Thinking in Parallel, Seeing the Importance of MapReduce, Doing Things in Parallel: Breaking Big Problems into Many Bite-Size Pieces, Writing MapReduce Applications, Getting Your Feet Wet: Writing a Simple MapReduce Application. Frameworks for Processing Data in Hadoop: YARN and MapReduce – Running Application Before Hadoop 2, Seeing a World Beyond MapReduce, Real-time and Streaming Applications. Statistical Analysis in Hadoop –Pumping Up Your Statistical Analysis, Machine Learning with Mahout, R on Hadoop.	

MODULE-3	10 Hrs.
Hadoop and the Data Warehouse: Friends or Foes? – Comparing and Contrasting Hadoop with Relational Databases, Modernizing the Warehouse with Hadoop. Hadoop and the Data Warehouse: Friends or Foes? – Comparing and Contrasting Hadoop with Relational Databases, Modernizing the Warehouse with Hadoop.	

MODULE-4	11 Hrs
Introducing Spark: Spark's Background and History, Common Use Cases for Spark, Understanding How Spark Processes Information, How Spark Benefits the Entire Organization, Core Spark Technology Components, Comparing Hadoop/MapReduce and Spark, Spark's Open-Source Challenges. How Spark, Hadoop and MapReduce Work Together: Choosing the Optimal Big Data Solution, Big Data in Action. Storm – What is storm? Storm architecture, Why Storm? Industry Use cases of storm (refer online material for storm)	



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Prescribed Textbooks:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Hadoop for Dummies	Dirk deRoos, Paul C. Zikopoulos, Bruce Brown, Rafael Coss, Roman B. Melnyk	3 rd	John Wiley & Sons, Inc.	2014,
2	Spark for Dummies	Robert D. Schneider and Jeff Karmiol	2nd	John Wiley & Sons	2019

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Big data and Analytics	Seema Acharya	3 rd	Wiley publications	2014
2	Hadoop Operations other text for spark and storm	Eric Sammer	3 rd	O'Reilley	2012

E-Books and Online course material:

1. <https://download.e-bookshelf.de/download/0002/3297/41/L-G-0002329741-0004402468.pdf>

Online course and video lecture:

1. Big Data Computing: <https://nptel.ac.in/courses/106/104/106104189/>

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/Semester
1	Classroom Teaching & Learning	3	14	42
2	Evaluation of Learning Process	1	5	08
3	Activity Based Learning (ABL)	-	-	40
Total Learning Hours/Semester				90

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Mini Project	20
Total		50



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Activity Based Learning (40Hours)

ABL (40Hours): Students engage in a hands-on exploration on installing and Hadoop and execute Map-Reduce applications.		Hours
1.	Hands-on Data Processing Activities , where students perform practical exercises using Big Data tool such as Hadoop.	20
2.	Problem-Solving through Mini Projects for real time applications	10
3.	Collaborative Learning and Tool Exploration to enhance experiential understanding of Big Data frameworks.	10
Total		40

Evaluation of Learning Process (8 Hours)

Type of Evaluation	Hours
Test (1,2 and 3)	3
Demonstration of Mini Project	2
Semester End Exam	3
Total	08

Course Articulation Matrix

Course Outcomes	Program Outcomes[POs]												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3												
CO2	3												
CO3	3												3
CO4			3		3								3



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Course Title	RESEARCH METHODOLOGY & INTELLECTUAL PROPERTY RIGHTS		
Course Code	24RIP	(L-T-P) C	(3-0-0) 3
Exam	3 Hrs.	Hours/Week	3
SEE	50 Marks	Total Hours	(42L+48ABL)90
Course Objective: To give an overview of technical research activities and patenting methodology. Course outcomes: At the end of course, students will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Carry out Literature Review and write technical paper	2,3,4,11	-
2.	Describe the fundamentals of patent laws and the patent drafting Procedure.	4, 11	-
3.	Elucidate copyright laws and subject matters of copyright	4, 11	-
MODULE-1			10 Hrs.
Introduction: Meaning of Research, Objectives of Engineering Research, and Motivation in Engineering Research, Types of Engineering Research. Ethics in Engineering Research: Ethics in Engineering Research Practice, Types of Research Misconduct, Ethical Issues Related to Authorship. Literature Review and Technical Reading, New and Existing Knowledge, Analysis and Synthesis of Prior Art, Bibliographic Databases, Web of Science, Google and Google Scholar, Effective Search: The Way Forward, Introduction to Technical Reading Conceptualizing Research, Critical and Creative Reading.			
MODULE-2			10 Hrs.
Attributions and Citations: Giving Credit Wherever Due, Citations: Functions and Attributes, Impact of Title and Keywords on Citations, Knowledge Flow through Citation, Citing Datasets, Styles for Citations, Acknowledgments and Attributions. Technical Writing and Publishing: Free Writing and Mining for Ideas, Attributes and Reasons of Technical Writing, Patent or Technical Paper?—The Choice, Writing, Journal Paper: Structure and Approach: Title, Abstract, and Introduction, Methods, Results, and Discussions, Table, Figures, Acknowledgments, and Closures.			
MODULE-3			10 Hrs.
Introduction To Intellectual Property: Role of IP in the Economic and Cultural Development of the Society, IP Governance, IP as a Global Indicator of Innovation, Origin of IP, Major Amendments in IP Laws and Acts in India. Patents: Conditions for Obtaining a Patent Protection, To Patent or Not to Patent an Invention. Rights Associated with Patents. Enforcement of Patent Rights. Inventions Eligible for Patenting. Non-Patentable Matters. Patent Infringements. Process of Patenting: Prior Art Search. Choice of Application to be Filed. Patent Application Forms. Jurisdiction of Filing Patent Application. Publication. Pre-grant Opposition. Examination. Grant of a Patent. Validity of Patent Protection. Post-grant Opposition. Do I Need First to File a Patent in India. Patent Related Forms. Fee Structure. Types of Patent Applications.			
MODULE-4			10 Hrs.
Copyrights and Related Rights: Classes of Copyrights. Criteria for Copyright. Ownership of Copyright. Copyrights of the Author. Copyright Infringements. Copyright Infringement is a Criminal Offence. Copyright Infringement is a Cognizable Offence. Copyrights and Internet. Non-Copyright Work. Copyright Registration. Judicial Powers of the Registrar of Copyrights. Fee Structure. Copyright Symbol. Validity of Copyright. Copyright Profile of India. Copyright and the word 'Publish'. Transfer of Copyrights to a Publisher. Copyrights and the Word 'Adaptation'. Copyrights and the Word 'IndianWork'. Joint Authorship. Copyright Society. Copyright Board. Copyright Enforcement Advisory Council (CEAC). Trademarks: Eligibility Criteria. Who Can Apply for a Trademark? Acts and Laws. Designation of Trademark			



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Symbols. Classification of Trademarks. Registration of a Trademark is Not Compulsory. Validity of Trademark. Types of Trademark Registered in India. Trademark Registry. Process for Trademarks Registration. **Self- study: Case Studies on Patents.** Case study of Curcuma (Turmeric) Patent, Case study of Neem Patent, IP Organizations In India.

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Engineering Research Methodology	Dipankar Deb, Rajeeb Dey, Valentina E, Balas	-	Springer	2019
2	Intellectual Property	Prof. Rupinder Tewari Ms. Mamta Bhardwa	8th	Professor Guralp Singh Sandhu Honorary Director	2021

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Research Methods for Engineers	David V. Thiel	-	Cambridge University Press	2014
2	Intellectual Property Rights	N.K.Acharya	8th	Asia Law House	2021

E Books and online course materials:

1. <https://download.e-bookshelf.de/download/0012/0144/90/L-G-0012014490-0035363481.pdf>

Online Courses and Video Lectures:

1. https://onlinecourses.swayam2.ac.in/ntr24_ed08/preview

Teaching - Learning – Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Student Study Hours – Self Learning	-	-	02
3	Activity Based Learning (ABL1 & ABL2)	-	-	38
4	Evaluation of Learning Process	-	-	08
Total Learning Hours / Semester				90



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Course Title	ENVIRONMENTAL STUDIES		
Course Code	24EVS	(L-T-P) C	(0-2-0) 1
Exam	3 Hrs	Hours/Week	2
SEE	50 Marks	Total Hours	(28T + 2ABL)30
Course Objective: The students will be able to develop a sense of responsibility about the environment, natural resources, their conservation and understand the concept, structure and function of different ecosystems and the ill effects of environmental pollution and other environmental issues like population growth, Acid rain, global warming etc. Course Outcomes: At the end of course, students will be able to:			
#	Course Outcomes	Mapping to PO's	
1.	Acquire an awareness of and sensitivity to the total environment and its allied problems	7, 10	
2.	Develop strong feelings of concern, sense of ethical responsibility for the environment and the motivation to act in protecting and improving it.	6,8	
3.	Analyze and evaluate environmental measures in real world situations in terms of ecological, political, economical, societal and aesthetic factors.	6, 8, 9	
MODULE-1			4 Hrs.
Environment: Definition, about the Earth, Earth's Structure I.e. Atmosphere and its parts, Hydrosphere, Lithosphere and Biosphere, Ecosystem, Balanced ecosystem, Effects of human activities on environment Agriculture Housing Industry Mining and Transportation.			
MODULE-2			8 Hrs.
Natural Resources: Water resources, Availability and Quality, Water borne diseases, Water induced diseases, Fluoride problem in drinking water. Mineral Resources - Forest Resources - Material Cycles - Carbon, Nitrogen and Sulphur Cycles.			
MODULE-3			8 Hrs.
Pollution: Effects of pollution - Water pollution - Air pollution Land pollution - Noise pollution.			
MODULE-4			8 Hrs.
Current Environmental issues of importance: Acid Rain, Ozone layer depletion - Population Growth, Climate change and Global warming. Environmental Impact Assessment and Sustainable Development Environmental Protection - Legal aspects. Water Act and Air Act.			



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Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Environmental Studies	Dr. D.L Manjunath	-	Pearson Education	2006
2.	Environmental Studies	Dr. S. M. Prakash	-	Elite Publishers	2006

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Environmental Studies	Benny Joseph	-	Tata McGraw ill	2005
2	Principles of Environmental Science and Engineering	P. Venugopala Rao	-	Prentice Hall of India.	-
3	Environmental Science and Engineering	Meenakshi	-	Prentice Hall India	-

E Books and online course materials:

<https://archive.org/details/environmentalstu0000manj/m%20ode/2up>

Teaching - Learning – Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	2	14	28
2	Student Study Hours – Self Learning	-	-	-
3	Activity Based Learning (ABL1 & ABL2)	-	-	2
4	Evaluation of Learning Process	-	-	-
Total Learning Hours / Semester				30

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	CIE with MCQs pattern	25
Activity Details	Presentation	25
Total		50



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Activity Based Learning (2 Hours):

ABL 1 (02 Hours): Presentation		Hours
Presentation	In this activity, students will provide presentation on different topics related to environment, natural resources, pollution and current environmental issues	2
Total		2

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
COs													
CO1							3			3			
CO2						3		3					
CO3						3		3	3				



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Course Title	MINI PROJECT		
Course Code	24IS506	(L-T-P) C	(0-0-2) 1
Exam	3 Hrs.	Hours/Week	2
SEE	50 Marks	Total Hours	30P

Course Objective: Students should form batches of 3-4 members and develop applications using any technology or domain.

Course Outcome: At the end of course, students will be able to:

#	Course Outcomes	Mapping to PO	Mapping to PSOs
1.	Identify a real-life or engineering problem and conduct challenge to investigate and solve.	1,2	1
2.	Utilize software engineering principles to plan and design a solution for the selected problem.	1,2,3	2
3.	Develop and test the designed solution using appropriate methods, resources, and modern tools.	3,5,4	1
4.	Collaborate effectively with team members and mentors, deliver presentations, and prepare comprehensive technical documentation and Adhere to ethical standards in all project-related activities.	9,10,11,8	1

Performance Indicators	Low	Medium	High
Literature Survey and Problem Definition (5 Marks)	Literature Survey not pertaining to the title of the project (2 M)	Incomplete literature survey and improper problem definition (3-4 M)	Extensive literature survey with clear state of the art problem definition (5M)
Effective Formulation of Design strategies (10 Marks)	Has no coherent strategies for problem solving (2 - 4 M)	Has some strategies for problem -solving, but does not apply them consistently (5-7 M)	Formulates strategies for solving problems (8-10 M)
Implementation Techniques (10 Marks)	No proper technique for implementation (2 - 4 M)	Has some techniques but does not apply them consistently (5-7 M)	Uses well defined implementation techniques (8-10 M)
Verification of the results (5 Marks)	No attempt at checking the incorrect solution. (2 M)	The solution is correct, but not visualized efficiently (3-4 M)	The solution is correct and visualized in an efficient way(5M)



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Presentation/ communication (10 Marks)	Disorganized and ineffective presentation (2 - 4 M)	Organized, but ineffective presentation (5-7 M)	Effectively organized presentation (8-10 M)
Report Preparation (10 Marks)	Disorganized and contents not sufficient (2 - 4 M)	Organized but not good content wise (5-7 M)	Effectively organized And well framed contents (8-10 M)

The Open ended Project work is to be carried out in three phases:

- **Project Phase I** - Students in consultation with the guides shall carry out literature survey to finalize the topic of the project. Evaluation of the project and its feasibility is done at the end of two weeks.
- **Project Phase II** - Students are expected to present the system analysis, Requirements Specification, design carried out/ algorithms developed and intermediate results at the end of six weeks.
- **Project Phase III** - Final internal evaluation shall be taken up during this phase. This includes presentation, project demonstration and report
- **The continuous evaluation of the project phases** – I, II, and III shall be carried out by the Committee consisting of Head of the department, Guide and other faculty.

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3										3	
CO2	3	3	3										3
CO3			3	3	3							3	
CO4									3	3		3	



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DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

Course Title	NATIONAL SERVICE SCHEME (NSS)		
Course Code	24NYP3	(L-T-P) C	(0-0-2)0
Exam	-	Hours/Week	2
SEE	-	Total Hours	24
Course Outcomes: At the end of the course, the student will be able to			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Understand the importance of his / her responsibilities towards society.	6	-
2	Analyze the environmental and societal problems/issues and will be able to design solutions for the same.	3,6	-
3	Evaluate the existing system and to propose practical solutions for the same for sustainable development.	3,6	-
4	Implement government or self-driven projects effectively in the field.	11	-
5	Develop capacity to meet emergencies and natural disasters & practice national integration and social harmony in general	11	-
MODULE - 1			
			8 Hrs.
Developing Sustainable Water management system for rural areas and implementation approaches. Contribution to any national level initiative of Government of India. For eg. Digital India, Skill India, Swachh Bharat, Atmanirbhar Bharath, Make in India, Mudra scheme, Skill development programs etc.			
MODULE - 2			8 Hrs.
Spreading public awareness under rural outreach programs.(minimum5 programs).			
MODULE - 3			8 Hrs.
Social connect and responsibilities.			
Suggested Learning Resources:			
Books :			
1. NSS Course Manual, Published by NSS Cell, VTU Belagavi.			
2. Government of Karnataka, NSS cell, activities reports and its manual.			
3. Government of India, NSS cell, Activities reports and its manual.			



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Course Title	PHYSICAL EDUCATION (PE)		
Course Code	24NYP3	(L-T-P) C	(0-0-2)0
Exam	-	Hours/Week	2
SEE	-	Total Hours	24
Course Outcomes: At the end of the course, the student will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Understand the fundamental concepts and skills of Physical Education, Health, Nutrition and Fitness.	9, 10, 12	-
2.	Familiarization of health-related Exercises, Sports for overall growth and development	9, 12	-
3.	Create a foundation for the professionals in Physical Education and Sports	12	-
4.	Participate in the competition at regional/state / national /international levels.	9, 10, 12	-
5.	Create consciousness among the students on Health, Fitness and Wellness in developing and maintaining a healthy lifestyle.	9, 10, 12	-
MODULE - 1			4 Hrs.
Orientation - Fitness, Food & Nutrition			
MODULE - 2			4 Hrs.
General Fitness & Components of Fitness - Agility – Shuttle Run, Flexibility – Sit and Reach, Cardiovascular Endurance – Harvard step Test			
MODULE - 3			16 Hrs.
Specific games (Any one to be selected by the student) 1. Badminton (Fore hand low/high service, back hand service, smash, drop) 2. Basketball (Dribbling, passing, shooting etc.) 3. Athletics (Field events – Throws)			



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Course Title	YOGA		
Course Code	24NYP3	(L-T-P) C	(0-0-2)0
Exam	-	Hours/Week	2
SEE	-	Total Hours	24

Course Outcomes: At the end of the course, the student will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Understand the Philosophical and Scientific Basis of Yoga	12	-
2.	Demonstrate Proficiency in Basic Yoga Practices	9	-
3.	Analyze the Role of Yoga in Managing Stress and Enhancing7, 12 - Lifestyle	7,12	-
4.	Apply Yoga Principles for Personal and Professional Growth	10,12	-

MODULE - 1	8 Hrs.
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Ashtanga Yoga: Asana , Pranayama , Pratyahara

MODULE - 2	8 Hrs.
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Different types of Asanas:

- Sitting 1. Ardha IJshtrasana 2. Vakrasana 3. Yogamudra in Padmasana
2. Standing 1. I.JrdhvaHastothanasana 2. Hastapadasana 3 . ParivrittaTrikonasana 4.Utkatasana
3. Supine line 1. Sarvangasana 2. Chakraasana 3. Pavanamuktasana

MODULE - 3	8 Hrs.
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Pranayama

Meaning, Need, importance of Pranayama, Different types, Meaning by name, technique, precautionary measures and benefits of each Pranayama, Ujjayi, Sheetal, Sheektari



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Course Title	CRYPTOGRAPHY, NETWORK SECURITY AND CYBER LAW		
Course Code	24IS601	(L-T-P) C	(3-0-0) 3
Exam	3 Hrs.	Hours/Week	03
SEE	50 Marks	Total Hours	(42L + 48ABL) 90

Course Objective: To impart the fundamentals of cryptographic techniques and various algorithms that enables providing network security services.

Course Outcomes: At the end of course, student will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Describe the basics of cryptographic techniques, principles & practices, Cyber security and cyber law	1,2	-
2	Apply cryptographic techniques to secure the data in transit	2,5	-
3	Analyze different cryptographic techniques to handle security threats	2,5	-
4	Understand and adopt Cyber security and Cyber law	8	-

MODULE - 1	11hrs
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Overview: Computer Security Concepts. The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms. A Model for Network Security. Classical Encryption Techniques: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques. Block Ciphers and the Data Encryption Standard: Traditional Block Cipher Structure, The Data Encryption Standard, A DES Example, The Strength of DES, Block Cipher Design Principles

MODULE - 2	11hrs
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Asymmetric Ciphers: Public-Key Cryptography and RSA: Principles of Public-Key Cryptosystems, the RSA Algorithm, Diffie Hellman Key Exchange. Digital Signatures: Digital Signatures, NIST Digital Signature Algorithm. Key Management and Distribution: Symmetric Key Distribution Using Symmetric Encryption, Symmetric Key Distribution Using Asymmetric Encryption, Distribution of Public Keys, X.509 Certificate.

MODULE - 3	10hrs
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User Authentication: Kerberos, Federated Identity Management, Personal Identity Verification. Network and Internet Security: Network Access Control and Cloud Security: Network Access Control, Extensible Authentication Protocol, IEEE 802.1X Port-Based Network Access Control.

MODULE - 4	10hrs
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Transport Level Security: Web Security Considerations, Secure Sockets Layer, Transport Layer Security, HTTPS, Secure Shell (SSH). Cyber Law: IT act aim and objectives, Scope of the act, Major Concepts, Important Provisions, Attribution, acknowledgement, and dispatch of electronic records. Regulation of certifying authorities, Penalties and adjudication, the cyber regulations appellate tribunal.



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Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Cryptography and Network Security	William Stallings	8th Edition	Pearson	2023
2	Cryptography, Network Security and Cyber Laws	Bernard L. Menezes:	3 rd edition	Cengage Learning India Pvt. Ltd.	2023

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Network Security: Private Communication in a Public World	Charlie Kaufman, Radia Perlman, Mike Speciner	3rd	Pearson Education	2022
2.	Cryptography and Network Security	Atul Kahate	3 rd	Tata McGraw-Hill	2022

E Books and online course materials:

1. <http://williamstallings.com/Crypto3e>

Online Courses and Video Lectures:

1. <https://nptel.ac.in/courses/106/105/106105031>

Teaching - Learning – Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Class Room Teaching & Learning	3	14	42
2.	Integrated Lab Component	-	-	-
3.	Student Study Hours – Self Learning	1	14	14
4.	Activity Based Learning	-	-	27
5.	Evaluation of Learning Process	-	-	07
Total Learning Hours / Semester				90



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Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted Mini Project – Cryptographic Algorithm / Digital Signature Implementation	20
Total		50

ABL: Mini Project Implementation

Activity	Task	Hours
Problem Identification & Topic Selection	Select project (encryption system / cyber law case / network security model)	2
Literature Survey / Background Study	Study algorithms, security concepts, and cyber laws	4
Design of Solution	Algorithm / architecture / case framework design	5
Implementation / Development	Coding / simulation / case analysis	6
Testing & Validation	Verify results and correctness	3
Report Writing	Documentation of project	3
Demonstration & Presentation	Final demo and viva	4
Total		27

Student Study Hours – Self Learning

Sl. No	Activity Description	Hours
1	Literature Survey (Cryptographic Algorithms / Concepts)	4
2	Understanding Tools & Technologies (Python/OpenSSL etc.)	3
3	Algorithm Design & Planning	3
4	Report Preparation & Documentation	2
5	Preparation for Evaluation / Viva	2
Total		14



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Evaluation of Learning Process (7 Hours)

Type of Evaluation	Hours
Test (1, 2 and 3)	3
Viva	1
Semester End Exam	1
Total	7

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2											
CO2		3		2									
CO3		3		2									
CO4								3					



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Course Title	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING		
Course Code	24IS602	(L-T-P)C	(3-0-2) 4
Exam	3 Hrs.	Hours/Week	5
SEE	50 Marks	Total Hours	(42L+28P+50ABL)120

Course Objective: Students will be able to apply the concepts of Artificial Intelligence to construct knowledge based systems, To apply the techniques of machine learning for real time problems.

Course outcomes: At the end of course, student will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Apply the concepts of intelligent agents, search strategies, logic, and machine learning techniques to solve real-world problems.	2,3	1
2.	Analyze datasets and problem scenarios to select suitable Artificial Intelligence methods and machine learning algorithms.	2,3,5	1
3.	Design intelligent systems using neural networks, Bayesian learning, and other AI & ML approaches for complex applications.	3,5	1
4.	Develop and implement Different kinds of machine learning algorithm with real-world problems.	3,5,8	1

MODULE – 1	11 Hrs.
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Introduction, Intelligent agents, Searching: Definition of AI, Intelligent Agents: Agents and environment, the nature of environments; the structure of agents, Problem-solving: Searching for solution; Uninformed search strategies; Informed search strategies. Adversarial Search, Constraint Satisfaction Problems, Logical agents: Games, Optimal decision in games, Alpha-Beta Pruning, Defining Constraint satisfaction problems; Backtracking search for CSPs; Knowledge-based agents; The Wumpus world as an example world, propositional logic, Syntax and semantics.

MODULE – 2	10 Hrs.
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Introduction to Machine learning: Human learning and its types, Machine learning and its types, Applications, tools and issues in machine learning, Activities in machine learning, Types of data, Exploring structure of data, Data quality and Pre-processing. **Modeling and Evaluation:** Introduction, Selecting a model, training a model, model representation and Interpretability, Evaluating performance of a model..

MODULE -3	11 Hrs.
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Learning Problems and Concept Learning: Well Posed learning problems, Designing Learning systems, Concept Learning Tasks, Search, Find-S, Version Spaces and Candidate Elimination Algorithm, Inductive bias. Supervised Learning: Introduction, example, classification model, classification learning steps, and Common algorithms –KNN, decision tree, and Random forest model.

MODULE -4	10 Hrs.
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Supervised Learning: SVM, Regression-Simple linear regression, Multiple linear regressions. Unsupervised Learning: Supervised Vs Unsupervised, Application, clustering. Basics of Neural **Networks:** Exploring the artificial neuron, Types of activation function, Early Implementations of ANN, Architectures of NN, Learning process in ANN, Back propagation algorithm. Bayesian learning: Introduction, Bayes theorem, Bayes theorem and concept learning.



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Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Artificial Intelligence - A Modern Approach	Stuart Russell and Peter Norvig	3rd	Pearson Education	2022
2.	Machine Learning	Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das	(INDIAN EDITION)	Pearson	2019

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Artificial Intelligence	Elaine Rich, Kevin Knight and Shiva shankar B Nair	3rd	Tata McGraw- Hill	2015
2.	Introduction to Artificial Intelligence and Expert Systems	Dan W Patterson	----	Pearson	2015
3.	Hands-on machine learning with scikit-learn and tensor flow, Concepts, Tools, and Techniques to Build Intelligent Systems.	O'Reilly Media, Aurélien Géron,	2nd	Tata McGraw- Hill	2019

E-Book and online course material:

- 1) <https://www.udacity.com/course/intro-to-artificial-intelligence--cs271>
- 2) <https://www.edx.org/course/artificial-intelligence-uc-berkeleyx-cs188-1x>

Online Course and Video Lecture:

- 1) <https://nptel.ac.in/courses/106106139/>

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	2	14	28
3	Evaluation of Learning Process	-	-	08
4	Activity Based Learning(ABL1&ABL2)	-	-	42
Total Learning Hours/Semester				120



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Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20marks each and reduced to 10 marks	30
Activity Details	1) Project Demonstration -10Marks 2) Lab Program Execution-10Marks	20
Total		50

Integrated Lab component (28hours)

Sl. No	Program Details	Hours
1.	Demonstrate data Analysis using the “ numpy ” module.	2
2.	Demonstrate Exploratory Data Analysis using the “ pandas ” module.	2
3.	Demonstrate Data Visualization using the “ matplotlib ” module.	2
4.	Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples.	4
5.	Implement and demonstrate the Candidate Elimination algorithm for finding the most specific hypothesis based on a given set of training data samples.	4
6.	Consider the given dataset, which demonstrates the salary distribution table of a company "ABC" based on years of experience. Using the given data implement the ML algorithm (Linear Regression) to predict the salary of a new employee with 5 years of experience. Create a visualization to represent training data and regression line.	2
7.	Consider the given Iris Datasets and implement the ML Algorithm (k-nearest neighbors) to classify the Iris flowers among three species (Setosa, Virginica and Versicolor) from measurements of sepal and petal.(Without using sk learner)	4
8.	Apply K-Means clustering to segment a customer dataset based on various attributes such As age, amount spent, satisfaction, and brand loyalty.	4
9.	Consider the given Iris dataset and implement the ML algorithm to classify the Iris flowers among three species (Setosa, Virginica and Versicolor) from measurements of sepal, petal Length and width. (using Decision Tree Algorithm) (Without using sk learner)	2
10.	Implement an Artificial Neural Network (ANN) using TensorFlow to predict customer churn based on bank customer data.	2
Total		28



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Activity Based Learning (42 Hours)

ABL1 (28Hours)		Hours
1.	Project Demonstration -Problem Analysis(Perform an in-depth analysis of a real-world problem)	5
2.	Data Preprocessing & Feature Engineering (Execute comprehensive data preprocessing, including data cleaning, handling missing and inconsistent values, transformation, normalization)	9
3.	ML Model Development (Design and implement appropriate machine learning models by selecting suitable algorithms)	14
4.	Model Evaluation & Optimization (Critically evaluate model performance using advanced evaluation metrics and validation techniques)	8
5.	Report and Presentation (Compile a detailed technical report articulating methodology, experimental results, and analytical insights, and deliver a structured presentation demonstrating problem-solving approach)	6
Total Learning Hours/Semester		42

Evaluation of Learning Process (8 Hours)

Type of Evaluation	Hours
Test (1,2 and 3)	3
Lab program Execution	2
Semester End Exam	3
Total	8

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1		3	3									3	
CO2		3	3		3							3	
CO3		3	3		3				3	3	3	3	
CO4		3	3		3				3	3	3	3	



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Course Title	CLOUD COMPUTING		
Course Code	24IS603	(L-T-P)C	(3-0-2) 4
Exam	3 Hrs.	Hours/Week	5
SEE	50 Marks	Total Hours	(42L+28P+50ABL)120
Course Objective: Students will be able to understand cloud infrastructure, virtualization, storage, networking, and resource provisioning. Course outcomes: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Comprehend the fundamental concepts of cloud computing, including service and deployment models.	2	-
2.	Describe the architecture and working of various cloud platforms and technologies.	2,3	-
3.	Analyse cloud storage models, providers, and standards, and evaluate the application of Software as a Service and Software plus Services in real-world scenarios.	3,5	2
4.	Apply principles of best practice in cloud application design and Management.	3,5,8	2
MODULE – 1			10Hrs.
Cloud computing basics: Cloud computing overview, deployment models applications, intranets and the Cloud first movers in the cloud. Your organization and cloud computing: when you can use cloud Computing, benefits limitations, security concerns, regulatory issues.			
MODULE – 2			11Hrs.
Cloud computing with the titans: Google, Microsoft, Amazon, salesforce.com the business case or Going to the cloud: cloud computing services, how those applications help your business, deleting your datacenter, Thomson's routers. Cloud computing technology: hardware and infrastructure clients, Security, network, services.			
MODULE -3			10Hrs.
Cloud storage: overview, cloud storage providers, standards: application, client, infrastructure, service Cloud computing at work: software as a service: overview, driving forces, company offerings, industries Software plus services: overview, mobile device integration, providers, Microsoft online.			
MODULE -4			11Hrs.
Software plus services Developing applications: Google, Microsoft, troubleshooting, Application management. Local clouds and thin clients: virtualization in your organization, server solutions, thin clients, case study. Migrating to the cloud: cloud services for individuals, cloud services aimed at mid Market, enterprise class cloud offerings, migration Internet of Things (IoT) and Fog Computing: Introduction, Relevant Technologies, Fog and Edge Computing Completing the Cloud, Advantages of FEC: SCALE, How FEC Achieves These Advantages: SCANC, Hierarchy of Fog and Edge Computing.			



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Prescribed Text Book:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Cloud Computing: A practical approach	Anthony T. Velte, Toby J. Velte, Robert Elsenpeter	3rd	McGraw Hill publication	2010
2	Fog and Edge Computing: Principles and Paradigms”,	Rajkumar Buyya, Satish Narayana Srirama		Wiley	2019 (UNIT-IV)

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Cloud Computing: Theory and Practice Dan C Ma	Dan C Marinescuc	1st	MK publishers	2017
2	Mastering Cloud Computing	Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi	5th	McGraw Hill publication	2021

E-Books and online course materials:

1. <https://archive.org/details/cloudcomputingpr0000velt>
2. <https://archive.org/details/cloudcomputingth0000mari>

Online Course and Video Lecture:

1. https://onlinecourses.nptel.ac.in/noc24_cs17

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	2	14	28
3	Evaluation of Learning Process	-	-	09
4	Activity Based Learning(ABL)	-	-	41
Total Learning Hours/Semester				120

Proposed Assessment Plan (for 50marks of CIE):

Tool	Remarks	Marks
Internals	Three tests conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Program Execution-10M 2) Mini Project-10M	20
Total		50



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Integrated Lab Component (28 Hours)

Sl. No	Program Details	Hours
1.	Use Google App Engine launcher to launch the web applications.	4
2.	Install Google App Engine. Create a hello world app and other simple web applications using python/java.	4
3.	Find a procedure to transfer the files from one virtual machine to another virtual machine.	2
4.	Install a C compiler in the virtual machine created using virtual box and execute Simple Programs such as file storage, file sharing.	2
5.	Use Firebase for Hosting a static website.	2
6.	Create a web app that stores and displays notes using Firebase.	2
7.	To build and deploy a cloud-based contact management application using Salesforce.com.	4
8.	Develop programs to implement CRUD (Create, Read, Update, Delete) operations using Google Firestore and MongoDB.	4
9.	Build a small web applications interface to upload and download files using Amazon S3 or Google Drive.	4
Total		28

Activity Based Learning (41 Hours)

ABL (41Hours): Design and implement a cloud-based application demonstrating the working of various cloud deployment models using a programming language/platform of your choice (e.g., AWS, Azure, Google Cloud, Firebase, Salesforce.com)		Hours
1.	In this activity, students will conduct a literature survey to explore and identify different cloud deployment models such as Public, Private, Hybrid, and Community Cloud.	8
2.	Interaction with faculty members to discuss and finalize the problem statement based on suitable deployment models.	5
3.	Designing and implementing the application by selecting appropriate cloud platforms and deployment strategies.	11
4.	Evaluating the performance, scalability, and cost aspects of the chosen deployment model.	7
5.	Presentation of the work and submission of the final project report.	10
Total		41



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Evaluation of Learning Process (9 Hours)

Type of Evaluation	Hours
Test (1,2 and 3)	3
Lab program Execution and Mini Project	3
Semester End Exam	3
Total	9

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
COs													
CO1		3											
CO2		3	3										
CO3			3		3								2
CO4			3		3			3					2



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Course Title	MAIN PROJECT PHASE 1		
Course Code	24IS604	(L-T-P)C	(0-0-4)2
Exam	3Hrs	Hours/Week	4
SEE	50Marks	Total Hours	40

Course Objective: Students will able to apply engineering knowledge and modern tools to design innovative solutions for real-world problems while enhancing teamwork, research, and professional skills.

Course Outcomes: At the end of the course, student will be able to:

#	Course Outcomes	Mapping to PO	Mapping to PSOs
1.	Identify a problem, through Extensive literature Survey leading to publication of a survey paper.	1,2	-
2.	Plan & design the solution to the chosen problem	3,4,5	2
3.	Make oral presentation and documentation of the work carried out	9,10,11	-

During VI semester, Candidates in consultation with the guides shall carry out literature survey to finalize the topic of the project. Students are expected to present the project synopsis, system analysis, Requirements Specification

- **Project Phase 1 – Team Formation , Topic Selection & Guide allotment**
- **Project Phase 2 – Extensive Literature Survey , Problem Definition**
- **Project Phase 3 – System Design, Report Preparation**

The evaluation of the project phases shall be carried out by the evaluation committee comprising of project guide & other faculty members. The committee will be constituted by the project coordinator in consultation with the Head of the department.

Performance Indicators	Low	Medium	High
1.Problem Definition(10m)	Clearly defined, specific, and well-articulated problem with strong relevance to current engineering and societal needs. (8-10M)	Well-defined problem with good articulation but minor areas needing refinement. (5-7M)	Vague or unclear problem statement; lacks relevance or clarity.(1-4M)
2. Literature Review(10M)	Has read more than 10papers from reputed journals or 15 papers from conference and 3books in the area of the project. (8-10 M)	Has read more than 7 papers from reputed journals or 10 papers from conference and 3books in the area of the project. (7-5 M)	Has read more than 5 papers from reputed journals or 7 papers from conference and 3books in the area of the project (1 - 4M)



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3.Design Approach(5M)	Well-planned methodology with a strong theoretical foundation and practical implementation; clear design principles applied.(4-5m)	Good methodology with a sound approach; design is mostly logical and structured.(2-3m)	Poor or missing methodology; weak design approach with significant gaps.(1m)
4. Communication, Teamwork & Leadership(5m)	professional presentation ,Strong leadership, excellent teamwork, and clear role distribution; active participation.(4-5m)	Good teamwork and leadership; minor collaboration gaps. (2-3M)	Poor teamwork; minimal contribution and weak coordination.(1)
5. Presentation (10m)	Excellent presentation with strong technical knowledge; confidently answers questions.(8-10M)	Good presentation with clear understanding but some minor issues. (5-7M)	Weak presentation with unclear delivery and poor defense of concepts.(1-4M)
6.Report Preparation(10m)	Effectively organized and well framed contents or using Latex editor(8-10M)	Organized but not good content wise (5-7M)	Disorganized and contents not sufficient(1-4M)

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
COs													
CO1	3	3											
CO2			3	3	3								2
CO3									3	3	3		



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Course Title	STORAGE AREA NETWORKS		
Course Code	24IS661	(L-T-P)C	(3-0-0)3
Exam	3Hrs.	Hours/Week	3
SEE	50Marks	Total Hours	(42L + 48ABL) 90
Course Objective: Develop skills to design, implement, manage, and secure enterprise storage solutions efficiently. Course Outcomes: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to POs	Mapping To PSOs
1.	Understand the fundamentals of data storage technologies and the architecture of Storage Area Networks (SANs).	1	-
2.	Describe different types of storage systems such as DAS, NAS, and SAN, and compare their features and use cases.	1	-
3.	Analyze various SAN components including host bus adapters, switches, storage arrays, and protocols like iSCSI and Fibre Channel.	2	1
4.	Demonstrate the configuration and management of SAN environments using tools and techniques commonly used in industry.	3,5	1
Module -1			11Hrs
Storage System: Introduction to evolution of storage architecture, key data center Elements, virtualization, and cloud computing. Key data center elements – Host (or compute), connectivity, storage, and application in both classic and virtual Environments. RAID implementations, techniques, and levels along with the Impact of RAID on application performance. Components of intelligent storage systems and virtual storage provisioning and intelligent storage system Implementations.			
Module-2			11Hrs
Storage Networking Technologies and Virtualization Fibre Channel SAN components, connectivity y options, and topologies including access protection mechanism „zoning”, FC protocol stack, addressing and operations, SAN-based virtualization and VSAN technology, iSCSI and FCIP(Fibre Channel over IP) protocols for storage access over IP network, Converged protocol FCoE and its components, Network Attached Storage (NAS) - components, protocol and operations, File level storage virtualization, Object based storage and unified storage platform.			
Module-3			10Hrs
Backup, Archive, and Replication: This unit focuses on information availability and business continuity solutions in both virtualized and non-virtualized environments. Business continuity terminologies, planning and solutions, Clustering and multi pathing architecture to avoid single points of failure, Backup and recovery-methods, targets and topologies, Data deduplication and Backup in virtualized. Environment, Fixed content and data archive, Local replication in classic and virtual environments, Remote replication in classic and virtual environments, Three-site remote replication and continuous data protection			



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Module-4	10Hrs
Cloud Computing Characteristics and benefits This unit focuses on the business drivers, definition, essential characteristics, and phases of journey to the Cloud. ,Business drivers for Cloud computing, Definition of Cloud computing, Characteristics of Cloud computing, Steps involved in transitioning from Classic datacenter to Cloud computing environment Services and deployment models, Cloud infrastructure components, Cloud migration considerations.	

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Information Storage and Management	EMC Education Services	2nd	Wiley ISBN: 9781118094839	2017
2.	Storage Virtualization	ClarkTom	2nd	John Wiley & Sons, Inc	2019

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Designing Storage Area Networks	Tom Clark	2nd	Cisco Press	2014
2	EMC Education Services: Information Storage and Management	EMC Corporation, Hopkinton	3rd	John Wiley & Sons, Inc	2012

E Books and online course materials:

1. https://www.google.co.in/books/edition/Storage_Area_Networks_For_Dummies/cIRghD4X2uMC?hl=en&gbpv=1&pg=PA3&printsec=frontcover

Online Courses and Video Lectures:

1. https://www.udemy.com/topic/storage-area-network/?srsltid=AfmBOopCfCjPjwjgXqVKmk4fNoChQe6YVuQ_fBqvZ370NQJk4P_8Veqc



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Proposed Assessment Plan (for 50marks of CIE):

Tool	Remarks	Marks
Internals	Three tests conductedfor20marks eachandreducedto10 marks	30
AAT (Visiting Start up industry)	1) Presentations on case study exercises in group of three or four students-10M 2) Preparationofthereport-10M	20
Total		50

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Evaluation of Learning Process	-	-	10
3	Activity Based Learning(ABL)	-	-	38
Total Learning Hours/Semester				90

Activity Based Learning (38 Hours)

Activity Based Learning(38 Hours)			Hours
1.	Storage Area network Case studies (Group of 3–4 students): Students will interpret various SAN technologies storage virtualization concept and different back up strategies strategies.		20
2.	Report Preparation: Students will prepare a detailed report documenting their observations, analysis, and key learning's from the case study.		10
3.	Presentation: Students will present their findings, highlighting insights related to Storage area network practices.		8
Total			38

Evaluation of Learning Process (9 Hours)

Type of Evaluation	Hours
Test (1,2 and 3)	3
Presentation on storage area network case studies	4
Semester End Exam	3
Total	10



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Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1		3											
CO2		3											
CO3			2		2								2
CO4			2		2								2



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Course Title	SUPPLY CHAIN TECHNOLOGY		
Course Code	24IS662	(L-T-P) C	(3-0-0) 3
Exam	3 Hrs.	Hours/Week	3
SEE	50 Marks	Total Hours	(42L + 48ABL) 90

Course Objective: Apply the principles of Supply Chain Analytics for solving real time problems.

Course outcomes: At the end of course, students will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Describe various importance of Supply chain Analytics process in the flows involving material, money, information and ownership	1,2,7,11	1
2.	Apply various Decision Domains in Supply Chain analytics for effective decision making.	1,2,3	1
3.	Develop effective Network Planning and Design of Logistics Network using Heuristics/optimization.	1,2,3,5	2
4.	Analyze case studies to assess the impact of data-driven decision-making in supply chain operations and strategy.	1,2,3	1

MODULE-1

10 Hrs.

Context of today's supply chains (SC) analytics, Understanding and defining the supply chain analytics (SCA) Revisions of Basic Lessons of Supply Chain Management, Why is Analytics Important in a supply chain?, Relating Operations Management with Supply chain concepts with SC Analytics, The importance of supply chain analytics in the flows involving material, money, information and ownership.

MODULE-2

10 Hrs.

Supply chain analytics, Key issues in supply chain analytics, What involves in supply chain analytics, Concept of Descriptive Analytics in a Supply Chain, Discussion on a Few Supply Chains Analytics applications in India (students participation is expected), Decision Domains in supply chain analytics.

MODULE-3

10 Hrs.

Foundation of Business Analytics (BA), E2: Introduction to Modeling, Approaches for Optimization and Simulation, Modeling software, Supply Chain (SC), Decisions that requires mathematical or interpretative modeling Understanding of Data and its role in Analytics, Analytics of a Transportation problem in a Supply Chain, Managerial implication of results of analytics, A case study of supply chain analytics.

MODULE-4

12 Hrs.

Foundation of prescriptive analytics in network planning in a supply chain, Network Planning in a Supply Chain, Importance of Network Planning, Design of Logistics Network using Heuristics/optimization (Exercise 3.4 Levi (2008)), Concept of 3PL/4PL in a Supply Chain, Case Study: GATI, Foundation of Modeling Coordination Decisions in Supply Chain Management, Foundation of performance management in supply chain management, its enablement of supply chains, role of ICT in supply chains

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Supply chain management by Sunil Chopra	Sunil Chopra and Peter Meindl,	5th Edition	Pearson Education	2012



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Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Modeling the supply Chain	Jeremy F. Shapiro	2nd Edition	Duxbury Thomson Learning	2006
2	Business Analytics	Rahul Saxena Anand Srinivasan.	-	Springer New York	2012

E Books and online course materials:

1. https://ebooks.link.springer.com/book/10.1007/978-3-030-92224-5?utm_source.
2. <https://locus.sh/resources/>

Online Courses and Video Lectures:

1. <https://upesonline.ac.in/online>

Teaching - Learning – Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	-	-	-
3	Student Study Hours – Self Learning	1	14	14
4	Activity Based Learning (ABL1 & ABL2)	-	-	28
5	Evaluation of Learning Process	-	-	06
Total Learning Hours / Semester				90

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three tests conducted for 20 marks each and reduced to 10 marks	30
AAT	1. Simulate a SupplyChain with Any Logic or SCM Games	20
Total		50

Activity Based Learning (28 Hours):

ABL 1 (27 Hours): Simulate a SupplyChain with Any Logic or SCM Games		Hours
Simulate a SupplyChain with Any Logic or SCM Games	Use a simulation tool (Any Logic or online SCM simulators)	6
	Tools: Any Logic, MIT Beer Game (online), SCM Globe, Forio simulations	
	Assign roles (supplier, manufacturer, retailer)	10
	Analyze how forecasting errors and delays affect the supply chain	12
Total		28

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Evaluation of Learning Process (6 Hours):

Type of Evaluation	Hours
Test (1, 2 and 3)	3
Semester End Exam	3
Evaluation	1
Total	7

Course Articulation Matrix:

[illegible]



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Course Title	COMPUTER VISION AND IMAGE PROCESSING		
Course Code	24IS663	(L-T-P)C	(3-0-0)3
Exam	3Hrs.	Hours/Week	3
SEE	50Marks	Total Hours	(42L+48ABL)90
Course Objective: To understand the fundamentals of computer vision and image processing. Course outcomes: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Apply suitable techniques to process and analyze images.	1	-
2.	Analyze appropriate operations for a given scenario.	2	-
3.	Compare the different image restoration and segmentation techniques.	3,5	-
4.	Implement various segmentation, compression and morphological algorithms.	3,5,9,10	-
MODULE-1			10Hrs.
Introduction: Image representation, Image digitization, Digital image properties, Color images. Image pre-processing: Pixel brightness transformations, Geometric transformations, local pre-processing. Segmentation: Thresholding, Edge-based segmentation, Region based segmentation, Matching.			
MODULE-2			11Hrs.
Image understanding: Image understanding control strategies, SIFT, RANSAC, Point distribution models, Active appearance models, Pattern recognition methods in image understanding, Boosted cascade of classifiers, Image understanding using random forests , Scene labeling and constraint propagation, Semantic image segmentation and understanding, Hidden Markov models, Gaussian mixture models and expectation maximization, Basics of projective geometry, A single Perspective camera, Scene reconstruction from multiple views.			
MODULE-3			11Hrs.
Image data compression and motion analysis: Image data properties, Discrete image transforms in image data compression, Predictive compression methods, Vector quantization, Hierarchical and progressive compression methods, Comparison of compression methods, JPEG and MPEG image compression, Statistical Texture description, Syntactic texture description methods, Hybrid texture description methods, Differential motion analysis methods, Optical Flow, Analysis based on correspondence of interest points, Detection of specific motion patterns, video tracking, motion models to aid tracking			
MODULE-4			10Hrs
Shape representation and morphology: Region identification, Contour- based shape representation and description, Region based shape representation and description, Shape classes, Morphology concepts and principles, Binary dilation and erosion, Gray- scale dilation and erosion, Skeletons and object marking, Granulometry, Morphology segmentation and watersheds.			



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Prescribed Text Books:

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Image Processing, Analysis and Machine Vision	Milan Sonka, Vaclav Hlavac, Roger Boyle	4th	Cengage learning	2013

Reference Books:

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Computer Vision–A Modern Approach	Forsyth, Ponce	2nd	Prentice Hall	2011
2.	Digital Image Processing	Rafael C. Gonzalez, Richard E. Woods	3rd	Pearson Education	2009

E books:

<https://szeliski.org/Book>

MOOC/Online Course:

1. <https://www.udemy.com/course/image-processing-and-computer-vision-with-python-opencv>
2. <https://archive.nptel.ac.in/courses/108/103/108103174/>

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals:	Three tests conducted for 20 marks each and reduced to 10 marks	30
Activity:	Students have to develop a simple application using scaling, rotation, shifting, transformation and reflection using Open CV. (10M) They are required to present their application + report (5+5=10M)	20
Total		50

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	-	-	-
3	Student Study Hours–Self Learning	-	-	-
4	Activity Based Learning(ABL1&ABL2)	-	-	41
5	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				90



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Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three tests conducted for 20 marks each and reduced to 10 marks	30
Activity Details	1. Application Development using Open CV(10M) 2. Presentation and Report Submission(10M)	20
Total		50

Activity Based Learning (41 Hours)

ABL1(17Hours) :Activity 1 details		Hours
Application Development using Open CV	Students will develop a simple application implementing image transformations such as scaling, rotation, shifting, transformation, and reflection using Open CV. They will test the application on different images and analyze the output of each operation.	30
Total		30

ABL2(10Hours):Activity 2 details		
Presentation and Report Submission	Students will present their developed application, explaining the methodology, implementation steps, and results. They are also required to submit an individual report documenting the objectives, process, observations, and conclusions.	11
Total		41

Evaluation of Learning Process (7Hours)

Type of Evaluation	Hours
Test(1,2and3)	3
Presentation	1
Semester End Exam	3
Total	7

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3												
CO2													
CO3			3		2								
CO4			3		2				2	2			



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Course Title	BLOCKCHAIN TECHNOLOGY																						
Course Code	24IS664	(L-T-P) C	(3-0-0) 3																				
Exam	3 Hrs.	Hours/Week	3																				
SEE	50 Marks	Total Hours	(42T+48ABL)90																				
Course Objective: The course provides a fundamental, models and technologies of Block chain. Course outcomes: At the end of course, student will be able to: <table> <tr> <th>#</th><th>Course Outcomes</th><th>Mapping to PO's</th><th>Mapping to PSO's</th></tr> <tr> <td>1.</td><td>Understand the types, benefits and limitations of block chain and bit coin.</td><td>1</td><td>1</td></tr> <tr> <td>2.</td><td>Explore the block chain decentralization, cryptography concepts and smart contracts.</td><td>1,5</td><td>1,2</td></tr> <tr> <td>3.</td><td>Comprehend the block chain applications outside of currencies.</td><td>1,6</td><td>1,2</td></tr> <tr> <td>4.</td><td>Analyze real-world block chain use cases and collaboratively design a block chain solution.</td><td>8,9,11</td><td>2</td></tr> </table>				#	Course Outcomes	Mapping to PO's	Mapping to PSO's	1.	Understand the types, benefits and limitations of block chain and bit coin.	1	1	2.	Explore the block chain decentralization, cryptography concepts and smart contracts.	1,5	1,2	3.	Comprehend the block chain applications outside of currencies.	1,6	1,2	4.	Analyze real-world block chain use cases and collaboratively design a block chain solution.	8,9,11	2
#	Course Outcomes	Mapping to PO's	Mapping to PSO's																				
1.	Understand the types, benefits and limitations of block chain and bit coin.	1	1																				
2.	Explore the block chain decentralization, cryptography concepts and smart contracts.	1,5	1,2																				
3.	Comprehend the block chain applications outside of currencies.	1,6	1,2																				
4.	Analyze real-world block chain use cases and collaboratively design a block chain solution.	8,9,11	2																				
MODULE – 1			10 Hrs.																				
Block chain 101: Distributed systems, History of blockchain: Introduction to Blockchain, Types of block chain, Tiers of block chain technology, CAP theorem and block chain, Benefits and limitations of block chain.																							
MODULE – 2			11 Hrs.																				
Decentralization and Cryptography: Decentralization using blockchain, Methods of decentralization, Routes to decentralization, Blockchain and full ecosystem decentralization, Smart contract, Decentralized organizations, Platforms for decentralization. Symmetric Cryptography: Cryptographic primitives- Symmetric cryptography, Asymmetric cryptography																							
MODULE -3			11 Hrs.																				
Introducing Bitcoin: Bitcoin definition, Transactions, Blockchain, The bitcoin network, Wallets, Bitcoin Payments. Alternative Coins: Theoretical foundations, Bitcoin limitations, Namecoin, Litecoin Smart Contracts: Definition, Ricardian contracts, Smart contract Templates.																							
MODULE -4			10 Hrs.																				
Ethereum 101: Introduction, Ethereum block chain, Ethereum Network, Components of the Ethereum block chain The Ethereum Virtual Machine (EVM) Blockchain-Outside of Currencies: Internet of Things, Government, Health, Finance, Media.																							



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Prescribed Text Book:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Mastering Blockchain – Distributed ledgers, Decentralization and smart contracts explained	Imran Bashir	3 rd	Packet Publishing Ltd	2017
2	Bitcoin and Crypto currency Technologies: A Comprehensive Introduction.	Arvind Narayanan, Joseph Bonneau, Edward W. Felten, Andrew Miller, Steven Goldfeder and Jeremy Clark.,	2 nd	Princeton University Press	2016

Reference Books

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Blockchain Basics: A non- Technical Introduction in 25 Steps,	Daniel Drescher	First Edition	Apress	2017
2	Mastering Bitcoin: Unlocking Digital Crypto currencies	Andreas M. Antonopoulos	First Edition	O'Reilly Media	2014

E-Books and online course material:

https://users.cs.fiu.edu/~prabakar/cen5079/Common/textbooks/Mastering_Blockchain_2nd_Edition.pdf

Online Courses and Video Lectures:

https://onlinecourses.nptel.ac.in/noc22_cs44/preview

https://onlinecourses.swayam2.ac.in/aic21_ge01/preview

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Tutorial class	-	-	-
3	Evaluation of Learning Process	-	-	10
4	Activity Based Learning (ABL1+ABL2)	-	-	38
Total Learning Hours/Semester				90



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Proposed Assessment Plan (for 50marks of CIE)

Tool	Remarks	Marks
Internals	Three tests conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Presentation on analyzing practical blockchain usecase and designing an innovative blockchain driven solution – 15 marks 2) Quiz – 5 marks	20
Total		50

Activity Based Learning (38 Hours)

ABL1 (38 Hours): Students will select a suitable topic from the Blockchain Technology course, prepare a structured presentation, analyze the concept with relevant examples/case studies, and present the findings as part of the activity.		Hours
1.	Topic Selection and Approval: Students will identify a relevant topic from Blockchain Technology modules and present it to the faculty for discussion and approval.	4
2.	Content Preparation and Research: After approval, students will design and implement the solution using JFLAP, demonstrating the required concepts.	5
3.	Analysis and Documentation: After approval, students will collect information, study references, and prepare well-organized presentation content covering theoretical and practical aspects.	6
4.	Presentation Design and Development: Students will create presentation slides with diagrams, workflows, and examples to explain blockchain concepts effectively.	5
5.	Analysis and Documentation: Students will analyze the selected topic, summarize key findings, and prepare supporting notes/report for submission.	6
6.	Final Presentation: Students will deliver the presentation, highlighting understanding of the concept, applications, and outcomes.	8
ABL2 (4 Hours): Students will participate in quiz-based learning activities covering all modules of Blockchain Technology, including problem-solving, conceptual questions, and multiple-choice assessments.		4
Total		38

Evaluation of Learning Process (10 Hours)

Type of Evaluation	Hours
Test (1,2 and 3)	3
Topic Presentation	3
Quiz	1
Semester End Exam	3
Total	10



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Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3											2	
CO2	3				3							2	2
CO3	3					3						2	2
CO4								3	3		3		3



MALNADCOLLEGE OFENGINEERING, HASSAN
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DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

Course Title	RESPONSIBLE AI		
Course Code	24OEIS61	(L-T-P) C	(3-0-0) 3
Exam	3	Hours/Week	03
SEE	50	Total Hours	(42L + 48ABL) 90

Course Objective: The objective of the course is to know about the responsibility of artificial intelligence (AI) to make AI more useful for society and humanity. The course will also teach principles and practices to perform responsible AI.

Course Outcomes: Upon completion of the course, students shall be able to

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Describe key aspects of responsible AI such as fairness, accountability, bias, privacy, etc.	2,3	
2.	Examine the fairness and ethical issues in AI models.	3	1
3.	Implement fairness in AI models and minimize bias in data.	3	1
4.	Preserve individual privacy while learning from data.	3,5	1

MODULE - 1	11hrs
Introduction to responsible AI., Need for ethics in AI. AI for Society and Humanity, Fairness and Bias ,Sources of Biases, Exploratory data analysis, limitation of a dataset, Preprocessing, in processing and post processing to remove bias, Group fairness and Individual fairness, Counterfactual fairness	
MODULE - 2	11hrs
Interpretability and explain ability: - Interpretability through simplification and visualization, Intrinsic interpretable methods, Post Hoc interpretability, Explain ability through causality, Model agnostic Interpretation.	
MODULE - 3	10hrs
Ethics and Accountability : Auditing AI models, fairness assessment, Principles for ethical practices, Privacy preservation , Attack models, Privacy-preserving Learning	
MODULE - 4	10hrs
Privacy preservation: Differential privacy, Federated learning, Case study: Recommendation systems, medical diagnosis, Hiring/ Education, Computer Vision, Natural Language Processing.	

Prescribed Text Books

Sl. NO	Book Title	Authors	Edition	Publisher	Year
1	Responsible Artificial Intelligence: How to Develop and Use AI in a Responsible Way	Virginia Dignum	1st	Springer	2019
2	Interpretable Machine Learning	Christoph Molnar	1st	Self-published / Lulu	2019



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Reference Books

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Artificial Intelligence: A Guide for Thinking Humans	Melanie Mitchell	1st	Farrar, Straus and Giroux	2019
2	Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy	Cathy O'Neil	1st	Crown Publishing Group	2016
3	Artificial Unintelligence: How Computers Misunderstand the World	Meredith Broussard	1st	MIT Press	2018

E Books and online course materials:

https://www.mlmi.eng.cam.ac.uk/files/tam_final_reduced.pdf

Online Courses and Video Lectures:

Sl. No	Course Name	Offered By	Year	URL
1	AI For Everyone	Coursera (DeepLearning.AI / Andrew Ng)	2019 Present	https://www.coursera.org/learn/ai-for-everyone
2	Machine Learning	Coursera (DeepLearning.AI)	2022 Present	https://www.coursera.org/learn/machine-learning
3	Mlops and Responsible AI Practices	Coursera (Microsoft)	2023 Present	https://www.coursera.org/learn/microsoft-mlops-and-responsible-ai-practices
4	Artificial Intelligence for Management	NPTEL (IIT)	2026	https://onlinecourses.nptel.ac.in/noc26_cs10/preview
5	Introduction to Artificial Intelligence	NPTEL (IIT)	2022 Present	https://onlinecourses.nptel.ac.in/noc22_cs56/preview

Teaching - Learning – Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	-	-	-
3	Student Study Hours – Self Learning	1	14	14
4	Activity Based Learning	-	-	27
5	Evaluation of Learning Process	-	-	07
Total Learning Hours / Semester				90



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Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted Presentation on Responsible AI Case Study Analysis using Real-World Data	20
Total		50

ABL: Introduction to Data Science

Sl. No	Activity	Task Description	Hours
1	Problem Identification & Case Selection	Select a real-world AI case (healthcare diagnosis, hiring system, recommendation system, etc.) focusing on ethical issues	2
2	Understanding AI System	Study how the selected AI system works (data, model, decision-making process)	4
3	Bias & Fairness Analysis	Identify possible biases in dataset and model (gender, race, etc.)	5
4	Data Analysis & Visualization	Perform basic EDA to understand patterns, imbalance, and fairness issues	6
5	Model Evaluation for Fairness	Apply fairness metrics or techniques to evaluate the model	4
6	Interpretation & Explainability	Use interpretability methods (LIME/SHAP concepts) to explain model decisions	3
7	Report Writing & Presentation	Prepare ethical analysis report and present findings with real-world insights	3
Total			27

Student Study Hours – Self Learning

Sl. No	Activity Description	Hours
1	Introduction to Responsible AI Concepts (Ethics, Fairness, Accountability, Transparency)	3
2	Basics of AI & Bias (Types of Bias, Sources of Bias in Data and Models)	3
3	Bias Detection & Mitigation Techniques (Pre-processing, In-processing, Post-processing)	3
4	Interpretability & Explainability (Intrinsic Models, Post-hoc Methods, Model-Agnostic Techniques)	2
5	Privacy Preservation Techniques (Differential Privacy, Federated Learning – basics)	1
6	Case Study Analysis (Real-world AI applications like healthcare, hiring, recommendation systems)	1
7	Preparation for Viva / Revision of Concepts	1
Total		14



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Evaluation of Learning Process (7 Hours)

Type of Evaluation	Hours
Test (1, 2 and 3)	3
Viva	1
Semester End Exam	3
Total	7

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1		3	2					2					
CO2			3					2				2	
CO3			3					3				2	
CO4			3		2			3				2	



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Course Title	INTRODUCTION TO MACHINE LEARNING		
Course Code	24OEIS62	(L-T-P)C	(3-0-0) 3
Exam	3 Hrs.	Hours/Week	3
SEE	50 Marks	Total Hours	(42L+48ABL)90

Course Objective: To apply the techniques of machine learning for real time problems.

Course Outcomes (COs) : Upon completion of the course, students shall be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Apply preprocessing, modeling, evaluation, concept learning, and supervised & unsupervised machine learning algorithms to solve given problems effectively.	2,3	-
2	Analyze machine learning algorithms, including supervised, unsupervised, neural networks, and Bayesian learning methods, to evaluate their suitability for different problem scenarios.	3,5	1
3	Design machine learning models incorporating preprocessing techniques, neural networks, Bayesian learning, and appropriate algorithms for solving real-world problems.	3,5	1
4	Develop and implement Different kinds of machine learning algorithm with real-world problems.	3,5	1

MODULE – 1	10 Hrs.
Introduction to Machine learning: Human learning and its types, Machine learning and its types, Applications, tools and issues in machine learning, Activities in machine learning, Types of data, Exploring structure of data, Data quality and Pre-processing. Modeling and Evaluation: Introduction, Selecting a model, training a model, model representation and Interpretability, Evaluating performance of a model.	
MODULE – 2	10 Hrs.
Learning Problems and Concept Learning: Well Posed learning problems, Designing a Learning systems, Concept Learning Tasks, Search, Find-S, Version Spaces and Candidate Elimination Algorithm Supervised Learning: Introduction, example, classification model, classification learning steps, Common algorithms –KNN, decision tree.	
MODULE -3	10 Hrs.
Supervised Learning: Random forest model, SVM, Regression-Simple linear regression, Multiple linear regressions, Unsupervised Learning: Supervised Vs Unsupervised, Application, clustering, Finding pattern using Association rule.	
MODULE -4	10 Hrs.
Basics of Neural Networks: Exploring the artificial neuron, Types of activation function, Early implementations of ANN, Architectures of NN, Learning process in ANN, Backpropagation algorithm. Bayesian learning: Introduction, Bayes theorem, Bayes theorem and concept learning, Other types of Learning – Representation learning, Active Learning, Instance based Learning, Ensemble learning	



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Prescribed Text Book:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Machine Learning,	Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das	(INDIAN EDITION)	Pearson	2019
2	Machine Learning	Tom M. Mitchell McGraw-Hill Education	(INDIAN EDITION)		2013

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Hands-on machine learning with scikit-learn and tensorflow, Concepts, Tools, and Techniques to Build Intelligent Systems.	O'Reilly Media , Aurélien Géron ,	2nd Ed	Tata McGraw-Hill	2019
2	Introduction to Machine Learning	Peter Linz	2nd Ed	PHI Learning Pvt. Ltd	2013
3	, The Elements of Statistical Learning, Springer	T. Hastie, R. Tibshirani, J. H. Friedman	1st		2001

EBooks and Online course material:

1. <https://learn.microsoft.com/en-us/training/modules/fundamentals-machine-learning/>

Online course and video lecture:

1. <https://nptel.ac.in/courses/106106139>

Teaching -Learning– Evaluation Scheme:

Sl.No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	-	-	-
3	Student Study Hours–Self Learning	1	14	14
4	Activity Based Learning (ABL1&ABL2)	-	-	27
5	Evaluation of Learning Process	-	-	07
Total Learning Hours/Semester				90



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Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Three tests conducted for 20 marks each and reduced to 10 marks	30
AAT	Demonstration activity- 1) Students will demonstrate machine learning concepts by applying ML models to real-world problems. 2) Students will participate in hackathons and coding competitions to apply their skills in practical scenarios.	20
Total		50

Student Self Learning and Activity Based Learning (48Hours)

ABL1 (18Hours): Students will demonstrate machine learning concepts by applying ML models to real-world problems.		Hours
1.	In this activity, Students will demonstrate machine learning concepts by applying ML models	2
2.	Meeting and discussing with the faculty and fixing the problem statement.	3
3.	Designing and implementing the Miniproject.	10
4.	Presentation and submitting the final report.	3
Total		18
ABL2 (9 Hours): Problem solving in hackthon / coding competitions etc		Hours
Various problem solve in any registered website (9 Hours)		9
Total Learning Hours/Semester		27

Evaluation of Learning Process (7Hours)

Type of Evaluation	Hours
Test(1,2and3)	3
Presentation	1
Semester End Exam	3
Total	7



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Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
COs													
CO1		3	3										
CO2			3		3							3	
CO3			3		3							3	
CO4			3		3							3	



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Course Title	INTRODUCTION TO DATA SCIENCE		
Course Code	24OEIS63	(L-T-P) C	(3-0-0) 3
Exam	3	Hours/Week	03
SEE	50	Total Hours	(42L + 48ABL)90
Course Objective: Apply the principles of data science for solving real time problems. Course outcomes:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Describe various Data Science process like statistical modeling, Exploratory data analysis, Data visualization.	1	-
2	Apply various feature selection algorithms for effective decision making.	3	1
3	Develop effective visualization for the given data using R	5	1
MODULE - 1			10hrs
Introduction: What is Data Science? Big Data and Data Science hype - and getting past the hype, Why now? – Datafication, Current landscape of perspectives, Skill sets needed. Statistical Inference - Populations and samples, Statistical modeling, probability distributions, fitting a model.			
MODULE - 2			11hrs
Exploratory Data Analysis and the Data Science Process - Basic tools (plots, graphs and summary statistics) of EDA, Philosophy of EDA. The Data Science Process, Case Study: Real Direct (online real estate firm). Three Basic Machine Learning Algorithms - Linear Regression			
MODULE - 3			10hrs
k-Nearest, Neighbors (k-NN), k-means, One More Machine Learning Algorithm and Usage in Applications - Motivating application: Filtering Spam. Why Linear Regression and k-NN are poor choices for Filtering Spam, Naive Bayes and why it works for Filtering Spam, Data Wrangling: APIs and other tools for scrapping the Web.			
MODULE - 4			10hrs
Feature Generation and Feature Selection Motivating Application: user (customer) retention, Feature Generation Feature Selection algorithms, Filters; Wrappers; Decision Trees, Random Forests. Data Visualization - Data Visualization History, What Is Data Science, Redux?, A Sample of Data Visualization Projects			

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Doing Data Science: Straight Talk from the Frontline	Cathy O'Neil & Rachel Schutt	1	O'Reilly Medi	2019



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Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Mining of Massive Datasets	AJure Leskovec, Anand Rajaraman, Jeffrey Ullman	3	Cambridge University Press	2020
2	Machine Learning: A Probabilistic Perspective,	Kevin P. Murphy	1	MIT Press, 2012	2023

E-Books

1. Doing Data Science: Straight Talk from the Frontline
https://api.pageplace.de/preview/DT0400.9781449363901_A24457138/preview-9781449363901_A24457138.pdf
2. Mining of Massive Datasets – <https://www.mmds.org/>
3. Machine Learning: A Probabilistic Perspective – <https://probml.github.io/pml-book/book1.html>

Online Courses and Video Lectures:

Sl.No	Course Name	Offered By	Year	URL
1	Data Science for Engineers	SWAYAM / NPTEL	2021	https://onlinecourses.nptel.ac.in/noc21_cs69/preview
2	Generative AI for Data Scientists Specialization	Coursera	2022	https://www.coursera.org/specializations/generative-ai-for-data-scientists

Teaching - Learning – Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	-	-	-
3	Student Study Hours – Self Learning	1	14	14
4	Activity Based Learning	-	-	27
5	Evaluation of Learning Process	-	-	07
Total Learning Hours / Semester				90



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Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted Presentation on Data Science Lifecycle and Case Studies using Real-World Examples	20
Total		50

ABL: Introduction to Data Science

Sl. No	Activity	Task Description	Hours
1	Problem Identification & Case Selection	Choose a real-world case study (health, education, sales, social media, etc.)	2
2	Data Collection	Gather dataset from sources (Kaggle, government portals, etc.)	4
3	Data Pre processing	Clean data, handle missing values, transform data	5
4	Exploratory Data Analysis (EDA)	Use statistics & visualization to understand data patterns	6
5	Model Building / Analysis	Apply basic techniques (classification, regression, or clustering)	4
6	Interpretation of Results	Analyse findings and derive insights	3
7	Report Writing & Presentation	Prepare report, charts, and final presentation	3
Total			27

Student Study Hours – Self Learning

Sl. No	Activity Description	Hours
1	Introduction to Data Science Concepts (What is Data Science, Lifecycle, Applications)	3
2	Basics of Python for Data Science (Variables, Data Types, Libraries like NumPy, Pandas)	3
3	Data Collection & Data Preprocessing (Handling Missing Data, Cleaning, Transformation)	3
4	Exploratory Data Analysis (EDA) using simple datasets	2



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5	Basic Visualization Techniques (Matplotlib / Sea born basics)	1
6	Case Study / Mini Dataset Practice	1
7	Preparation for Viva / Revision of Concepts	1
Total		14

Evaluation of Learning Process (7 Hours)

Type of Evaluation	Hours
Test (1, 2 and 3)	3
Viva	1
Semester End Exam	3
Total	7

Course Articulation Matrix

Course Outcomes	Program outcomes												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
COs													
CO1	3	3			3								
CO2		3	3									2	
CO3					3							2	



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Course Title	PROMPT ENGINEERING		
Course Code	24OEIS64	(L-T-P)C	(3-0-0)3
Exam	3Hrs.	Hours/Week	3
SEE	50Marks	Total Hours	(42L+48ABL) 90
Course Objective: To provide an overview of prompt engineering concepts, techniques, and applications for designing effective AI prompts and optimizing human–AI interaction. Course outcomes: At the end of course, students will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping To PSO's
1.	Understand the of importance and benefits prompt engineering	1,2	1
2.	Apply the techniques involved and monitor the prompt for Generative AI	1,2,3,4	1
3.	Compute the functions and feedback for Chat GPT prompt and identify the framework to find out the Quality prompt.	1,2,3,4	1
4.	Analyze the effective output for the quality prompt and evaluate the various advanced prompt engineering techniques	1,2,3,4,11	1,2
MODULE-1			11Hrs.
Introduction to Prompt Engineering: Prompts- Types of Prompts – works of prompt engineering Evaluating and validating prompts - Role of prompts in AI models – Importance of effective prompts Techniques in Prompt engineering - Ethical considerations in prompt engineering– Benefits in prompt engineering..			
MODULE-2			10Hrs.
Prompt Engineering – Generative AI: Generative language models- NLP and ML foundations common NLP task , Optimizing prompt-based models, Tuning and optimization techniques , Pre-training and transfer learning – Designing effective prompts – prompt generation strategies – Monitoring prompt effectiveness.			
MODULE-3			11Hrs.
ChatGPT: Reinforcement Learning from Human Feedback- The Process of Building a Model- Moving from Instruct GPT to ChatGPT- Instruct GPT- ChatGPT- The Changing API- Chat Completion API Moving Away from Chat-Moving Beyond Chat to Functions- Prompt Engineering as Play Writing. A Framework for Effective AI Communication: The CLEAR Framework - Concise and Logical Prompt Crafting - Explicit Prompt Crafting - Adaptive Prompt Crafting - Reflective Prompt Crafting The Relationship Between Prompts And Outputs - Quality Prompts - A Systematic Approach.			
MODULE-4			10Hrs
Advanced Prompt Engineering: Chain-of-Thought (CoT) Prompting, Tree-of-Thoughts (ToT) Prompting, Active prompting, Reason and Act (ReAct), Expert Prompting, Automatic Prompt Engineering (APE).			



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Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Prompt Engineering for Generative AI	James Phoenix, Mike Taylor	-	O'Reilly Media	2024

Reference Books:

Sl. No	Book Title	Authors	Editio	Publisher	Year
1.	The Art of Prompt Engineering with Chatgpt: A Hands-On Guide: 3	Nathan Hunter	-	Nathan Hunter (Independent Publisher)	2023
2.	Prompt Engineering: The Art of Asking Hardcover	Yaswanth Sai Palaghat	-	Notion Press	2023

E Books and online course materials:

1. https://www.thepromptindex.com/ebookdownload.html?utm_source=chatgpt.com
2. https://www.kdnuggets.com/2023/04/free-ebook-mastering-generative-ai-prompt-engineering.html?utm_source=chatgpt.com

Online Courses and Video Lectures:

1. https://www.courseera.org/learn/prompt-engineering?utm_source=chatgpt.com

Teaching - Learning – Evaluation Scheme:

Sl. No	Teaching and Learning Method	No .of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	-	-	-
3	Student Study Hours–Self Learning	-	-	02
4	Activity Based Learning (ABL1 & ABL2)	-	-	40
5	Evaluation of Learning Process	-	-	06
Total Learning Hours/Semester				90

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three tests conducted for 20 marks each and reduced to 10 marks	30
AAT	Details of activities to be conducted Activity 1: Prompt Design & Optimization Lab Activity 2: Mini Project – AI Application using Prompt Engineering)	20
Total		50



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Course Title	NATIONAL SERVICE SCHEME(NSS)		
Course Code	24NYP4	(L-T-P)C	(0-0-2)
Exam	-	Hours/Week	2
SEE	-	Total Hours	24

Course Outcomes: At the end of the course, the student will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Understand the importance of his/her responsibilities towards society	6	-
2	Analyze the environmental and societal problems/issues and will be able to design solutions for the same.	3, 6	-
3	Evaluate the existing system and to propose practical solutions for the same for sustainable development.	3, 6	-
4	Implement government or self-driven projects effectively in the Field.	11	-
5	Develop capacity to meet emergencies and natural disasters& Practice national integration and social harmony in general.	11	-

MODULE-1	8 Hrs.
Plantation and adoption of plants. Know your plants.	
MODULE-2	8Hrs.
Organize National integration and social harmony events/workshops/seminars. (Minimum02programs).	
MODULE-3	8 Hrs.
Govt. school Rejuvenation and helping them to achieve good infrastructure.	

Suggested Learning Resources:

Books:

1. NSS Course Manual, Published by NSS Cell, VTU Belagavi.
2. Government of Karnataka, NSS cell, activities reports and its manual.
3. Government of India, NSS cell, Activities reports and its manual.



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Course Title	PHYSICAL EDUCATION(PE)		
Course Code	24NYP4	(L-T-P)C	(0-0-2)
Exam	-	Hours/Week	2
SEE	-	Total Hours	24
Course Outcomes: At the end of the course, the student will be able to:			
	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Understand the fundamental concepts and skills of Physical Education, Health, Nutrition and Fitness.	9,10,12	-
2	Familiarization of health-related Exercises, Sports for overall growth and development	9,12	-
3	Create a foundation for the professionals in Physical Education And Sports	12	-
4	Participate in the competition at regional/state/national/ International levels.	9,10,12	-
5	Create consciousness among the students on Health, Fitness and Wellness in developing and maintaining a healthy lifestyle.	9,10,12	-
MODULE-1			4 Hrs.
Orientation -Postural deformities, Stress management			
MODULE-2			16Hrs.
Specific games (Any one to be selected by the student) 1.Throw ball 2. Table Tennis 3. Athletics (Field Events-Jumps)–Any event as per availability of Ground.			
MODULE-3			4 Hrs.
Aerobics			



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Course Title	YOGA		
Course Code	24NYP4	(L-T-P)C	(0-0-2)
Exam	-	Hours/Week	2
SEE	-	Total Hours	24

Course Outcomes: At the end of the course, the student will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Understand the Philosophical and Scientific Basis of Yoga	12	-
2	Demonstrate Proficiency in Basic Yoga Practices	9	-
3	Analyze the Role of Yoga in Managing Stress and Enhancing Life style	7, 12	-
4	Apply Yoga Principles for Personal and Professional Growth	10,12	-

MODULE-1	8 Hrs.
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Ashtanga Yoga

1. Dharana
2. Dhyana(Meditation)
3. Samadhi

MODULE-2	8Hrs.
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Different types of Asanas

- a. Sitting1.Bakasana2.Hanumanasana3.EkapadaRajakapotasana4. Yogarnudrain Vajrasana
- b. Standing1.Vatayanasana2.Garudasana
- c. Balancing1.Veerabhadrasana2.Sheershasana

MODULE-3	8 Hrs.
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Pranayama

1. Bhastrika
2. Bhramari



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Course Title	ANALYTICAL ABILITY AND SOFT SKILLS		
Course Code	24ASK	(L-T-P) C	(0-1-0) 1
Exam	1 Hr.	Hours/Week	2
SEE	50 Marks	Total Hours	30
Course Objective: Students will be able to select appropriate data mining techniques to extract useful pattern. Course outcomes: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Apply methods to solve numerical and reasoning problems	2,3	-
2	Lead a team in corporate offices	8,9	-
3	Communicate effectively in professional ambience	10	-
MODULE – 1			40 Hrs.
Hard Skills: Speed/Distance, Probability, Permutations/Combinations, Profit/Loss, Simple Interest/Compound Interest, Number theories, Number/Letter series, Coding/Decoding, Blood relations, Directions, Clock, Calendar. Logical reasoning problems			
MODULE – 2			15 Hrs.
Soft Skills: Basic grammar, Spotting errors, Sentence formation, Email writing, Public speaking, Client communication, Leadership, Managerial skills, Stress management, Presentation Skills			
MODULE -3			15 Hrs.
Technical Skills: Review of C programming, Simple coding, Syntax rules, MCQs on C language.			
MODULE -4			14 Hrs.
Activities: GD, JAM, Mock Interview, Pick and speak, Presentation			

Course articulation matrix:

Course Outcomes	Program Outcomes [POs]													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		3	3											
CO2								3	3					
CO3										3				