

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
(2022 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



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Semester-wise Credit Distribution

Semester →	I	II	III	IV	V	VI	VII	VIII	Total Credits
Curricular Component ↓									
Basic Science Course (BSC)	4	4	4	1					13
Engineering Science Course (ESC)/ Emerging Technology Course (ETC)/Programming Language Course	3	6	3	3					15
Professional Core Course (PCC)	10	7	13	15	12	11	8		76
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	1			4				6
Ability Enhancement Course (AEC)/ Skill Enhancement Course (SEC)	2	2	1	1	3	1			10
Universal Human Value Course (UHV)			1	1					2
Total Credits	20	20	22	21	23	20	18	16	160

Malnad College of Engineering, Hassan

Scheme of Teaching and Examinations 2022-23

Outcome-Based Education (OBE) and Choice Based Credit System (CBCS) (Effective from the academic year 2022-23)

I Semester Mechanical, and Electrical		PHYSICS CYCLE					STREAMS: Civil,			
Sl. No	Course Code	Course Title	TD	Teaching Hours/Week			Examination			Credit s
				L	T	P	CIE Marks	SEE Marks s	Total Marks	
1	22MATC11/ 22MATM11 / 22MATE11	Mathematics for CV/ME/EC Stream	Mathematics	2	2	2	50	50	100	04
2	22PHYC12/ 22PHYM12/ 22PHYE12	Physics for CV/ME/EC stream	Physics	2	2	2	50	50	100	04
3	22CIV13/ 22EME13/ 22BEE13 /22EEE13	Engg. Mechanics/ Elements of Mech. Engg./Basic Electronics/ Elements of Electrical Engg.	CV/ME/ EC/EEE	2	2	0	50	50	100	03
4	22ESC14x	Engineering Science Course-I	Respective Engg. department	3	0	0	50	50	100	03
5	22ETC15x	Emerging Technology Course	Any department	3	0	0	50	50	100	03
6	22ENG16	Communicative English	Humanities	1	0	0	50	50	100	01
7	22KSK17/ 22KBK17	Sanskrutika Kannada/ Balake Kannada	Humanities	1	0	0	50	50	100	01
8	22IDT18	Innovation and Design Thinking	Physics (Coordinating Dept)	0	0	2	50	50	100	01
TOTAL				14	06	06	400	400	800	20

TD- Teaching Department, **L**-Lecture, **T**-Tutorial, **P**-Practical, **CIE**–Continuous Internal Evaluation, **SEE**- Semester End Examination,

Scheme of Teaching and Examinations 2022-23

Outcome-Based Education (OBE) and Choice Based Credit System (CBCS) (Effective from the academic year 2022-23)

I semester		CHEMISTRY CYCLE					STREAMS: Computer Science			
Sl. No	Course Code	Course Title	TD	Teaching Hours/Week			Examination			Credits
				L	T	P	CIE Mark s	SEE Mark s	Total Marks	
1	22MATS11	Mathematics for CSE Stream	Mathematics	2	2	2	50	50	100	04
2	22CHES12	Chemistry for CSE Stream	Chemistry	2	2	2	50	50	100	04
3	22CED13	Computer-Aided Engineering Drawing	CV/ME	2	0	2	50	50	100	03
4	22ESC14x	Engineering Science Course-I	Respective Engg. department	3	0	0	50	50	100	03
5	22PLC15x	Programming Language Course	Any department	2	0	2	50	50	100	03
6	22ENG16	Communicative English	Humanities	1	0	0	50	50	100	01
7	22ICO17	Indian Constitution	Humanities	1	0	0	50	50	100	01
8	22SFH18	Scientific Foundations of Health	Sports	1	0	0	50	50	100	01
TOTAL				14	04	08	400	400	800	20

TD- Teaching Department, **L**-Lecture, **T**-Tutorial, **P**-Practical, **CIE**–Continuous Internal Evaluation, **SEE**- Semester End Examination,

Scheme of Teaching and Examinations 2022-23

Outcome-Based Education (OBE) and Choice Based Credit System (CBCS) (Effective from the academic year 2022-23)

II Semester		PHYSICS CYCLE					STREAMS: Computer Science			
Sl. No	Course Code	Course Title	TD	Teaching Hours/Week			Examination			Credit s
				L	T	P	CIE Marks	SEE Marks	Total Marks	
1	22MATS21	Mathematics for CS Stream-II	Mathematics	2	2	2	50	50	100	04
2	22PHYS22	Physics for CS stream	Physics	2	2	2	50	50	100	04
3	22PPC23	Principles of Programming Using C	CS	2	0	2	50	50	100	03
4	22ESC24x	Engineering Science Course-II	Respective Engg. department	3	0	0	50	50	100	03
5	22ETC25x	Emerging Technology Course	Any department	3	0	0	50	50	100	03
6	22PWS26	Professional Writing Skills in English	Humanities	1	0	0	50	50	100	01
7	22KSK27/ 22KBK27	Samskrutika Kannada/ Balake Kannada	Humanities	1	0	0	50	50	100	01
8	22IDT28	Innovation and Design Thinking	Physics (Coordinating Dept)	0	0	2	50	50	100	01
TOTAL				14	04	08	400	400	800	20

TD- Teaching Department, **L**-Lecture, **T**-Tutorial, **P**-Practical, **CIE**–Continuous Internal Evaluation, **SEE**- Semester End Examination,

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Scheme of Teaching and Examinations 2022-23

Outcome-Based Education (OBE) and Choice Based Credit System (CBCS) (Effective from the academic year 2022-23)

II semester		CHEMISTRY CYCLE			STREAMS: Civil, Mechanical, and Electrical					
Sl. No	Course Code	Course Title	TD	Teaching Hours/Week			Examination			Credits
				L	T	P	CIE Marks	SEE Marks	Total Marks	
1	22MATC21// 22MATM21/ 22MATE21	Mathematics for CV/ME/EE Stream-II	Mathematics	2	2	2	50	50	100	04
2	22CHEC22/ 22CHEM22/ 22CHEE22	Chemistry for CV/ME/EE Stream	Physics	2	2	2	50	50	100	04
3	22CED23	Computer-Aided Engineering Drawing	CV/ME	2	0	2	50	50	100	03
4	22ESC24x	Engineering Science Course-II	Respective Engg. department	3	0	0	50	50	100	03
5	22PLC25x	Programming Language Course	Any department	2	0	2	50	50	100	03
6	22PWS26	Professional Writing Skills in English	Humanities	1	0	0	50	50	100	01
7	22ICO27	Indian Constitution	Humanities	1	0	0	50	50	100	01
8	22SFH28	Scientific Foundations of Health	Sports	1	0	0	50	50	100	01
TOTAL				14	04	08	400	400	800	20

TD- Teaching Department, **L-**Lecture, **T-**Tutorial, **P-**Practical, **CIE**–Continuous Internal Evaluation, **SEE-** Semester End Examination,

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List of Elective Courses

I Semester B. E

(ESC-I) Engineering Science Courses-I					(ETC-I) Emerging Technology Courses-I				
Code	Title	L	T	P	Code	Title	L	T	P
22ESC141	Introduction to Civil Engineering	3	0	0	22ETC15A	Smart Materials and Systems	3	0	0
22ESC142	Introduction to Electrical Engineering	3	0	0	22ETC15B	Green Buildings	3	0	0
22ESC143	Introduction to Electronics Engineering	3	0	0	22ETC15C	Introduction to Nano Technology	3	0	0
22ESC144	Introduction to Mechanical Engineering	3	0	0	22ETC15D	Introduction to Sustainable Engineering	3	0	0
22ESC145	Introduction to C Programming	2	0	2	22ETC15E	Renewable Energy Sources	3	0	0
					22ETC15F	Waste Management	3	0	0
					22ETC15G	Emerging Applications of Biosensors	3	0	0
					22ETC15H	Introduction to Internet of Things (IOT)	3	0	0
					22ETC15I	Introduction to Cyber Security	3	0	0
					22ETC15J	Introduction to Electric Vehicle Technology	3	0	0
(PLC-I) Programming Language Courses-I					22ETC15K	Introduction to Embedded System	3	0	0
Code	Title	L	T	P					
22PLC15A	Introduction to Web Programming	2	0	2					
22PLC15B	Introduction to Python Programming	2	0	2					
22PLC15C	Basics of JAVA programming	2	0	2					
22PLC15D	Introduction to C++ Programming	2	0	2					

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List of Elective Courses

II Semester B. E

(ESC-I) Engineering Science Courses-II					(ETC-I) Emerging Technology Courses-II				
Code	Title	L	T	P	Code	Title	L	T	P
22ESC241	Introduction to Civil Engineering	3	0	0	22ETC25A	Smart Materials and Systems	3	0	0
22ESC242	Introduction to Electrical Engineering	3	0	0	22ETC25B	Green Buildings	3	0	0
22ESC243	Introduction to Electronics Engineering	3	0	0	22ETC25C	Introduction to Nano Technology	3	0	0
22ESC244	Introduction to Mechanical Engineering	3	0	0	22ETC25D	Introduction to Sustainable Engineering	3	0	0
22ESC245	Introduction to C Programming	2	0	2	22ETC25E	Renewable Energy Sources	3	0	0
					22ETC25F	Waste Management	3	0	0
					22ETC25G	Emerging Applications of Biosensors	3	0	0
					22ETC25H	Introduction to Internet of Things (IOT)	3	0	0
					22ETC25I	Introduction to Cyber Security	3	0	0
					22ETC25J	Introduction to Electric Vehicle Technology	3	0	0
(PLC-I) Programming Language Courses-II					22ETC25K	Introduction to Embedded System	3	0	0
Code	Title	L	T	P					
22PLC25A	Introduction to Web Programming	2	0	2					
22PLC25B	Introduction to Python Programming	2	0	2					
22PLC25C	Basics of JAVA programming	2	0	2					
22PLC25D	Introduction to C++ Programming	2	0	2					



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THIRD SEMESTER

THIRD SEMESTER											
Sl. No	Course Category	Course Code	Course Title	Teaching Hours/Week				Exam Marks			Credits
				L	T	P	Total	CIE	SEE	Total	
1	BSC	22MAIS301	Mathematics for Information Science Engineering	3	2	0	5	50	50	100	4
2	IPCC	22IS302	Digital Design & Computer Organization	3	0	2	5	50	50	100	4
3	PCC	22IS303	Operating Systems	3	2	0	5	50	50	100	4
4	IPCC	22IS304	Data Structures and Applications	3	0	2	4	50	50	100	4
5	PCCL	22IS305	Unix Lab	0	0	2	2	50	50	100	1
6	ESC	22IS306X	ESC/ETC/PLC	2	0	2	4	50	50	100	3
7	UHV	22SCR	Social Connect and Responsibility	0	0	2	2	100	-	100	1
8	AEC/SEC	22IS307X	Ability Enhancement Course/Skill Enhancement Course - III	If the course is a Theory				50	50	100	1
				1	0	0	1				
				If the course is a laboratory							
				0	0	2	2				
9	BSC	22BCM301	Bridge Mathematics-I (Mandate Audit Course for Diploma entry students)	3	0	0	3	100	-	100	A
Total							35				22

Note: AEC, SEC, ETC courses are to be chosen suitably by the BOS of the programme

Engineering Science Course (ESC/ETC/PLC)

22IS306A	OOP with Java	22IS306C	Discrete Mathematical Structures
22IS306B	OOP with C++	22IS306D	Graph Theory and Combinatorics
Ability Enhancement Course – III			
22IS307A	R Programming	22IS307C	Data Visualization with Python
22IS307B	Data Analytics with Excel	22IS307D	Version Controller with Git



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FOURTH SEMESTER

FOURTH SEMESTER											
Sl. No	Course Category	Course Code	Course Title	Teaching Hours/Week				Exam Marks			Credits
				L	T	P	Total	CIE	SEE	Total	
1	PCC	22IS401	Software Engineering	2	2	0	4	50	50	100	3
2	IPCC	22IS402	Microprocessor and Microcontroller	3	0	2	4	50	50	100	4
3	IPCC	22IS403	Database Management Systems	3	0	2	5	50	50	100	4
4	IPCC	22IS404	Design and Analysis of Algorithms	3	0	2	5	50	50	100	4
5	ESC	22IS405X	ESC/ETC/PLC	2	0	2	4	50	50	100	3
6	UHV	22UHV	Universal Human Values	0	2	0	2	50	50	100	1
7	AEC/SEC	22IS406X	Ability Enhancement Course/Skill Enhancement Course - IV	If the course is a Theory				50	50	100	1
				1	0	0	1				
				If the course is a laboratory							
				0	0	2	2				
8	BSC	22BEIS407	Biology for Engineers	0	2	0	2	50	50	100	1
Total							28				21
Note: AEC, SEC, ETC courses are to be chosen suitably by the BOS of the programme											

Engineering Science Course (ESC/ETC/PLC)

22IS405A	C# and .Net Technologies	22IS405C	Optimization Techniques
22IS405B	Internet of Things	22IS405D	Probability, Statistics and queing
Ability Enhancement Course – III			
22IS406A	Green IT and Sustainability	22IS406C	Introduction to Web Technology
22IS406B	User Interface Design	22IS406D	Technical writing usingLatex



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FIFTH SEMESTER

Sl. No	Course Category	Course Code	Course Title	Teaching Hours/Week				Exam Marks			Credits
				L	T	P	Total	CIE	SEE	Total	
1	IPCC	22IS501	Computer Networks	3	0	2	5	50	50	100	4
2	PCC	22IS502	Theoretical Foundations of Computation	2	2	0	4	50	50	100	3
3	IPCC	22IS503	Full Stack Development	3	0	2	5	50	50	100	4
4	PCCL	22IS504	Data Visualization Lab	0	0	2	2	50	50	100	1
5	HSMC	22IS505	Entrepreneurship and Management	3	0	0	3	50	50	100	3
6	HSMC	22EVS	Environmental Studies	0	2	0	2	50	50	100	1
7	PEC	22IS5XX	Professional Elective Course - I	3	0	0	3	50	50	100	3
8	AEC	22RIP	Research Methodology and IPR	2	2	0	4	50	50	100	3
9	PI	22IS506	Mini Project	0	0	2	2	50	50	100	1
Total							30				23

Professional Elective Course I			
22IS551	Software Testing	22IS553	Object Oriented Modelling and Design
22IS552	Robotic Process Automation	22IS554	Service Oriented Architecture



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SIXTH SEMESTER

Sl. No	Course Category	Course Code	Course Title	Teaching Hours/Week				Exam Marks			Credits
				L	T	P	Total	CIE	SEE	Total	
1	PCC	22IS601	Cryptography, Network Security and Cyber Law	3	0	0	3	50	50	100	3
2	IPCC	22IS602	Artificial Intelligence and Machine Learning	3	0	2	5	50	50	100	4
3	IPCC	22IS603	Cloud Computing	3	0	2	5	50	50	100	4
4	PI	22IS604	Main Project Phase - I	0	0	4	4	50	50	100	2
5	PEC	22IS6XX	Professional Elective Course - II	3	0	0	3	50	50	100	3
6	OEC	22OEIS6X	Open Elective Course - I	3	0	0	3	50	50	100	3
7	OEC	22SW01	Swayam NPTEL – 1	0	1 (A)	0	1 (A)	-	-	-	A
8	AEC	22ASK	AEC/SEC	0	0	2	2	50	50	100	1
Total							25				20

Note: The course 22ASK Will be handled by tap office. It will be conducted during the vacation after the 5th semester.

Professional Elective Course - II

22IS661	Data Mining and Warehousing	22IS663	Mobile Computing Applications
22IS662	Big Data Technologies	22IS664	Block Chain Technology

Open Elective Course - I

22OEIS61	Web Technologies	22OEIS63	Internet of Things
22OEIS62	Java Programming	22OEIS64	Data Science



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SEVENTH SEMESTER

Sl. No	Course Category	Course Code	Course Title	Teaching Hours/Week				Exam Marks			Credits
				L	T	P	Total	CIE	SEE	Total	
1	IPCC	22IS701	Deep Learning	3	0	2	5	50	50	100	4
2	IPCC	22IS702	Data Science using R	3	0	2	5	50	50	100	4
3	PI	22IS703	Main Project Phase - II	0	0	8	8	50	50	100	4
4	PEC	22IS7XX	Professional Elective Course - III	3	0	0	3	50	50	100	3
5	OEC	22OEIS7X	Open Elective Course – II	3	0	0	3	50	50	100	3
Total							24				18

Professional Elective Course - III

22IS771	Virtual Reality and Augmented Reality	22IS773	Computer Vision Using OpenCV
22IS772	Parallel Computing	22IS774	Generative Artificial Intelligence

Open Elective Course - II

22OEIS71	Fundamentals of Database Management System	22OEIS73	Fundamentals of Block Chain
22OEIS72	Introduction to Big Data	22OEIS74	Introduction to Data Science



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EIGHTH SEMESTER

Sl. No	Course Category	Course Code	Course Title	Teaching Hours/Week				Exam Marks			Credits
				L	T	P	Total	CIE	SEE	Total	
1	PEC	22SW02	Professional Elective (NPTEL Online Course)	3	0	0	3	-	100	100	3
2	OEC	22SW03	Open Elective (NPTEL Online course)	3	0	0	3	-	100	100	3
3	PI	22INT	Internship (Research/Industry) (15-20 weeks)	0	0	12	12	100	100	200	10
Total							18				16

Course Title		DIGITAL DESIGN AND COMPUTER ORGANIZATION	
Course Code	22IS302	(L-T-P)C	(3-2-0)4
Exam	3 Hrs	Hours/Week	5
SEE	50 Marks	Total Hours	50
Course Objective: Students will be able to design synchronous and asynchronous circuits.			
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 behaviour of basic components of Digital circuits	1	-
	&Apply different methods for simplifying Boolean equations and		
	design circuits		
2	Analyse the working/Functionality of Different data processing	1, 2	2
	circuits. Carryout the task of designing efficient combinational and		
	sequential logic circuit implementations from functional		
	description of digital systems.		
3	Understand the instruction execution mechanism of a computer,	1	
	working of processing unit, input/output operations.		
4	Analyze different memory organizations and cache mapping	1	
	policies.		
MODULE – 1			
Digital Logic: Overview of Basic Gates and Universal Logic Gates, AND-OR-Invert Gates, Positive and Negative LogiBoolean Laws and Theorems, Sum-of-Products Method, Truth Table to Karnaugh Map, Pairs, Quads, and Octets, 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			
Data-Processing Circuits (contd..): Magnitude Comparator Arithmetic Circuits: Arithmetic Building Blocks, Flip-F			
Flops, Edge-triggered RS, D, JK Flip-Flops, JK Master-Slave Flip-Flops, Various Representations of Flip-Flops.Registers. Serial In-Serial Out. Serial In-Parallel Out. Parallel In-Serial Out. Parallel In-Parallel			

Arithmetic: Multiplication of positive numbers, Signed operand multiplication, Fast multiplication – bit-pair re Division. Basic Processing Unit: Some Fundamental Concepts, Execution of a Complete Instruction, Multiple Bus Organization											
Practical Component											
Guided Experiments : - Realize the behaviour of following gates: i) AND ii) OR 3) NOT 4) NOR 5) NAND - Design and implement BCD to Excess-3 code converter. - Design and implement a Johnson Counter using 4-bit Shift Register IC. - Design and implement an Asynchronous Counter using 4 bit Binary Counter IC to count up from 0 to (n<15) - Design and implement a Full Adder using 4:1 multiplexer chip. - Simplify and realize given Boolean expressions using logic gates ($y = C' + A'D' + B'D'$).											
Open ended Experiments : - Design and implement: i) 4:1 Multiplexer ii) 2:4 Decoder using NAND gates. - Design and implement a 3 stage Asynchronous Counter using J-K flip flops to count down from 7 to n . - 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. - Realize Full Subtractor using only NAND gates. - Realize Full Adder using only Nand gates.											
Text Books: Donald P Leach, Albert Paul Malvino and Goutam Saha, Digital Principles and Applications, 8th Edition, Mc											
Reference Books: A. Anand Kumar, Digital Electronics, PHI - R.P Jain, Modern Digital Electronics, TMH - Stephen Brown, ZvonkoRanesic , Fundamentals of Digital Logic with verilog Design, TMH, 2006 - Charles H. Roth, Jr, Fundamentals of Logic Design, , 5th Edition, Thomson, 2004											
MOOC Course: - Switching circuits and logic design https://nptel.ac.in/courses/106/105/106105185/ - Digital Circuits and Systems SWAYAM IIT-Madras , https://swayam.gov.in/ndl_noc19_ee51											
Course Outcomes	Program Outcomes [POs]										
COs	O1	O2	O3	O4	O5	O6	O7	O8	O9	O10	O11

CO3	3										
CO4	3										

Course Title	OPERATING SYSTEMS		
Course Code	22IS303	(L-T-P)C	(3-2-0)4
Exam	3 Hrs	Hours/Week	5
SEE	50 Marks	Total Hours	50
Course Objective: Students will be able to design synchronous and asynchronous circuits.			
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 , Disk Scheduling and memory management Algorithms	3	-
3	Apply different mechanisms for handling deadlocks and synchronization problems	3	
4	Implement various CPU scheduling algorithms , disk scheduling , page replacement algorithms	2,3	-
MODULE – 1			9 Hrs.
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			9 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			9 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			9 Hrs.

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.

Text Books:

Abraham Silberschatz, Peter Baer Galvin, Greg Gagne: Operating System Concepts, 9th Edition, 2018, John Wiley & Sons, ISBN 978-1-265-5427-0

Reference Books:

1. Andrew.S.Tanenbaum: Modern Operating Systems - A Concept Based Approach, 4th Edition, Addison Wesley, 2015. ISBN: 978-0133591620.
2. P.C.P. Bhatt: Introduction to Operating Systems: Concepts and Practice, 2nd Edition, PHI, 2008.
3. William Stallings: Operating Systems Internals and Design Principles, 8th Edition, Tata McGraw-Hill Education, 2007, ISBN - 978-0070611948.

MOOC Course:

1. Fundamentals of Operating System <https://nptel.ac.in/courses/106/105/106105214/>

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]												PSO1	PSO2
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		
CO1	3	3												
CO2			3											
CO3			3											
CO4		3	3											

Course Title	DATA STRUCTURES AND APPLICATIONS		
Course Code	22IS304	L-T-P	(3-0-2) 4
Exam	3 Hrs.	Hours/Week	5
SEE	50 Marks	Total Hours	50 (36L+14P)

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	2

MODULE – 1

9 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

9 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, Insert operation, 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

9 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

9 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.

Practical Component:

1. Design and Implement a menu driven Program in C for the following Array operations:
 - a. Creating an Array of N Integer Elements
 - b. Display of Array Elements with Suitable Headings

c. Inserting an Element (ELEM) at a given valid Position (POS)

Deleting an Element at a given valid Position (POS)

2. Write a C Program to create a Sequential file with at least 5 records, each record having the structure shown below:

USN	Name	Marks1	Marks2	Marks3
Non-zero positive integer	25 characters	Positive integer	Positive integer	Positive integer

Write necessary functions

a. To display all the records in the file.

To search for a specific record based on the USN.

3. Write a menu driven C Program to arrange a pile of dinner plates that you encounter when you eat at the local cafeteria: When you remove a plate from the pile, you take the plate on the top of the pile. This is exactly the plate that was added most recently to the pile by the dishwasher. If you want the plate at the bottom of the pile, you must remove all the plates on top of it to reach it (use integers to number dinner plates).

4. Write recursive C Programs for

a. Searching an element in a given list of integers using the Binary search method.

b. Solving the Towers of Hanoi problem.

5. Write a C Program to evaluate a valid suffix/postfix expression using stack. Assume that the suffix/ postfix expression is read as a single line consisting of non-negative single digit operands and binary arithmetic operators. The arithmetic operators are + (add), - (subtract), * (multiply) and / (divide).

6. Write a menu driven C Program to simulate the working of a queue of vehicles on toll-tax bridge: The vehicle that comes first to the toll tax booth leaves the booth first. The vehicle that comes last leaves last. Therefore, it follows first-in-first-out (FIFO) strategy of queue (use integers to represent vehicles).

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

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.

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

10. Write a menu driven C Program

- a. To construct a binary search tree of integers.
b. To traverse the tree using all the methods i.e., In-order, Pre-order and Post-order.

Text Books:

1. Yedidyah Langsam and Moshe J. Augenstein and Aaron M. Tenenbaum, Data structures using C and C++, PHI, 2006 Chapters 2, 3, 4, 5

Reference Books:

1. Data Structures: A Pseudo-code approach with C –Gilberg and Forouzan, 2nd edition, Cengage Learning, 2014.
2. M.G.Venkateshmurthy, Programming techniques through C - A beginner's companion, Pearson Education, Asia.
3. An Introduction to Data Structures with Applications- Jean-Paul Tremblay & Paul G. Sorenson, 2nd Edition, McGraw Hill, 2013.

MOOC Course:

2. Data Structures and algorithms <https://nptel.ac.in/courses/106/102/106102064/>

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]												PS01	PS02
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		
CO1	3													
CO2		3											2	
CO3		3											2	
CO4		2											2	

Course Title	UNIX LABORATORY		
Course Code	22IS305	L-T-P	(0-0-2)1
Exam	3 Hrs.	Hours/Week	2
SEE	50 Marks	Total Hours	28

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

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1	Execute the basic UNIX commands.	2	-
2	Demonstrate and develop UNIX shell scripts	3	-

```
ls ,ls -ld ,ls -d ,cat ,cd ,od ,mkdir,echo ,date , mv , cal ,wc,pwd,rmdir,touch,sort ,read ,clear,ps ,whoami,
alias , find ,test,expr,set ,shift ,type .
```

1. Write a shell script that takes a valid directory name as an argument and recursively descend all the sub-directories, finds the maximum length of any file in that hierarchy and writes this Maximum value to the standard output.
2. Write a shell script that accepts a path name and creates all the components in that path name as directories. For example, if the script is named mpc, then the command mpc a/b/c/d should create directories a, a/b, a/b/c, a/b/c/d.
3. Write a shell script that accepts two file names as arguments, checks if the permissions for these files are identical and if the permissions are identical, output common permissions and otherwise output each file name followed by its permissions.
4. Create a script file called file-properties that reads a file name entered and outputs its properties.
5. Write a shell script that accepts one or more filenames as argument and convert all of them to uppercase, provided they exist in the current directory.
6. Write a shell script that accepts a filename as argument and displays its creation time if the file exists and if it does not, send an output error message.
7. Write a shell script that gets executed and displays the message either "Good Morning" or "Good Afternoon" or "Good Evening" depending upon the time at which the user logs in.
8. Write a shell script that accepts the file name, starting and ending line number as an argument and displays all the lines between the given line numbers.

[illegible]

Course Title	OBJECT ORIENTED PROGRAMMING WITH JAVA		
Course Code	22IS306A	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			
Course Outcomes: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1	Comprehend the fundamental concepts Object Oriented Programming	1, 2	1
2	Apply Object Oriented constructs for program development	2	1
4	Analyze a java program for identifying bugs	2, 3	1
MODULE-1			
			7 Hrs
Object Oriented Concepts and Java: Concepts of Object-Oriented programming language: Object, Class, Message passing, inheritance, encapsulation, and polymorphism Difference between OOP and other conventional programming – advantages and disadvantages of OOP. Introduction to Java: Java and Java Applications, Java Development Kit(JDK), The Byte Code, The Java Buzzwords, Simple Java Programs using Control Statements and Blocks of code, Lexical Issues. Data Types, Variables, and Arrays The primitive Types, Integers, Floating-Point Types, Characters, Booleans, Variables, Type conversion and Casting, Arrays, Strings.			
MODULE-2			6 Hrs.
Operators: Arithmetic, Bitwise, Relational, Boolean Logical, Assignment Operator, The ‘?’ Operator, Operator Precedence. Program Control Statements: Input characters from the Keyword, if statement, Nested ifs, if-else-if Ladder, Switch Statement, Nested switch statements, for Loop, Enhanced for Loop, While Loop, do-while Loop, use break, Use continue, Nested Loops.			
MODULE-3			6Hrs
Introducing Classes, Objects and Methods: Class Fundamentals, Declaring Objects, Object Reference Variables, Methods, Constructors, the “This” keyword, Garbage collection, Overloading Methods, and constructors, Argument Passing, Returning Objects, Access Control, Nested and Inner Classes.			
MODULE-4			7Hrs
Inheritance, Packages, and Interfaces: Inheritance Basics, Using Super, Multilevel Hierarchy, When Constructors are called, Method Overriding, Abstract Classes. Packages, Access Protection, Importing Packages, Interfaces			
Exception Handling: Exception-Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and Catch, Multiple catch Clauses, throw, Java’s Built-in Exceptions, Customized exceptions.			
Text Books:			
1. Herbert Schildt, “Java the Complete Reference, 9th Edition, Tata McGraw Hill			

2. E- Bala Guruswamy 7th edition 2021

Reference Books:

1. Y. Daniel Liang, "Introduction to JAVA Programming, Brief Version", 9th Edition, Pearson Education, 2019

Practical component

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.
2. Write a Java program to count the number of occurrences of each letter in a string regardless of case.
3. Write a Java program that ignores non-alphanumeric characters in checking whether a string is a palindrome.
4. Create a java program to make a calculator using switch case to do arithmetic operations.
5. Create a Class Vehicle. Demonstrate method overriding by considering any two types of vehicles.
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.
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.
8. Write a program to demonstrate use of extending interfaces.
9. Write a java program to demonstrate handling of Array Index Out Of Bounds Exception and Arithmetic Exception.

TextBooks:

1. Herbert Schildt, "Java the Complete Reference, 9th Edition, Tata McGraw Hill.
2. E- Balaguruswamy 7th edition 2021.

Reference Books:

1. Y. Daniel Liang, "Introduction to JAVA Programming, Brief Version", 9th Edition, Pearson Education, 2019.

MOOC:

https://onlinecourses.nptel.ac.in/noc22_cs47/preview

Course Articulation Matrix

[illegible]

Exception Handling; Exception Handling Mechanism; Throwing Mechanism; Catching Mechanism; Rethrowing an Exception; Specifying Exceptions.

Practical Component

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.
2. Using reference variables and inline functions, Implement a C++ program to find the average of three real numbers.
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. Using template function, Perform a generic sorting program and demonstrate the same for integers and real numbers.
5. Overloading the operators ++ and --, Implement a C++ program to create a stack of integers and demonstrate the push and pop operations.
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
7. Using friend function concept, demonstrate a C++ program
8. Create a class called A and derive two classes B and C from this. Demonstrate single inheritance with suitable functions.
9. With the help of a Virtual function, demonstrate a C++ program that displays the area and circumference of a Rectangle, Square and a Circle.
10. Implement a C++ program to find the area of rectangle, triangle and sphere. Use function overloading concept
11. Design a C++ program to create a class STUDENT with the following specification: Data members: Name, Roll_no, SGPA. Member Functions: Read and Write. Use these specification to read and print the information of 3 students.
12. Implement a C++ program to
 - a. Concatenate two strings, and
 - b. Search if the second string is present in the first string.

Text Books:

1. Object- oriented programming with C++, E Balguruswamy, 6th Edition, Tata McGraw Hill, 2014
2. Mastering C++, K R Venugopal, Rajkumar Buyya, Tata McGraw Hill, 2nd Edition, Tata McGraw Hill, 2013.

Reference Books:

1. The Complete Reference C++, Herbert Schildt, 4th Edition, Tata McGraw Hill, 2012
2. C++ Primer, Stanley B. Lippman, Josee Lajoie, 5th Edition, Pearson Education, 2009.

MOOC Course:

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

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													
CO2		2											3	
CO3		3											3	

Course Title	DISCRETE MATHEMATICAL STRUCTURES AND COMBINATORICS		
Course Code	22IS306C	L-T-P	(2-2-0)3
Exam	3 Hrs.	Hours/Week	4
SEE	50 Marks	Total Hours	40
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	Use 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			10 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	10 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. weighed trees, prefix codes and biconnected components. Modelling of real-life problems using graphical approach and their analysis.	

Text Books: 1. Discrete and Combinatorial Mathematics, R C Grimaldi, Pearson's publications, 5th edition, 2007.														
Reference Books: 1. Discrete Mathematical Structures, by D. S. Malik & M. K. Sen, Thomson's Publications, First edition, 2006.														
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	2												
CO2	3	2												
CO3	3	2												
CO4	3	2												

Course Title	GRAPH THEORY AND COMBINATORICS		
Course Code	22IS306D	L-T-P	(2-2-0)3
Exam	3 Hrs.	Hours/Week	4
SEE	50 Marks	Total Hours	40

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

10 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

10 Hrs.

Derangements – Nothing Is In Its Right Place, Rook Polynomials, Arrangements with Forbidden Positions, Generating functions, introductory examples, Definition and examples.

Calculational Techniques, Partitions of Integers, the Exponential Generating Function, the Summation Operator.

Text Books:

1. R C Grimaldi, Discrete Mathematics and Combinatorics, Pearson Education, 5th Edition, 2007.

Reference Books:

1. Narsing Deo, Graph Theory with Applications to Engineering and Computer Science, PHI Publications
5. V. Balakrishnan, Combinatorics, Schaum Series, Tata McGraw-Hill Publications

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]
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COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2												
CO2	3	2												
CO3	3	2												
CO4	3	2												

Course Title	R PROGRAMMING		
Course Code	22IS307A	L-T-P	(1-0-0)1
Exam	3 Hrs.	Hours/Week	2 Hrs
SEE	50 Marks	Total Hours	28

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

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 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	-

Sl.No	Experiments
1	Demonstrate the steps for installation of R and 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 – RStudio,

	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)									
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: a. Profit for each month. b. Profit after tax for each month (Tax Rate is 30%). c. Profit margin for each month equals to profit after tax divided by revenue. d. Good Months – where the profit after tax was greater than the mean for the year. e. Bad Months – where the profit after tax was less than the mean for the year. f. The best month – where the profit after tax was max for the year. g. The worst month – where the profit after tax was min for the year. Note: a. All Results need to be presented as vectors b. 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 c. Results for the profit margin ratio need to be presented in units of % with no decimal point. d. It is okay for tax to be negative for any given month (deferred tax asset) e. Generate CSV file for the data. Suggested Reading – Text Book 1 – Chapter 4 (Vectors, Combining Matrices)									
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)									
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)									
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)									
6	The built-in data set mammals contain data on body weight versus brain weight. Develop R commands to: a) Find the Pearson and Spearman correlation coefficients. Are they similar? b) Plot the data using the plot command. c) 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 – (Scatterplots) Reference Book 2 – 13.2.5 (Covariance and Correlation)									
7	Develop R program to create a Data Frame with following details and do the following operations. <table><tr><th>itemCode</th><th>itemCategory</th><th>itemPrice</th></tr><tr><td>1001</td><td>Electronics</td><td>700</td></tr><tr><td>1002</td><td>Desktop Supplies</td><td>300</td></tr></table>	itemCode	itemCategory	itemPrice	1001	Electronics	700	1002	Desktop Supplies	300
itemCode	itemCategory	itemPrice								
1001	Electronics	700								
1002	Desktop Supplies	300								

	1003	Office Supplies	350
	1004	USB	400
	1005	CD Drive	800
8	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. a) Assigning names, using the air quality data set. b) Change colors of the Histogram c) Remove Axis and Add labels to Histogram d) Change Axis limits of a Histogram e) Add Density curve to the histogram Suggested Reading –Reference Book 2 – Chapter 7 (7.4 – The ggplot2 Package), Chapter 24 (Smoothing and Shading)		
9	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)		
10	Using the built in dataset mtcars 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 carburettors. Develop R program, to solve the following: a) What is the total number of observations and variables in the dataset? b) Find the car with the largest hp and the least hp using suitable functions c) Plot histogram / density for each variable and determine whether continuous variables are normally distributed or not. If not, what is their skewness? d) What is the average difference of gross horse power(hp) between automobiles with 3 and 4 number of cylinders(cyl)? Also determine the difference in their standard deviations. e) Which pair of variables has the highest Pearson correlation? References (Web links): https://cran.r-project.org/web/packages/explore/vignettes/explore_mtcars.html https://www.w3schools.com/r/r_stat_data_set.asp https://rpubs.com/BillB/217355		
11	Demonstrate the progression of salary with years of experience using a suitable data set (You can		

create your own dataset). Plot the graph visualizing the best fit line on the plot of the given data points. Plot a curve of Actual Values vs. Predicted values to show their correlation and performance of the model. Interpret the meaning of the slope and y-intercept of the line with respect to the given data. Implement using lm function. Save the graphs and coefficients in files. Attach the predicted values of salaries as a new column to the original data set and save the data as a new CSV file.

Suggested Reading – Reference Book 2 – Chapter 20 (General Concepts, Statistical Inference, Prediction)

Text Books:

1. Cotton, R., Learning R: a step by step function guide to data analysis. 1st edition. O'reilly Media Inc

Reference Books:

1. Jones, O., Maillardet. R. and Robinson, A. (2014). Introduction to Scientific Programming and Simulation Using R. Chapman & Hall/CRC, The R Series.
2. Davies, T.M. (2016) The Book of R: A First Course in Programming and Statistics. No Starch Press.

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
CO1	3													
CO2			2											
CO3		2												
CO4			2											

Course Title	Data Analytics with Excel		
Course Code	22IS307B	L-T-P	(0-0-1) 1
Exam	3 Hrs.	Hours/Week	2 Hrs
SEE	50 Marks	Total Hours	28

Course Objective: Students will be able to identify the principles of data analysis and apply analysis techniques to datasets in Excel.

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 key concepts of data analysis, its significance in various domains, and the role of Excel as a tool for data manipulation and visualization.	1	1
2.	Demonstrate the ability to apply Excel functions and tools for data manipulation, cleaning, and transformation to analyse and gain insights from datasets.	2,3,5,9	1
3.	Develop the skills to analyse datasets using descriptive statistics, data visualization techniques, and Excel charts to effectively communicate patterns and trends.	2,4,5	1

1. Introduction to Data Analysis and Excel Basics

Create a simple Excel spreadsheet that tracks personal expenses over the course of a week. Use basic functions to calculate total expenses.

2. Data Entry, Cleaning, and Data Types

1. Given a dataset with missing values, fill in the missing values using appropriate Excel techniques.
2. Create a dataset with a mix of data types (numeric, text, dates) and ensure data consistency.

3. Descriptive Statistics and Data Visualization

1. Analyse a sales dataset by calculating mean, median, mode, and range using Excel functions.
2. Create a bar chart to visualize the distribution of sales across different products.

4. Data Analysis Functions and Pivot Tables

1. Analyse a student performance dataset to calculate the average score, highest score, and lowest score using Excel functions.
2. Create a pivot table to summarize and compare the sales figures for different regions.

5. Exploratory Data Analysis

1. Analyse a dataset containing employee information. Use filtering and sorting to find the top earners and junior employees.
2. Apply data validation to ensure that dates are entered correctly in a dataset.

6. Hypothesis Testing and Regression Analysis

1. Compare the average test scores of two groups of students using a t-test in Excel.
2. Perform a simple linear regression analysis to predict sales based on advertising spending.

7. Advanced Data Visualization

Create a scatter plot to show the relationship between hours studied and exam scores using a dataset of your choice.

8. Advanced Functions for Data Analysis

Analyse a real-world dataset using advanced Excel functions such as VLOOKUP and COUNTIFS.

9. Working with Large Datasets

Analyse a large dataset (provided) using Excel's filtering, sorting, and pivot table features.

10. Time Series Analysis

Analyse a time series dataset (provided) using Excel to identify trends and patterns.

11. Advanced Chart Types

Create a histogram to show the distribution of ages in a dataset using Excel.

12. Formula Auditing and Error Handling

Identify and rectify errors in each dataset using Excel's formula auditing tools.

Text Books:

3. "Excel Data Analysis for Dummies" by Stephen L. Nelson and E. C. Nelson: A beginner-friendly guide to using Excel for data analysis.
4. "Data Analysis Using SQL and Excel" by Gordon S. Linoff: Covers data analysis techniques using Excel and SQL.

Reference Books:

1. "Data Smart: Using Data Science to Transform Information into Insight" by John W. Foreman

MOOC Course:

<https://elearn.nptel.ac.in/shop/nptel/digital-skilling/>

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	2		2				2				3	
CO3		3		2	2								3	

Course Title	Data Visualization with Python		
Course Code	22IS 307C	L-T-P	(0-0-1)1
Exam	3 Hrs	Hours/Week	2 Hrs

Course Objective: Students will be able to demonstrate the use of IDLE or PyCharm IDE to create Python Applications.

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 use of IDLE or PyCharm IDE to create Python Applications.	2	-
2.	Use Python programming constructs to develop programs for solving real-world problems.	2	2
3.	Use Matplotlib for drawing different Plots.	5	-
4.	Demonstrate working with Seaborn, Bokeh for visualization.	2	-
5.	Use Plotly for drawing Time Series and Maps.	5	-

Sl.No	Experiments
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 also count the number of occurrences of each digit in the input number. Datatypes: https://www.youtube.com/watch?v=gCCVsvgR2KU Operators: https://www.youtube.com/watch?v=v5MR5JnKcZI Flow Control: https://www.youtube.com/watch?v=PqFKRqpHrjw For loop: https://www.youtube.com/watch?v=0ZvaDa8eT5s While loop: https://www.youtube.com/watch?v=HZARImviDxg Exceptions: https://www.youtube.com/watch?v=6SPDvPK38tw
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 (when $N > 0$) 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. Functions: https://www.youtube.com/watch?v=BVfCWuca9nw Arguments: https://www.youtube.com/watch?v=ijXMGpoMkhQ Return value: https://www.youtube.com/watch?v=nuNXiEDnM44
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

	https://www.youtube.com/watch?v=RRHQ6Fs1b8w&list=PLjVLYmrlmjGcC0B_FP3bkJJIPkV5GuZR&index https://www.youtube.com/watch?v=7ABCuhWO9II&list=PLjVLYmrlmjGcC0B_FP3bkJJIPkV5GuZR&index
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. https://www.youtube.com/watch?v=Qk7caotaQUQ&list=PLjVLYmrlmjGcC0B_FP3bkJJIPkV5GuZR&index https://www.youtube.com/watch?v=PSji21jUNO0&list=PLjVLYmrlmjGcC0B_FP3bkJJIPkV5GuZR&index
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. https://www.youtube.com/watch?v=UO98IJQ3QGI&list=PL-osiE80TeTvipOqomVEeZ1HRrcEvtZB_
7	Write a Python program which explains uses of customizing seaborn plots with Aesthetic functions. https://www.youtube.com/watch?v=6GUZXDef2U0
8	Write a Python program to explain working with bokeh line graph using Annotations and Legends. a) Write a Python program for plotting different types of plots using Bokeh. https://www.youtube.com/watch?v=HDvxYoRadcA
9	Write a Python program to draw 3D Plots using Plotly Libraries. https://www.youtube.com/watch?v=cCck7hCanpw&list=PLE50-dh6JzC4onXqkv9H3HtPbBVA8M94&index=4
10	a) Write a Python program to draw Time Series using Plotly Libraries. b) Write a Python program for creating Maps using Plotly Libraries. https://www.youtube.com/watch?v=xnJ2TNrGYik&list=PLE50-dh6JzC4onXqkv9H3HtPbBVA8M94&index=5 https://www.youtube.com/watch?v=D35m2CdMhVs&list=PLE50-dh6JzC4onXqkv9H3HtPbBVA8M94&index=6

Text Books:

1. Al Sweigart, "Automate the Boring Stuff with Python", 1st Edition, No Starch Press, 2015. (Available under CC BY-NC-SA license at <https://automatetheboringstuff.com/>)
2. Reema Thareja "Python Programming Using Problem Solving Approach" Oxford University Press.
3. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd Edition, Green Tea Press, 20
(Available under CC-BY-NC license at <http://greenteapress.com/thinkpython2/thinkpython2.pdf>)
4. Jake VanderPlas "Python Data Science Handbook" 1st Edition, O'REILLY.

CO4		2													
CO5					3										

Course Title	PROJECT MANAGEMENT WITH GIT			
Course Code	22IS307D	L-T-P	(0-0-1)1	
Exam	3 Hrs.	Hours/Week	2 Hrs	
SEE	50 Marks	Total Hours	28	

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	Mapping to PO's	Mapping to 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	-
4.	Use the commands related to Git Tags, Releases and advanced git operations	1	-
5.	Analyse and change the git history	2	

Sl.NO	Experiments
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.	Creating and Managing Branches Create a new branch named "feature-branch." Switch to the "master" branch. Merge the "feature-branch" into "master."
3.	Creating and Managing Branches Write the commands to stash your changes, switch branches, and then apply the stashed changes.
4.	Collaboration and Remote Repositories Clone a remote Git repository to your local machine.
5.	Collaboration and Remote Repositories Fetch the latest changes from a remote repository and rebase your local branch onto the updated remote branch.
6.	Collaboration and Remote Repositories Write the command to merge "feature-branch" into "master" while providing a custom commit message for the merge.
7.	Git Tags and Releases Write the command to create a lightweight Git tag named "v1.0" for a commit in your local repository.
8.	Advanced Git Operations

	Write the command to cherry-pick a range of commits from "source-branch" to the current branch.
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?
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."
11.	Analysing and Changing Git History Write the command to display the last five commits in the repository's history.
12.	Analysing and Changing Git History Write the command to undo the changes introduced by the commit with the ID "abc123".

Text Books:

1. Prem Kumar Ponuthurai, Jon Loeliger, Version Control with GiT, 3rd edition, O'Reilly Media, Inc.

Course Articulation Matrix

[illegible]

Course Title	SOCIAL CONNECT & RESPONSIBILITY		
Course Code	22SCR	L-T-P	(0-0-2)1
Exam	3 Hrs.	Hours/Week	2
SEE	50 Marks	Total Hours	15
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	Mapping to PSO's
1	Describe societal challenges and build solutions to alleviate these complex social problems through immersion, design & technology.	6	-
2	Communicate and connect with their surroundings.	7, 12	-
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, photoblog 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 14-20 hrs 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.

Marks allotted for the diary are out of 50. 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

Course Title	SOFTWARE ENGINEERING		
Course Code	22IS401	(L-T-P)C	(2-2-0) 3
Exam	3 Hrs.	Hours/Week	4
SEE	50 Marks	Total Hours	40
Course Objective:			
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	Apply software process activities during system design	3	2
3	Apply different approaches of verifying and validating a software product.	1	2
4	Apply various project management activities	3	2
MODULE – 1			10 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. Self Study: Case Studies- A patient information system for mental health care, A wilderness weather station			
MODULE – 2			10 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. Behavioural models. Model-driven engineering. Self Study: Behavioural models			
MODULE -3			10 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. Self Study: Designing UML diagrams			
MODULE -4			10 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. Self Study: COCOMO, ISO9000, SEI Capability Maturity Model, Other Important Quality Standards, Six Sigma.			

Text Books:

1. Ian Sommerville, "Software Engineering", 9th Edition, Person Education, 2014. (Chapters:1,2,3,4,5,7,8,9)
2. Fundamentals of Software Engineering, Rajib Mall, 2015, Prentice-Hall Of India Pvt. Ltd., ISBN: 9788120348981 (Chapters: 3)

Reference Books:

1. Roger S. Pressman, "Software Engineering - A Practitioners Approach", 7th Edition, McGraw-Hill, 2007.
2. Waman S. Jawadekar, "Software Engineering Principles and Practice", Tata McGraw-Hill, 2004.
3. Software Engineering: A Concise introduction to Software Engineering by Pankaj Jalot, Springer.

Tutorial Component

Students will be made to understand Case studies on topics discussed in classes. Presentation on case studies. This will help students in better understanding of concepts.

1. Considering the following case studies,
 - a) Identify the requirements and prepare the SRS document (as per IEEE format) from Problem Statements.
 - b) Design Models using following UML diagrams for the case studies given below (Tool: Star UML/Enterprise Architect)
 - c) Use of any Open Source Test Tool like Selenium or equivalent as determined by the course co-coordinator

Structural Diagrams

- Class diagram
- Object diagram
- Component diagram
- Deployment diagram

Behavioural Diagrams

- Use case diagram
- Sequence diagram
- Collaboration diagram
- State chart diagram
- Activity diagram

List of Case Studies

1. Library Management System
2. Hospital Management System
3. Online reservation Management System
4. Airport check-in and security screening System
5. Restaurant business System
6. Bank ATM System
7. Ticket vending machine
8. Student marks Analyzing System

MOOC Course:

4. Software Engineering <https://nptel.ac.in/courses/106/105/106105182/>

[illegible][illegible]

Course Title	DATABASE MANAGEMENT SYSTEMS		
Course Code	22IS403	(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 databases, and application of SQL for solving problems. 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 concepts of Database Management Systems and its applications.	1	-
2	Design ER diagram for real world applications and develop SQL queries.	3	2
3	Apply normalizations for relation scheme.	2	-
4	Describe the issues in transaction management.	1	-
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, Relationship Types of Degree Higher Than Two.			
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.			

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, Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth 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,.

Practical Component:

Perform the following programs using MySQL.

1. Consider the following schema:

EMPLOYEE (Ename, Ssn, Bdate, Sex, Address, salary, Mgrssn, Dno)

DEPARTMENT (Dname, Dnumber, Mgrssn, Mgr_start_date)

PROJECT (Pname, Pnumber, Plocation, Dnum)

WORKS_ON (Essn, Pno, Hours)

DEPENDENT(Essn, Dependent_name, Sex)

Create above tables by specifying primary key, foreign key and other suitable constraints.

Insert atleast 5 tuples to each created table.

- i. Retrieve the name and address of all employees who work for the "ISE" department.
- ii. For each employee, retrieve the employee's name and the name of his or her immediate supervisor
- iii. Find the sum of all salaries of all employees
- iv. For each department, retrieve the department number, the number of employees in the department and their average salary.

2. Consider the following relation schema:

SAILORS (Sid: integer, Sname: string, Rating: integer, Age: real)

BOATS (Bid: integer, Bname: string, Color: string)

RESERVES (sid: integer, Bid: integer, Day:date)

Create above tables by specifying primary key, foreign key and other suitable constraints.

Insert atleast 5 tuples to each created table.

Design a database to the satisfy the above requirements and answer following queries

- i. Find all sailors with a rating above 7
- ii. Find the names of sailors who have reserved boat number 103
- iii. Find the names of sailors who have reserved a red boat
- iv. Find the names of sailors who have reserved a red or a green boat

3. Consider the following relation schema:

STUDENT (Snum: integer, Sname: string, Major: string, Level: string, Age: integer)

CLASS (Cname: string, Meets at: string, Room: string, Fid: integer)

ENROLLED (Snum: integer, Cname: string)

FACULTY (Fid: integer, Fname: string, Deptid: integer)

The meaning of these relations is straightforward; for example, enrolled has one record per student-class pair such that the student is enrolled in the class. Level is a two character code with 4 different values (example: Junior: JR etc)

3. Write the following queries in SQL. No duplicates should be printed in any of the answers.

- i. Find the names of all Juniors (level = JR) who are enrolled in a class taught by Prof. Harshith
- ii. Find the names of all classes that either meet in room R128 or have five or more Students enrolled.
- iii. Find the names of all students who are enrolled in two classes that meet at the same time.
- iv. Find the names of faculty members who teach in every room in which some class is taught.

4. Consider the relation schema for book dealer database:

AUTHOR (Author-id:int, Name:string, City:string, Country:string)

PUBLISHER (Publisher-id:int, Name:string, City:string, Country:string)

CATALOG (Book-id:int, Title:string, Author-id:int, Publisher-id:int, Category-id:int, Year:int, Price:int)

CATEGORY (Category-id:int, Description:string)

ORDER-DETAILS (Order-no:int, Book-id:int, Quantity:int)

Create the above tables by properly specifying the primary keys and the foreign keys. Enter atleast five tuples for each relation.

- i. Give the details of the authors who have 2 or more books in the catalog and the price of the books is greater than the average price of the books in the catalog and the year of publication is after 2000.
- ii. Find the author of the book which has maximum sales.
- iii. Demonstrate how you increase the price of books published by a specific publisher by 10%
- iv. List any department that has all its adopted books published by a specific publisher

5. Consider the schema for Movie Database:

ACTOR (Act_id, Act_Name, Act_Gender) DIRECTOR (Dir_id, Dir_Name, Dir_Phone)

MOVIES (Mov_id, Mov_Title, Mov_Year, Mov_Lang, Dir_id)

MOVIE_CAST (Act_id, Mov_id, Role)

RATING (Mov_id, Rev_Stars)

Write SQL queries to

Create the above tables by properly specifying the primary keys and the foreign keys. Enter atleast five tuples for each relation.

1. List the titles of all movies directed by 'Hitchcock'.
2. Find the movie names where one or more actors acted in two or more movies.

3. List all actors who acted in a movie before 2000 and also in a movie after 2015.
4. Update rating of all movies directed by 'Steven Spielberg' to 5.

6. Consider the following database for a banking enterprise

BRANCH (branch-name: String, branch-city: String, assets: real)

ACCOUNTS (accno: int, branch-name: String, balance: real)

DEPOSITOR (customer-name: String, customer-street: String, customer-city: String)

LOAN (loan-number: int, branch-name: String, amount: real)

BORROWER (customer-name: String, loan-number: int)

Create the above tables by properly specifying the primary keys and the foreign keys. Enter atleast five tuples for each relation.

1. Find all the customers who have at least two accounts at the Main branch.
2. Find all the customers who have an account at all the branches located in a specific city.
Demonstrate how you delete all account tuples at every branch located in a specific city.

Text Books:

1. Elmasri and Navathe,: "Fundamentals of Database Systems", 7th Edition, Addison-Wesley,2015.
2. Raghu Ramakrishnan and Johannes Gehrke," Database Management Systems", 3rd Edition, McGraw-Hill,2007

Reference Books:

1. Silberschatz, Korth and Sudarshan: "Database System Concepts", 6th Edition, Mc-Graw Hill, 2010.
2. C.J. Date, A. Kannan, S. Swamynatham: "An Introduction to Database Systems", 8th Edition, Pearson Education, 2006.

MOOC:

1. Database Management Systems<https://nptel.ac.in/courses/106/105/106105175/>

Course Articulation Matrix

[illegible]

Course Title	DESIGN AND ANALYSIS OF ALGORITHMS																						
Course Code	22IS404	(L-T-P)C	(3-0-2)4																				
Exam	3hrs	Hours/Week	5																				
SEE	50 Marks	Total Hours	50 (36L+14P)																				
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: <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>Apply various algorithm design techniques to solve the given problem.</td><td>3</td><td>1</td></tr> <tr> <td>2.</td><td>Analyse the time complexity of the algorithm using asymptotic notations.</td><td>2</td><td>1</td></tr> <tr> <td>3.</td><td>Differentiate tractable & intractable problems & apply techniques that help to cope up with limitation of algorithm power.</td><td>3</td><td>1</td></tr> <tr> <td>4.</td><td>Conduct experiments to implement the designed algorithms</td><td>3</td><td>1</td></tr> </table>				#	Course Outcomes	Mapping to PO's	Mapping to PSO's	1.	Apply various algorithm design techniques to solve the given problem.	3	1	2.	Analyse 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
#	Course Outcomes	Mapping to PO's	Mapping to PSO's																				
1.	Apply various algorithm design techniques to solve the given problem.	3	1																				
2.	Analyse 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			9 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			9 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			9 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			9 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.																							

Practical Component/Tutorial:	
Guided Experiments Implement the following using C/Java Language. 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 a graph 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. 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.	Open ended Experiments Students have to solve a given problem using any suitable design technique and demonstrate its efficiency. Sample list of problems (but not limited to this) that can be considered are 1. Josephus problem 2. Travelling salesman problem 3. Job assignment problem 4. Boyre Moore string matching algorithm 5. Searching problem like - Given a string, find all possible palindromic substrings in it, Given a sequence of numbers between 2 and 9, print all possible combinations of words formed from the mobile keypad which has English alphabets associated with each key. 6. Sorting problem like - Given two integer arrays, reorder elements of the first array by the order of elements defined by the second array.
Text Books: 1. Anany Levitin, Introduction to the Design and Analysis of Algorithms, 3rd Edition, Pearson Education, 2017.	
Reference Books: 1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Introduction to Algorithms, 3rd Edition PHI 2. Horowitz E., Sahani S., Rajasekharan S., Computer Algorithms, Galgotia Publications	

MOOC Course:

1. Design and Analysis of Algorithms <https://nptel.ac.in/courses/106/106/106106131/>

MOOC Course:

1. Design and Analysis of Algorithms <https://nptel.ac.in/courses/106/106/106106131/>

Course Articulation Matrix									
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Course Title	C# AND .NET TECHNOLOGIES		
Course Code	22IS405A	(L-T-P)C	(2-0-2) 3
Exam	3 Hrs	Hours/Week	4
SEE	50 Marks	Total Hours	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	1,2	-
3	Interpret Interfaces and define custom interfaces for application.	1,2	-
4	Analyse a C# program for identifying bugs.	2	-

MODULE – 1

7Hrs.

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.

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.

Understanding parameter arrays, working with inheritance, creating interfaces and defining abstract classes, Using garbage collection and resource management.

MODULE -4

6Hrs.

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

Practical Component/Tutorial:

1. Write a C# program that calculates the area of a rectangle. The program should ask the user to enter the length and width of the rectangle as inputs. Then, using appropriate variables, operators, and expressions, calculate and display the area of the rectangle.
2. Program that converts a temperature from Celsius to Fahrenheit. The program should have a method called Convert To Celsius that takes a temperature in Celsius as a parameter and returns the corresponding temperature in Fahrenheit. Use appropriate variable types and

apply appropriate scope in your program.

3. Write a C# program that calculates the average of a series of numbers entered by the user. The program should ask the user to enter the numbers one by one, and use a loop to accumulate the sum of the numbers. If the user enters a non-numeric value, the program should handle the exception gracefully and continue asking for valid input. Once the user is done entering numbers, calculate and display the average.
4. Create a class called "Car" that represents a car object. The Car class should have properties such as "Make", "Model", and "Year" to store the car's make, model, and manufacturing year respectively. Implement a method called "StartEngine" that prints a message indicating that the car's engine has started. In the Main method, create an instance of the Car class, set its properties, and call the StartEngine method to demonstrate the usage of classes and objects.
5. Create an enumeration called "DaysOfWeek" that represents the days of the week (e.g., Monday, Tuesday, etc.). Then, create a structure called "Appointment" that has properties such as "MeetingName" (string), "Day" (DaysOfWeek), and "Time" (DateTime). In the Main method, create an array of Appointment objects and populate it with different appointments. Display the details of each appointment using a loop.
6. Write a program that takes a variable number of integers as input using a parameter array. The program should calculate and display the sum of all the integers entered by the user.
7. Create a base class called "Shape" that has an abstract method called "CalculateArea" and a virtual method called "DisplayInfo". Create two derived classes called "Rectangle" and "Circle" that inherit from the Shape class. Implement the CalculateArea method in both derived classes to calculate the area of a rectangle and a circle respectively. Implement the DisplayInfo method in each derived class to display information about the shape. Finally, create instances of the Rectangle and Circle classes, call the CalculateArea and DisplayInfo methods on them to demonstrate inheritance and polymorphism.
8. Create a class called "Person" that has private fields for name and age. Implement properties to access and modify these fields. The Name property should be read-only, while the Age property should be read-write. In the Main method, create an instance of the Person class, set the name and age properties, and display the person's details.
9. Create a generic class called "Stack<T>" that represents a stack data structure. The class should have methods to push an item onto the stack, pop an item from the stack, and check if the stack is empty. In the Main method, create two instances of the Stack class, one for storing integers and another for storing strings. Push some items onto both stacks and perform pop operations to demonstrate the generic behaviour of the class.
10. Create a class called "Complex" that represents a complex number. Implement operator overloading for addition, subtraction, and multiplication of complex numbers. Test the operator overloading by performing arithmetic operations on instances of the Complex class.

Text Books: 1. John Sharp, Microsoft Visual C# Step by Step, 8th Edition, PHI Learning Pvt. Ltd. 2016

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| Text Books:
1. John Sharp, Microsoft Visual C# Step by Step, 8th Edition, PHI Learning Pvt. Ltd. 2016 |
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Reference Books: 1. Tom Archer, Andrew Whitechapel, Inside C#, WP Publishers 2. Herbert Schildt, The Complete Reference C# 3.0, Tata McGraw Hill Education Private Limited

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| Reference Books: <ol style="list-style-type: none">1. Tom Archer, Andrew Whitechapel, Inside C#, WP Publishers2. Herbert Schildt, The Complete Reference C# 3.0, Tata McGraw Hill Education Private Limited |
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MOOC Course: 1. https://www.coursera.org/learn/intro-to-dotnet-core

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1. https://www.coursera.org/learn/intro-to-dotnet-core |
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Course Title	INTERNET OF THINGS		
Course Code	22IS405B	(L-T-P)C	(3-0-0)3
Exam	3 Hrs.	Hours/Week	3
SEE	50 Marks	Total Hours	40 Hrs
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 PO's	Mapping to PSO's
1	Explain the fundamentals and applications of IoT, its Architecture, Design Principles and Standards	1	
2	Apply programming skills to design IoT applications	3	
3	Analyze IoT system management	2	2
4	Design and Implement applications of IoT and make presentation in team	5,10	2
MODULE – 1			10 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			10 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; NETOPEER. IoT platform Design Methodology - IoT Design Methodology; Introduction; Case Study on IoT System for Weather Monitoring.			
MODULE -3			10 Hrs.
IoT Physical Devices and End points - What is an IoT device; Exemplary Device- Raspberry Pi, Linux on Raspberry Pi, Raspberry Pi Interfaces, Other IoT devices. IoT Physical Servers & Cloud Offerings: Designing a Restful Web API, Amazon Web Services for IoT, AmazonEC2, Amazon Auto Scaling, AmazonS3, Amazon RDS.			
MODULE -4			10 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.			

Text Books:

1. Internet of Things - A Hands on Approach, ArshdeepBahga and Vijay Madisetti Universities Press, 2015

Reference Books:

1. Olivier Hersent, David Boswarthick, Omar Elloumi, The Internet of Things: Key Applications and Protocols, 2nd Edition, Wiley ISBN: 978-1-119-99435-0, 370 pages, January 2012.
2. Vijay Madisetti, ArshdeepBahga, Internet of Things: A Hands-On Approach Vijay Madisetti, 1st Edition ISBN-10: 0996025529, 2014

MOOC Course:

Design for Internet of things <https://nptel.ac.in/courses/108/108/108108098/>

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													
CO2			2											
CO3		3												2
CO4					3					3				3

Course Title	OPTIMIZATION TECHNIQUES		
Course Code	22IS405C	L-T-P	(3-0-0)3
Exam	3 Hrs.	Hours/Week	3 Hrs
SEE	50 Marks	Total Hours	40
Course outcomes: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Apply problem solving techniques through OR approaches	2	-
2.	Formulate the problem using linear programming technique	1	-
3.	Analyze the optimal solution for the given problem by applying Transportation problems	3	-
4.	Analyze the strategies with different players through game theory approach.	3	-
5.	Analyze the sequence of jobs to be executed by machines for the given problem	3	-
MODULE – 1			10 Hrs.
Linear programming problem(LPP): Introduction, structure of linear programming model, advantages, general model of Linear programming problem(LPP), examples of LP formulation, graphical solutions of LP problem and Solution of LPP by simplex method:			
MODULE – 2			10 Hrs.
Transportation and Assignment Problems: Mathematical model of transportation problem, methods of finding initial solution (Northwest corner rule, Least cost method, Vogel's approximation method), test for optimality in TP using MODI Method. Mathematical model of assignment problem, Hungarian method for solving assignment problem.			
MODULE -3			10 Hrs.
Theory of games: Introduction, two-person zero sum games, pure strategies (MinMax and MaxMin principles), mixed strategies. The rules of principles of dominance, algebraic method to solve games without saddle point, graphical methods to solve games.			
MODULE -4			10 Hrs.
Network Analysis: PERT and CPM, Network construction and determination of critical path, Calculation of ES, EF, LS, LF, TF, FF and IF, Crashing of a project, Scheduling of a project and resource levelling.			
Text Books:			
1. Operations Theory and Applications, J.K. Sharma, 5th edition, MacMillan publisher India(Chapter 1,2,3,4,5,9,10,11,12,20).			
2. Operations Research S.D Sharma, Kedarnath, Ramnath and Co, 2002.			
Reference Books:			
1. Operations Research – An Introduction Taha H A- Low price edition 7th edition,2006.			
2. Introduction to operation Research, Hiller and Liberman, Mc GrawHill , 5th edition ,2001.			

Course Articulation Matrix

[illegible]

Course Title	PROBABILTIY, STASTISTICS AND QUEING		
Course Code	22IS405D	L-T-P	(3-0-0)3
Exam	3 Hrs.	Hours/Week	3 Hrs
SEE	50 Marks	Total Hours	40

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, Joint 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.

Text Books:

1. S. C. Gupta, "Fundamentals of Statistics", 46th Edition, Himalaya Publishing House.

2. G. V. Kumbhojkar, "Probability and Random Processes", 14th Edition, C. Jamnadas and co.

Reference Books:

1. Kishor S. Trivedi, "Probability, Statistics with Reliability, Queuing and Computer Science Applications", 2nd Edition, Wiley India Pvt. Ltd.
2. Vijay K. Rohatgi, A. K. Md. Ehsanes Saleh, An Introduction To Probability And Statistics, 3rd Edition, Wiley Publication.

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													
CO2	3													
CO3	3													
CO4		2												

Course Title	Green IT and Sustainability		
Course Code	22IS406A	L-T-P	(2-0-0)1
Exam	3 Hrs.	Hours/Week	2 Hrs
SEE	50 Marks	Total Hours	20
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 the concepts of how to manage the green IT with necessary components.	1	-
2.	Select hardware and software to facilitate more sustainable operation	2	-
3.	Relate the green computing practices to save energy	2,6,7	-
4.	Describe the use of IT in relation to environmental perspectives.	2,6,7	-

[illegible]

Course Title	User Interface Design		
Course Code	22IS406B	(L-T-P)C	(1-0-0)1
Exam	3Hrs	Hours/Week	2
SEE	50 Marks	Total Hours	20
Course Objective: Students will be able to apply the concepts and principles of User Interface Design and evaluate User Interfaces.			
Course Outcomes: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Describe motivations, theories and design processes of interactive systems	1	-
2	Appreciate the desirable features of good error messages, web pages, windows, documentation, help facility and visualization techniques	1	-
3	Analyze different types of user interfaces, devices and quality of service issues	2	-
4	Design appropriate user interface for given requirement	3	-
MODULE – 1			5Hrs.
Usability of Interactive Systems: Introduction, Usability Goals and Measures, Usability Motivations, Universal Usability, Goals for our Profession. Guidelines, Principles, and Theories: Introduction, Guidelines, Principles, Theories, four pillars of design.			
MODULE – 2			5Hrs.
Direct Manipulation and Virtual Environments: Introduction, Examples of Direct Manipulation, Discussion of Direct Manipulation. Menu Selection, Form Fill-in, and Dialog Boxes: Introduction, Task Related Menu Organization, Single Menus, Combination of Multiple Menus.			
MODULE -3			5Hrs.
Quality of Service: Introduction, Models of Response-Time Impacts, Expectations and Attitudes, User Productivity, Variability in Response Time, Frustrating Experiences.			
MODULE -4			5Hrs.
User Documentation and Online Help: Introduction, Online Versus Paper Documentation, Reading from Paper versus from Displays, Shaping the Content of the Documentation, Accessing the Documentation, Online Tutorials.			
Text Books: 1. Ben Schneiderman, Catherine Plaisant, Maxine Cohen, Steven Jacobs - Designing the User Interface-Strategies for Effective Human-Computer Interaction, 5th Edition, Pearson Education Inc. - Dorling Kindersley (India) Pvt. Ltd., 2014			
Reference Books: 1. Alan J Dix et. Al, —Human Computer Interaction, 3rd Edition, PHI, 2004 2. Wilber O Galitz, —The Essential Guide to User Interface Design - An Introduction to GUI Design, Principles and Techniques , Wiley Dreamtech India Pvt. Ltd., 2007			

MOOC Course: 1. User Interface Design https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-ar10/

MOOC Course: 1. User Interface Design https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-ar10/

Course Articulation Matrix									
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Course Title	INTRODUCTION TO WEB TECHNOLOGY		
Course Code	22IS406C	L-T-P	(0-0-1)1
Exam	3 Hrs.	Hours/Week	2
SEE	50 Marks	Total Hours	26

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

#	Course Outcomes	Mapping to PO	Mapping to PSOs
1.	Understand the fundamentals of HTML, XHTML, Javascript, PHP and MYSQL	1	-
2.	Design programs using Javascript and PHP	2, 3	-
3.	Design and implement interactive Websites	3, 5	2

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

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, Branch, 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.

Text Books:
1. Robert W Sebesta. Programming the World wide web, 8th edition, Pearson Education

- Reference Books:**
1. Chris Bates. Web Programming building internet applications, 3rd edition, Wiley India
 2. James Lee, Brent Ware. Open Source Web Development with LAMP, Pearson Education

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1. Chris Bates. Web Programming building internet applications, 3rd edition, Wiley India
2. James Lee, Brent Ware. Open Source Web Development with LAMP, Pearson Education

- | Course Articulation Matrix | | | | | | | | | |
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Course Articulation Matrix									
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Course Title	TECHNICAL WRITING USING LATEX		
Course Code	22IS406D	L-T-P	(0-0-1)1
Exam	3 Hrs	Hours/Week	2 Hrs
SEE	50 marks	Total Hours	28 Hrs
Course Outcomes: At the end of the course, student will be able to:			
#	Course Outcomes	Mapping to PO	Mapping to PSOs
1.	Identify different types of technical documents for a given requirement.	1	-
2.	Create well-written short technical documents and typeset it in LaTeX	5	-
3.	Create a simple report for a given technical topic, and typeset it in LaTeX	10	-
4.	Create a sample research paper in a technical topic, and typset it in LaTeX templates	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.			
Text Books:			
1. Phillip A Laplante, "Technical Writing: A Practical Guide for Engineers and Scientists", 1st Edition, CRC Press, 2011. 2. Tobias Oetiker, "The Not So Short Introduction to LATEX" 2e https://cslab.pepperdine.edu/warford/cosc320/lshort.pdf [retrieved 18 Oct. 22]			

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
COs														
CO1	3													
CO2					3									
CO3										3				
CO4										3				

Course Title	BIOLOGY FOR ENGINEERS		
Course Code	22BEIS407	(L-T-P)C	(1-0-0)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 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.			
Text Books: 1. Jenkins, C.H. Bioinspired Engineering, NY: Momentum press, 2012 ISBN: 97816066502259 2. A Practical Guide to Bio-inspired Design, Hashemi Farzaneh, Helena, Lindemann, Udo, Springer 2019, ISBN 978-3-662-57683-0			

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Course Title	UNIVERSAL HUMAN VALUES		
Course Code	22UHV	(L-T-P)C	(0-1-0)1
Exam	3 Hrs	Hours/Week	2 Hrs.
SEE	50 marks	Total Hours	28 Hrs.
Course Objective: The course aims at development of 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: At the end of course, student will be able to:			
COs	Statement		POs
CO1	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.		PO6,PO7, PO8, PO9, PO12
CO2	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.		PO6,PO7, PO8, PO9, PO12
CO3	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.		PO6,PO7, PO8, PO9, PO12
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.			
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 fulfilment 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, Definitiveness 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.

Self-Learning Activities-

1. Sharing about One self and Exploring Natural Acceptance
2. Exploring Harmony of Self with the Body
3. Exploring the Feeling of Respect
4. Exploring the Four Orders of Nature Lecture and Exploring Co-existence in Existence
5. Exploring Humanistic Models in Education, Exploring Steps of Transition towards Universal Human Order

Text Book and Teachers Manual-

1. The Textbook: 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. ISBN 978-93-87034-47-1
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. ISBN 978-93-87034-53-2

Reference Books:

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. HumanValues, A.N.Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth-by Mohandas Karamchand Gandhi
5. Small is Beautiful-E.F Schumacher.
6. Slow is Beautiful-Cecile Andrews
7. Economy of Permanence-JCKumarappa
8. Bharat Mein Angreji Raj–Pandit Sunderlal.
9. Redis covering India-by Dharampal
10. Hind Swarajor Indian Home Rule-by Mohandas K. Gandhi.
11. India Wins Freedom-Maulana Abdul Kalam Azad
12. Vivekananda-Romain Rolland(English)
13. Gandhi-Romain Rolland(English)

Course Articulation Matrix														
Course Outcomes	Program Outcomes [POs]													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						2	1	3	2			1		
CO2						2	1	3	2			1		
CO3						2	1	3	2			1		

MALNAD COLLEGE OF ENGINEERING, HASSAN

(An Autonomous Institution Affiliated to VTU, Belgaum)



Autonomous Programmes

Bachelor of Engineering



DEPARTMENT OF

INFORMATION SCIENCE AND ENGINEERING

SYLLABUS

V & VI Semester (2022 Admitted Batch)

(3rd Year)

Academic Year 2024-25

VISION

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

MISSION

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

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)

Engineering Graduates will be able to:

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

PROGRAM SPECIFIC OUTCOMES (PSOs)

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
THREE CIE's conducted for a total of 30 marks	30
Activities as decided by course faculty / Laboratory Component for Integrated Courses	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

MALNAD COLLEGE OF ENGINEERING, HASSAN

Scheme & Syllabus for III Year

B. E. Information Science and Engineering

Academic Year 2024-25

V SEMESTER

Sl. No	Course category & Course Code		Course Title	Teaching Hours /Week				Examination			
				Theory Lecture	Tutorial	Practical/Dr awing	Credits	Duration in hours	CIE Marks	SEE Marks	Total Marks
				L	T	P	C				
1	IPCC	22IS501	Computer Networks	3	0	2	4	5	50	50	100
2	PCC	22IS502	Theoretical Foundations of Computation	2	2	0	3	4	50	50	100
3	IPCC	22IS503	Full Stack Development	3	0	2	4	5	50	50	100
4	PCCL	22IS504	Data Visualization Lab	0	0	2	1	2	50	50	100
5	HSMC	22IS505	Entrepreneurship and Management	3	0	0	3	3	50	50	100
6	PEC	22IS5XX	Professional Elective Course – I	3	0	0	3	3	50	50	100
7	AEC	22RIP	Research Methodology and IPR	2	2	0	3	4	50	50	100
8	HSMC	22EVS	Environmental Studies	0	2	0	1	2	50	50	100
9	PI	22IS506	Mini Project	0	0	2	1	2	50	50	100
			Total				23	30	450	450	900

Course Category:

PCC: Professional Core Course, PCCL: Professional Core Course laboratory, UHV: Universal Human Value Course, MC: Mandatory Course(Non-credit),AEC:AbilityEnhancementCourse,SEC:SkillEnhancementCourse, SDA: Skill Development Activity, ESC: Engineering Science Course, ETC: Emerging Technology Course

Note: AEC, SEC, ETC courses are to be chosen suitably by the BOS of the programme

Professional Elective Course - I

22IS551	Software Testing	22IS553	Object Oriented Modelling and Design
22IS552	Robotic Process Automation	22IS554	Service Oriented Architecture

MALNAD COLLEGE OF ENGINEERING, HASSAN

Scheme & Syllabus for III Year

B. E. Information Science and Engineering

Academic Year 2024-25

VI SEMESTER

Sl.No	Course category & Course Code		Course Title	Teaching Hours /Week				Examination			
				Theory Lecture	Tutorial	Practical/Drawing	Credits	Duration in hours	CIE Marks	SEE Marks	Total Marks
				L	T	P	C				
1	PCC	22IS601	Cryptography, Network Security and Cyber Law	3	0	0	3	3	50	50	100
2	IPCC	22IS602	Artificial Intelligence and Machine Learning	3	0	2	4	5	50	50	100
3	IPCC	22IS603	Cloud Computing	3	0	2	4	5	50	50	100
4	PI	22IS604	Main Project Work Phase 1	0	0	4	2	4	50	50	100
5	PEC	22IS6XX	Professional Elective Course - 2	3	0	0	3	3	50	50	100
6	OEC	22OES6X	Open Elective - 1 (Institution Level)	3	0	0	3	3	50	50	100
7	OEC	22SW01	Swayam NPTEL - 1	0	1(A)	0	A	-	-	-	-
8	AEC/SDC	22ASK	AEC/SDC V	0	0	2	1	2	50	50	100
Total							20	25	350	350	700
Course Category: PCC: Professional Core Course, PCCL: Professional Core Course laboratory, UHV: Universal Human Value Course, MC: Mandatory Course(Non-credit),AEC:Ability Enhancement Course,SEC:Skill Enhancement Course, SDA: Skill Development Activity, ESC: Engineering Science Course, ETC: Emerging Technology Course Note: AEC, SEC, ETC courses are to be chosen suitably by the BOS of the programme											

Note: The course 22ASK will be handled by TAP office. It will be conducted during the vacation after the 5th Semester.

Professional Elective Course - II

22IS661	Data Mining and Warehousing	22IS663	Mobile Computing Applications
22IS662	Big Data Technologies	22IS664	Block Chain Technology

Open Elective Course - I

22OES61	Web Technologies	22OES63	Internet of Things
22OES62	Java Programming	22OES64	Data Science

Course Title	Computer Networks		
Course Code	22IS501	L-T-P	(3-0-2) 4
Exam	3 Hrs.	Hours/Week	5
SEE	50 Marks	Total Hours	50 (36L+14P)
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 PO's	Mapping to PSO's
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	1	
3.	Analyze different protocols at MAC sub-layer, Network and Transport Layers	2	
4.	Design networks applying Internetworking concepts and appropriate IP addressing for a given problem	3, 5	
MODULE-1			9 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 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			9 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			9 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	9 Hrs
Transport-Layer: Introduction, Transport-Layer Services, Transport Layer Protocols - Simple Protocol, TL Protocols: Introduction, User Datagram Protocol, 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	

Prescribed Text Books:

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 Books:

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

MOOC Course:

Sl.No	Course Name	Course offered by	Year	URL
1	Computer Networking	Swayam	2020	https://www.my-mooc.com/en/mooc/computer-networking--ud436
2	Advanced Computer Networking	IIT Indore, IIT Gandhi nagar	2023	https://onlinecourses.nptel.ac.in/noc23_cs35/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	20
Total		50

Laboratory Plan:

SINo	Program Details
1	Write and execute a program for distance vector algorithm to find the suitable path for transmission between sender and receiver.
2	Write and execute a program to find 16-bit and 32-bit checksum Fletcher and Adler checksum methods
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.
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).
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.
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.
7	Simulate the transmission of ping messages over a network topology consisting of 6 nodes
8	Simulate an Ethernet LAN using n nodes, change error rate and data rate and compare throughput.
9	Simulate an Ethernet LAN using n nodes and set multiple traffic nodes and plot congestion window for different source / destination.
10	Simulate simple ESS and with transmitting nodes in wire-less LAN by simulation and determine the performance with respect to transmission of packets.

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
	CO1	3												
	CO2	3												
	CO3		2											
CO4			3		3									

Course Title	Theoretical Foundations of Computation																						
Course Code	22IS502	L-T-P	(2-2-0) 3																				
Exam	3 Hrs.	Hours/Week	4																				
SEE	50 Marks	Total Hours	(40) 26L + 14T																				
Course Objective: The course provides a basic understanding of theory of computation and students will be able to design various kinds of automata, formal languages and grammars as a first step towards learning advanced topics such as compiler design. 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 fundamental concepts of formal languages and automata theory</td><td>1</td><td>-</td></tr> <tr> <td>2.</td><td>Design DFAs, NFAs, and perform conversions among them</td><td>3</td><td>-</td></tr> <tr> <td>3.</td><td>Design regular expressions, context free grammars, Push Down Automata and Turing machines for different levels of formal languages</td><td>3</td><td>-</td></tr> <tr> <td>4.</td><td>Construct and simulate different kinds of automata using simulation tool</td><td>5</td><td>-</td></tr> </table>				#	Course Outcomes	Mapping to PO's	Mapping to PSO's	1.	Understand the fundamental concepts of formal languages and automata theory	1	-	2.	Design DFAs, NFAs, and perform conversions among them	3	-	3.	Design regular expressions, context free grammars, Push Down Automata and Turing machines for different levels of formal languages	3	-	4.	Construct and simulate different kinds of automata using simulation tool	5	-
#	Course Outcomes	Mapping to PO's	Mapping to PSO's																				
1.	Understand the fundamental concepts of formal languages and automata theory	1	-																				
2.	Design DFAs, NFAs, and perform conversions among them	3	-																				
3.	Design regular expressions, context free grammars, Push Down Automata and Turing machines for different levels of formal languages	3	-																				
4.	Construct and simulate different kinds of automata using simulation tool	5	-																				
MODULE-1			10 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			10 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	10 Hrs.
Pushdown Automata: Introduction and construction of Pushdown Automata, Acceptance by final state and empty stack , Equivalence of PDA's and CFG's Turing Machines: Introduction to Turing Machine, Construction of Turing Machine.	
MODULE-4	10 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.	

Prescribed Text Books:

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	2007

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Introduction to Languages and Theory of Computation	John Martin	4th	Tata McGraw - Hill	2007
2	An Introduction to Formal Languages and Automata	Peter Linz	5th	Narosa publishing house	2012

MOOC Course:

Sl.No	Course Name	Course offered by	Year	URL
1	Automata Theory	Stanford University	2024	https://online.stanford.edu/courses/s-oe-yicsautomata-automata-theory
2	Introduction to Automata, Languages and Computation	IIT B	2024	https://onlinecourses.nptel.ac.in/noc21_cs19/preview

Course Title	FULLSTACK DEVELOPMENT		
Course Code	22IS503	L-T-P	(3-0-2) 4
Exam	3 Hrs.	Hours/Week	5
SEE	50 Marks	Total Hours	50 (36L + 14P)
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 with Django and Visual Studio Code.	1,5	-
2.	Designing of Models and Forms for rapid development of web pages.	3	1
3.	Analyze the role of Template Inheritance and Generic views for developing full stack web applications.	1, 4	2
4.	Apply the Django framework libraries to render non HTML contents like CSV and PDF.	1, 3	1
MODULE-1			9 Hrs.
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			9 Hrs.
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			9 Hrs.
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 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			9 Hrs
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. Generic Views and Django State Persistence: Using Generic Views, Generic Views of Objects, Extending Generic Views of objects, Extending Generic Views.			

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	1 st	Pack Publishing	2011
2	Django 3 Web Development Cookbook	Aidas Bendroraitis, Jake Kronika	4 th	Packt Publishing	2020

MOOC Course:

Sl.No	Course Name	Course offered by	Year	URL
1	Full Stack	IBM	2024	https://www.mooc-list.com/tags/full-stack#google_vignette
2	Modern Application Development	NPTEL	2020	https://nptel.ac.in/courses/106106222

EBooks:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	The Definitive Guide to Django: Web Development Done Right	Adrian Holovaty, Jacob Kaplan Moss	2 nd	Springer-Verlag Berlin and Heidelberg GmbH & Co. KG Publishers	2009

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	Laboratory conduction	20
Total		50

Laboratory Plan:

SINo	Program Details
1	Installation of Python, Django and Visual Studio code editors can be demonstrated.
2	Creation of virtual environment, Django project and App should be demonstrated
3	Develop a Django app that displays current date and time in server
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
5	Develop a simple Django app that displays an unordered list of fruits and ordered list of selected students for an event
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.
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 ManyToMany field.
8	For student and course models created in Lab experiment for Module2, register admin interfaces, perform migrations and illustrate data entry through admin forms.
9	Develop a Model form for student that contains his topic chosen for project, languages used and duration with a model called project.
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.
11	Develop example Django app that performs CSV and PDF generation for any models created in previous laboratory component.

Course Articulation Matrix

[illegible]

Course Title	Data Visualization with Python		
Course Code	22IS504	L-T-P	(0-0-2) 1
Exam	2 Hrs.	Hours/Week	2
SEE	50 Marks	Total Hours	14
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: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to PO's	Map 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	-
Experiments			
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.		
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.		
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		
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.		
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.		
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.		
7.	Write a Python program which explains uses of customizing seaborn plots with Aesthetic functions.		

Course Title		Entrepreneurship and Management			
Course Code		22IS505	L-T-P		(3-0-0) 3
Exam		3 Hrs.	Hours/Week		3
SEE		50 Marks	Total Hours		40
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	Explain the importance of entrepreneurship and entrepreneurial Process.	2, 11	-	
	4	Prepare a project report for a given business requirement.	6	-	
MODULE-1				10 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, MakingPlanningEffective–DecisionMaking–Meaning,TypesofDecisions,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				10 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.					

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Principles of Management	P. C. Tripathi, P.N. Reddy	7th	Tata McGraw 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:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Principles of Management	P. C. Tripathi, P.N. Reddy	7 th	Tata McGraw Hill	2021

MOOC Course:

Sl.No	Course Name	Course offered by	Year	URL
1	Management: Entrepreneur Development	By Dr. Nilam Panchal B.K. School of Business Management, Gujarat University	2023	https://onlinecourses.swayam2.ac.in/cec23_mg11/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 (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

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3									3			
CO2		2									2			
CO3		2									2			
CO4						2								

Course Title	Software Testing																						
Course Code	22IS551	L -T-P	(3-0-0) 3																				
Exam	3 Hrs.	Hours/Week	3																				
SEE	50 Marks	Total Hours	40																				
Course Objective: Students will be able to apply effective testing techniques for developing quality software. Course outcomes: At the end of course, student will be able to: <table border="1"> <thead> <tr> <th>#</th><th>Course Outcomes</th><th>Mapping to PO's</th><th>Mapping to PSO's</th></tr> </thead> <tbody> <tr> <td>1</td><td>Explain the concepts of Software Testing & its documentation process</td><td>1</td><td>2</td></tr> <tr> <td>2</td><td>Apply various testing techniques in the process of software development</td><td>3</td><td>2</td></tr> <tr> <td>3</td><td>Apply different approaches of verifying and validating a software product.</td><td>3,5</td><td>-</td></tr> <tr> <td>4</td><td>Apply various project management activities</td><td>3</td><td>2</td></tr> </tbody> </table>				#	Course Outcomes	Mapping to PO's	Mapping to PSO's	1	Explain the concepts of Software Testing & its documentation process	1	2	2	Apply various testing techniques in the process of software development	3	2	3	Apply different approaches of verifying and validating a software product.	3,5	-	4	Apply various project management activities	3	2
#	Course Outcomes	Mapping to PO's	Mapping to PSO's																				
1	Explain the concepts of Software Testing & its documentation process	1	2																				
2	Apply various testing techniques in the process of software development	3	2																				
3	Apply different approaches of verifying and validating a software product.	3,5	-																				
4	Apply various project management activities	3	2																				
MODULE-1			10 Hrs.																				
A Perspective on Testing, Examples: Basic definitions, Test cases, Insights from a Venn diagram, Identifying test cases, code based testing, fault taxonomies, Levels of testing. Examples: Generalized pseudocode, The triangle problem, The NextDate function, The commission problem, The SATM (Simple Automatic Teller Machine) problem, The currency converter, Saturn windshield wiper, Garage Door Opener.Boundary Value Testing, Equivalence Class Testing, Decision Table-Based Testing: Boundary value analysis, Robustness testing, Worst-case testing, Special value testing, Examples, Random testing, Equivalence classes,traditional Equivalence Class Testing Improved Equivalence Class Testing Equivalence test cases for the triangle problem, Next Date function, and the commission problem, Guidelines and observations. Decision tables, Test cases for the triangle problem, NextDate function, and the commission problem, cause effect graphing,Guidelines and observations.																							
MODULE-2			10 Hrs.																				
Path Testing, Data Flow Testing: DD paths, Test coverage metrics, Basis path testing, guidelines and observations. Definition-Use testing, Slice-based testing, program Slicing Tools Guidelines and observations.Life cycle based testing, model based testing: Traditional waterfall testing ,testing in iterative life-cycle, agile testing, agile model-driven development , Testing Based on Models Appropriate Models, Commercial Tool Support for Model-Based Testing																							

MODULE-3	10 Hrs.
Integration Testing: Decomposition-based integration, call graph-based, Path-based integrations. System Testing: Threads, Basic concepts for requirements specification, Model-Based Threads, Use Case-Based Threads Long versus Short Use Cases, How Many Use Cases?, Coverage Metrics for System Testing, Supplemental Approaches to System Testing , Non functional System Testing Atomic System Function Testing Example.	
MODULE-4	10 Hrs
Process Framework: Validation and verification, Degrees of freedom, Varieties of software. Basic principles: Sensitivity, redundancy, restriction, , partition, visibility, Feedback. The quality process, Planning and monitoring, Quality goals, Dependability properties, Analysis, Testing, Improving the process, Organizational factors. Planning and Monitoring the Process, Documenting Analysis and Test: Quality and process, Test and analysis strategies and plans, Risk planning, Monitoring the process, Improving the process, The quality team, Organizing documents, Test strategy document, Analysis and test plan, Test design specifications documents, Test and analysis reports.	

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Software Testing, A Craftsman's Approach	Paul C. Jorgensen	4th	Auerbach Publications	2014
2	Software Testing and Analysis – Process, Principles and Techniques	Mauro Pezze	-	Wiley India	2008

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Foundations of Software Testing	WaseemRoshen	-	Pearson Education	2008

E Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Software Testing, A Craftsman's Approach	Paul C. Jorgensen	4th	Auerbach Publications	2014

MOOC Course:

Sl.	Course Name	Course offered by	Year	URL
1	Software Testing	IIIT Bangalore	2024	https://onlinecourses.nptel.ac.in/no_c20_cs77/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	An automation project by students in a group of 2-4 students.	20
Total		50

Course articulation Matrix:

[illegible]

Course Title	Robotic Process Automation		
Course Code	22IS552	L-T-P	(3-0-0) 3
Exam	3 Hrs.	Hours/Week	3
SEE	50 Marks	Total Hours	40

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 PO's	Mapping to PSO's
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

10 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

10 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

Prescribed Text Books:

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	Alok Mani Tripathi,	-	Packtpub	March 2018.

Reference Books:

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

E Books:

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	Alok Mani Tripathi,	-	Packtpub,	March 2018.

MOOC Course:

Sl.No	Course Name	Course offered by	Year	URL
1	AI Powered Automation	uipath	2024	https://www.uipath.com/rpa/academy

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	An automation project by students in a group of 2-4 students.	20
Total		50

Course articulation Matrix:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2		3												
CO3			3	3										
CO4			3		3				3					3

Course Title	Object Oriented Modelling and Design		
Course Code	22IS553	L-T-P	(3-0-0) 3
Exam	3 Hrs.	Hours/Week	4
SEE	50 Marks	Total Hours	40
Course Objective: Student will learn Object-Oriented modelling development design concepts for software system development Course outcomes: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to PO's	Map to PSo
1.	Understand the concepts of object-oriented modeling and basic class modeling problems.	1	-
2.	Draw class diagrams, sequence diagrams and interaction diagrams to solve real life applications	2	1
3.	Apply a befitting design pattern for the given problem.	1	-
4.	Work effectively in teams to present UML notations for applications.	9,10	-
MODULE-1			10 Hrs.
Introduction: What is Object Orientation? What is OO Development? OO Themes. Modeling as Design Technique: Modeling, Abstraction, Three Models. Class Modeling: Object and Class Concepts, Link and Associations Concepts, Generalization and Inheritance, A Sample Class Model, Navigation of Class Models. Advanced object and class concepts; Association ends; N- ary associations; Aggregation; Abstract classes; Multiple inheritance; Metadata; Reification; Constraints; Derived Data; Packages. State Modeling: Events, States, Transitions and Conditions, State Diagrams, State diagram behavior.			
MODULE-2			10 Hrs.
Advanced State Modeling: Advanced State Modeling, Nested State Diagrams, Nested States, Signal Generalization, Concurrency, A Sample State Model, Relation of Class and State Models. Interaction Modeling: Use Case Models, Sequence Models, Activity Models. Advanced Interaction Modeling: Use Case Relationships, Procedural Sequence Models, Special Constructs for Activity Models. Process Overview: Development stages, Development life cycle.			
MODULE-3			10 Hrs.
System Conception: Process Overview: Development stages; Development life Cycle; System Conception: Devising a system concept; elaborating a concept; preparing a problem statement. Domain Analysis: Overview of analysis; Domain Class model: Domain state model; Domain interaction model; Iterating the analysis.			

Application Analysis: Application Interaction model, Application Class Model, Application State Model, Adding Operations. **System Design:** Overview of System Design, Estimating Performance, Making a Reuse Plan, Breaking a System in to Sub-systems, Identifying Concurrency, Allocation of Sub-systems, Management of Data Storage, Handling Global Resources. Choosing a Software Control Strategy, Handling Boundary Conditions, Setting the Trade-off Priorities, Common Architectural Styles.

MODULE-4

10 Hrs

Implementation Modeling: Overview of implementation, Fine-tuning Classes, Fine Tuning Generalizations, Realizing Associations, Testing.

Legacy Systems: Reverse Engineering, reverse Engineering Tips, Wrapping, Maintenance.

Patterns: What is a Pattern and What Makes a Pattern? Pattern Categories, Relationships between Patterns, Pattern Description.

Design Patterns: Communication Patterns, Forwarder-Receiver, Client-Dispatcher-Server, Publisher-Subscriber

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Object Oriented Modelling and Design with UML	Michael Blaha, James Rumbaugh	2nd Edition	Pearson Education,	2007
2.	Pattern-Oriented Software Architecture - A System of Patterns	Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal	Volume-1	John Wiley and Sons	2008

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Object-Oriented Analysis and Design with Applications	Grady Booch et. al	3 rd	Pearson Education	2007
2	Object-Oriented Analysis and Design with Applications	Booch, Jacobson, Rambaugh	3 rd	pearson, Reprint	2013

E Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year	URL
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1	Object Oriented Modelling and Design with UML	Michael Blaha, James Rumbaugh	2 nd	Pearson Education	2012	https://www.google.co.in/books/edition/Object_oriented_Modeling_and_Design_with/MtdaFEfY0XMC?hl=en&gbpv=1&pg=PR3&printsec=frontcover
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MOOC Course:

Sl.No	Course Name	Course offered by	Year	URL
1	Object –Oriented Analysis and Design	IIT Kharagpur	2022	https://nptel.ac.in/courses/106105153

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 on a case study using OO modeling tools	20
Total		50

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													
CO2		3											3	
CO3	3													
CO4									3	3				

Course Title	Service Oriented Architecture																						
Course Code	22IS554	L -T-P	(3-0-0) 3																				
Exam	3 Hrs.	Hours/Week	3																				
SEE	50 Marks	Total Hours	40																				
Course Objective: Students will be able to understand and implement remote services 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 different IT architectures</td><td>1</td><td>-</td></tr> <tr> <td>2</td><td>Explain SOA based applications</td><td>2</td><td>-</td></tr> <tr> <td>3</td><td>Illustrate web service and realization of SOA</td><td>3,4</td><td></td></tr> <tr> <td>4</td><td>Discuss RESTful services</td><td>3,5,9</td><td>2</td></tr> </table>				#	Course Outcomes	Mapping to PO's	Mapping to PSO's	1	Understand the different IT architectures	1	-	2	Explain SOA based applications	2	-	3	Illustrate web service and realization of SOA	3,4		4	Discuss RESTful services	3,5,9	2
#	Course Outcomes	Mapping to PO's	Mapping to PSO's																				
1	Understand the different IT architectures	1	-																				
2	Explain SOA based applications	2	-																				
3	Illustrate web service and realization of SOA	3,4																					
4	Discuss RESTful services	3,5,9	2																				
MODULE-1			10 Hrs.																				
SOA BASICS:Software Architecture;Need for Software Architecture, Objectives of Software Architecture, Types of IT Architecture, Architecture Patterns and Styles, Service oriented Architecture: Service Orientation in Daily Life, Evolution of SOA, Drives for SOA, Dimension of SOA, Key components, perspective of SOA, Enterprise-wide SOA; Considerations for Enterprise-Wide SOA: Strawman Architecture For Enterprise-Wide-SOA-Enterprise, SOALayers, Application Development Process, SOA Methodology For Enterprise																							
MODULE-2			10 Hrs.																				
Enterprise Applications; Architecture Considerations, Solution Architecture for enterprise application, Software platforms for enterprise Applications; Package Application Platforms, Enterprise Application Platforms, Service-oriented-Enterprise Applications; Considerations for Service-Oriented Enterprise Applications, Patterns for SOA, Pattern-Based Architecture for Service-Oriented Enterprise Application(java reference model only).Composite Applications, SOA programming models..																							
MODULE-3			10 Hrs.																				
SOA ANALYSIS AND DESIGN; Need For Models, Principles of Service Design, Design of Activity Services, Design of Data services, Design of Client services and Design of business process services, Technologies of SOA; Technologies For Service Enablement, Technologies For Service Integration, Technologies for Service orchestration.																							
MODULE-4			10 Hrs																				
Business case for SOA; Stakeholder OBJECTIVES, Benefits of SOA, Cost Savings, Return on Investment, SOA Governance, Security and implementation; SOA Governance, SOA Security, approach for enterprise wide SOA implementation, Trends in SOA; Technologies in Relation to SOA, Advances in SOA.																							

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Service–Oriented Architecture for Enterprise Applications	Shankar Kambhampaly	2 nd	Wiley	2014

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	SOA-Based Enterprise Integration	WaseemRoshen	-	Tata McGraw-HILL	2009

E Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Service–Oriented Architecture for Enterprise Applications	Shankar Kambhampaly	2 nd	Wiley	2014

MOOC Course:

Sl.	Course Name	Course offered by	Year	URL
1	Service- Oriented Architecture	University of Alberta	2024	https://www.coursera.org/learn/service-oriented-architecture

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	An automation project by students in a group of 2-4 students.	20
Total		50

Course articulation Matrix:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2		3												
CO3			3	3										
CO4			3		3				3					3

Course Title	RESEARCH METHODOLOGY & INTELLECTUAL PROPERTY RIGHTS		
Course Code	22RIP	L-T-P	(3-0-0) 3
Exam	3 Hrs.	Hours/Week	3
SEE	50 Marks	Total Hours	40
Course Objective: To give an overview of technical research activities and patenting methodology. Course outcomes: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Carry out Literature Review and write technical paper	2,3,4,12	-
2.	Describe the fundamentals of patent laws and the patent drafting Procedure.	4, 12	-
3.	Elucidate the copyright laws and subject matters of copyright	4, 12	-
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: TheWay 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-PatentableMatters. 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 ‘Indian Work’. 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 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 Gurpal 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:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Engineering Research Methodology	Dipankar Deb, Rajeeb Dey, Valentina E, Balas	-	Springer	2019

MOOC Course:

Sl.	Course Name	Course offered by	Year	URL
1	Research Methodology and IPR	National Institute of Technical Teachers Training and Research, Chennai.	2024	https://onlinecourses.swayam2.ac.in/ntr24_ed08/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	.	20
Total		50

Course Articulation Matrix

[illegible]

Course Title	Environmental Studies		
Course Code	22EVS	L-T-P	(0-2-0) 1
Exam	3 Hrs	Hours/Week	2
SEE	50 Marks	Total Hours	28
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, student 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	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			7 Hrs.
Pollution: Effects of pollution - Water pollution - Air pollution Land pollution - Noise pollution.			
MODULE-4			7 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.			

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	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:

Sl.No	Book Title	Authors	Edition	Publishe r	Year	URL
1	Environmental Studies	Dr. D.L Manjunath	-	Dorling Kindersley	2007	https://archive.org/details/environmentalstu0000manj/page/4/mode/2up

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Two tests conducted for 20 marks each	40
Activity 1	MCQ	10
Total		50

Course Articulation Matrix

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

Course Title	Mini Project		
Course Code	22IS506	L-T-P	(0-0-2) 1
Exam	3 Hrs.	Hours/Week	2
SEE	50 Marks	Total Hours	28
Course Objective: Students should form batches of 3-4 members and develop applications using any technology or domain.			
#	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	1
4.	Collaborate effectively with team members and mentors, deliver presentations, and prepare comprehensive technical documentation.	9,10,11,12	1
5.	Adhere to ethical standards in all project-related activities.	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)
Presentation/ communication (10 Marks)	Disorganized and ineffective presentation (2 - 4 M)	Organized, but ineffective presentation (5-7 M)	Effective 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	PO12	PSO1	PSO2
CO1	3	3											3	
CO2	3	3	3											3
CO3			3		3								3	
CO4									3	3	3	3	3	
CO5								3					3	

Course Title	Cryptography, Network Security and Cyber Law																						
Course Code	21IS601	L-T-P	(3-0-0) 3																				
Exam	3 Hrs.	Hours/Week	3																				
SEE	50 Marks	Total Hours	40																				
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: <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 basics of cryptographic techniques, principles & practices, Cyber security and cyber law</td><td>1</td><td>-</td></tr> <tr> <td>2.</td><td>Apply cryptographic techniques to secure the data in transit</td><td>2</td><td>-</td></tr> <tr> <td>3.</td><td>Analyze different cryptographic techniques to handle security threats</td><td>2</td><td>-</td></tr> <tr> <td>4.</td><td>Understand and adopt Cyber security and Cyber law</td><td>8</td><td>-</td></tr> </table>				#	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.	Apply cryptographic techniques to secure the data in transit	2	-	3.	Analyze different cryptographic techniques to handle security threats	2	-	4.	Understand and adopt Cyber security and Cyber law	8	-
#	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.	Apply cryptographic techniques to secure the data in transit	2	-																				
3.	Analyze different cryptographic techniques to handle security threats	2	-																				
4.	Understand and adopt Cyber security and Cyber law	8	-																				
MODULE-1			10 Hrs.																				
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			10 Hrs.																				
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 Certificates.																							
MODULE-3			10 Hrs.																				
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			10 Hrs																				
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.																							

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Cryptography and Network Security	William Stallings	7th	Pearson Education	2018
2	Cryptography, Network Security and Cyber Laws	Bernard Menezes	-----	Cengage Learning	2010

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	2nd	Pearson Education	2016
2	Cryptography and Network Security	Atul Kahate	3rd	Tata McGraw-Hill	2011

MOOC Course:

Sl.No	Course Name	Course offered by	Year	URL
1	Cryptography and Network Security	IITB	2024	https://nptel.ac.in/courses/106/105/106105031/ .

E-Book:

Sl. No	Book Title	Authors	Edition	Publisher	Year	URL
1	Cryptography and Network Security. Principles and Practice	William Stallings	3 rd	Pearson Education	2007	http://williamstallings.com/Crypto3e

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	1) Implementation of cryptographic algorithm – 10 marks 2) Problem Solving test – 10 marks	20
Total		50

AAT - Implementation of cryptographic algorithm

Students are supposed to develop a Cryptographic algorithm/Digital Signature without using libraries or built-in functions. Code demonstration along with a report has to be submitted. Example: Implementation of classical encryption techniques, RSA Digital Signature algorithm, Elgamal Digital Signature, Diffie Hellman Signature, and Modified RSA algorithm for practical purpose, Public key encryption schemes and Hybrid encryption schemes.

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2		3												
CO3		3												
CO4								3						

Course Title	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING																						
Course Code	22IS602	L-T-P	(3-0-2) 4																				
Exam	3 Hrs.	Hours/Week	5																				
SEE	50 Marks	Total Hours	(50) 36L+14P																				
Course Objective: Students will be able to apply the concepts of Artificial Intelligence to construct knowledge based systems. 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>Elucidate different types of intelligent agents, search strategies, logic and examples of learning</td><td>1</td><td>1</td></tr> <tr> <td>2.</td><td>Analyze and formulate the problems using Artificial Intelligence and Machine Learning approaches that involve problem solving, knowledge representation, automated reasoning and learning.</td><td>2</td><td>1</td></tr> <tr> <td>3.</td><td>Develop a solution for the given problem using different intelligent agents.</td><td>3,5,9,10,12</td><td>1</td></tr> <tr> <td>4.</td><td>Apply preprocessing, modeling, evaluation, and both supervised and unsupervised machine learning algorithms to solve given problems.</td><td>2, 3</td><td>1</td></tr> </table>				#	Course Outcomes	Mapping to PO's	Mapping to PSO's	1.	Elucidate different types of intelligent agents, search strategies, logic and examples of learning	1	1	2.	Analyze and formulate the problems using Artificial Intelligence and Machine Learning approaches that involve problem solving, knowledge representation, automated reasoning and learning.	2	1	3.	Develop a solution for the given problem using different intelligent agents.	3,5,9,10,12	1	4.	Apply preprocessing, modeling, evaluation, and both supervised and unsupervised machine learning algorithms to solve given problems.	2, 3	1
#	Course Outcomes	Mapping to PO's	Mapping to PSO's																				
1.	Elucidate different types of intelligent agents, search strategies, logic and examples of learning	1	1																				
2.	Analyze and formulate the problems using Artificial Intelligence and Machine Learning approaches that involve problem solving, knowledge representation, automated reasoning and learning.	2	1																				
3.	Develop a solution for the given problem using different intelligent agents.	3,5,9,10,12	1																				
4.	Apply preprocessing, modeling, evaluation, and both supervised and unsupervised machine learning algorithms to solve given problems.	2, 3	1																				
MODULE-1			9Hrs.																				
Introduction, Intelligent agents, Searching: Definition of AI, Intelligent Agents: Agents and environment; Rationality; the nature of environments; the structure of agents. Problem-solving: Problem-solving agents; Searching for solution; Uninformed search strategies; Informed search strategies, Heuristic Functions. Local Search Algorithms and Optimization Problems: Hill-climbing search, Simulated annealing																							
MODULE-2			9 Hrs.																				
Adversarial Search, Constraint Satisfaction Problems, Logical agents, First-order logic : 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; Logic; propositional logic; Propositional theorem proving; Syntax and semantics of first-order logic; Using first- order logic;																							
MODULE-3			9 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. 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, Inductive bias.																							

MODULE-4	9 Hrs
Supervised Learning: Introduction, example, classification model, classification learning steps, Common algorithms – KNN, decision tree, Random forest model. Unsupervised Learning: Supervised Vs Unsupervised, Application, clustering, Finding pattern using Association rule. 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.	

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	2014
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 Shivashankar 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 tensorflow, Concepts, Tools, and Techniques to Build Intelligent Systems.	O'Reilly Media , Aurélien Géron ,	2nd Ed	Tata McGraw-Hill	2019

MOOC Course:

SN	Course Name	Course offered by	URL
1	Introduction to artificial intelligence	Udacity	https://www.udacity.com/course/intro-to-artificial-intelligence--cs271
2	Artificial intelligence	Columbia University	https://www.edx.org/course/artificial-intelligence-uc-berkeleyx-cs188-1x
3	Introduction to Machine Learning	IIT Madras	https://nptel.ac.in/courses/106106139/

E-Book:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Hands-On Machine Learning	Scikit-Learn, Keras, and TensorFlow	2nd	O'Reilly Media	2019

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	20
Total		50

Lab Experiments

1.	Demonstrate data Analysis using the “ numpy ” module.
2.	Demonstrate Exploratory Data Analysis using the “ pandas ” module.
3.	Demonstrate Data Visualization using the “ matplotlib ” module.
4.	Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples.
5.	Implement and demonstrate the Candidate Elimination algorithm for finding the most specific hypothesis based on a given set of training data samples.
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.
7.	Consider the Iris dataset from the sklearn.datasets module 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.
8.	Apply K-Means clustering to segment a customer dataset based on various attributes such as age, amount spent, satisfaction, and brand loyalty.
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)
10.	Implement an Artificial Neural Network (ANN) using TensorFlow to predict customer churn based on bank customer data.

Course Articulation Matrix

[illegible]

Course Title	CLOUD COMPUTING		
Course Code	22IS603	L-T-P	(3-0-2) 4
Exam	3 Hrs.	Hours/Week	5
SEE	50 Marks	Total Hours	(40) 26L+14P
Course Outcomes: At the end of the course, student will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Elucidate the concepts of Cloud Computing architecture and its design challenges	2	-
2	Describe the principles of Parallel and Distributed Computing.	2	-
3	Identify resource management fundamentals, i.e. resource abstraction, sharing and sandboxing.	3,5	2
4	Apply principles of best practice in cloud application design and management.	3,5	2
Module - 1			
			09 Hrs.
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			09 Hrs.
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, thomsons routers. Cloud computing technology: hardware and infrastructure clients, security, network, services.			
Module - 3			09 Hrs.
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			09 Hrs.
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.			

Prescribed Text Books:

I.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

Reference Books:

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

E Books:

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.	Cloud Computing: Theory and Practice	Dan C Marinescuc	1st	MK publishers	2017

MOOC Course:

Sl.No	Course Name	Course offered by	Year	URL
1	Cloud computing	BITS, Pilani	2023	https://bits-pilani-wilp.ac.in/bitspilani-campaign/campaign-SEM1/cloud-computing
2	Cloud computing	By Prof. Soumya Kanti Ghosh, IIT Kharagpur	2023	https://onlinecourses.nptel.ac.in/noc24_cs17/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	Laboratory Conduction	20
Total		50

Course Title	Main Project Phase - 1		
Course Code	22IS604	L-T-P	(0-0-2)2
CIE	100 Marks	Hours/Week	2

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	2
3.	Make oral presentation and documentation of the work carried out	9,10	-

During VII 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 and **should publish a technical paper on Literature Survey.**

Project Phase1–Team Formation, Topic Selection & Guide allotment

Project Phase2–Extensive Literature Survey, Problem Definition

Project Phase3–System Design, Report Preparation and Publication

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.

The topic chosen during Mini Project3 will be continued & implemented during eighth semester

Performance Indicators	Low	Medium	High
Literature Survey And Problem Definition (30 Marks)	Literature Survey not Pertaining to the title of the project	Incomplete literature Survey and improper problem definition	Extensive literature survey with clear state of the art problem definition
Design (10Marks)	Has no coherent strategies for problem Solving	Has some strategies for problem – solving, But does not apply The m consistently	Formulates strategies for solving problems
Presentation/ communication (20 Marks)	Disorganized and ineffective presentation	Organized, but ineffective presentation	Effective organized presentation
Report Preparation (20 Marks)	Disorganized and contents not sufficient	Organized but not good content wise	Effectively organized and well framed contents
Paper Publication (10Marks)	Paper submitted & awaiting results	National conference International Conference	Journal

Punctuality(Project Dairy Maintenance) (10marks)	Not meeting the Guide regularly	Meeting regularly but doesn't document details of every session	Up to date dairy maintenance
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Course Articulation Matrix

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO1	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	3	-	-	-	-	-	-	-	-	-	-	3
CO3	-	-	-	-	-	-	-	-	3	3	-	-	-	-

Course Title	Data Mining and Warehousing		
Course Code	22IS661	L-T-P	(3-0-0) 3
Exam	3 Hrs.	Hours/Week	3
SEE	50 Marks	Total Hours	40
Course Objective: Students will be able to select right data mining technique to extract useful patterns. Course outcomes: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Acquire the knowledge of data quality and data pre-processing	1	-
2.	Explain the process of Data Mining , Classification and Association Analysis	2,3	-
3.	Acquire the knowledge of Data Warehouse design , Modelling and usage	3	-
4.	Do the cluster analysis and explain the application of data mining	2	2
MODULE-1			10 Hrs.
Introduction, Data: Why Data Mining? What is Data Mining? What kinds of data can be mined?, What kinds of pattern can be mined?, Which technologies are used? Major issues in data mining. Getting to know your data: Data objects and attribute types , Basic statistical description of data : measuring the central tendency, Measuring the dispersion of data , measuring data similarity and dissimilarity			
MODULE-2			10 Hrs.
Data Pre-processing: Data Pre-processing: An overview, Data cleaning, Data integration, Data Reduction: overview of data reduction strategies, wavelet transforms, Principal component analysis, attributes subset selection, Data Transformation: min-max normalization and Z-score normalization. Data Warehouse and online Analytical processing: Data Warehouse: Basic Concepts ,Data Warehouse modelling : Data cube and OLAP , Data warehouse design and usage: A business analysis frame work for data warehouse design, Data warehouse design process, Data warehouse usage for information processing			
MODULE-3			10 Hrs.
Classification: Preliminaries, General Approach to Solving a Classification Problem, Decision Tree Induction, Rule-based classification ,K- Nearest-neighbour Classifier. Mining frequent patterns Association and correlations: basic concepts and methods: Basic Concepts, Frequent item set mining methods: Apriori Algorithm, generating association rules from frequent item sets , Improving the efficiency of Apriori, A Pattern growth Approach for Mining Frequent item sets.			

MODULE-4	10 Hrs
Cluster Analysis: Basic Concepts and Methods, Cluster Analysis, Partitioning Methods, Agglomerative versus divisive hierarchical clustering, DBSCAN . Data Mining Trends and research frontiers : Data mining Applications , Data mining and society, Data mining trends	

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Data Mining – Concepts and Techniques	Jiawei Han and Micheline Kamber	4 th	Morgan Kaufmann	2012
2	Introduction to Data Mining, ,	Pang-Ning Tan, Michael Steinbach, Vipin Kumar,	2 nd	Pearson Education	2014

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	1. Insight into Data Mining– Theory and Practice, ,	K.P.Soman, Shyam Diwakar, V. Ajay,	4th	PHI	2006

E Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Data Mining – Concepts and Techniques	Jiawei Han and Micheline Kamber	4 th	Morgan Kaufmann	2012

MOOC Course:

Sl.No	Course Name	Course offered by	Year	URL
1	Dataware housing and mining	IIT	2022	https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-ar10/

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	1) Quiz -10 3) Assignment – 10	20
Total		50

Course Articulation Matrix

[illegible]

Course Title	Big Data Technologies		
Course Code	22IS662	L-T-P	(3-0-0)3
Exam	3 Hrs.	Hours/Week	3
SEE	50 Marks	Total Hours	40
Course Objective: Acquire the knowledge, skills and tools to manage big data Course Outcomes: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Describe big data concepts, database models and big data techniques	1	-
2.	Describe 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 or Hbase query for a given problem	3	1
Module - 1			10 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.			
Storing Data in Hadoop: 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.			

Extremely Big Tables: Storing Data in HBase – Say Hello to HBase, Understanding the HBase Data Model, Understanding the HBase Architecture, Taking HBase for a Test Run, Getting Things Done with HBase, HBase and the RDBMS world.

Module - 4	10 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)	

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Hadoop for Dummies	Dirk deRoos, Paul C. Zikopoulos, Bruce Brown, Rafael Coss, Roman B. Melnyk	2nd	John Wiley & Sons, Inc	2017
2.	Robert D. Schneider and Jeff Karmiol	Spark for Dummies	2nd IBM Limited	John Wiley & Sons, Inc	2019

Reference Books:

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

E Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Hadoop for Dummies	Dirk deRoos, Paul C. Zikopoulos, Bruce Brown, Rafael Coss, Roman B. Melnyk	2nd	John Wiley & Sons, Inc	2017

MOOC Course:

Sl.No	Course Name	Course offered by	Year	URL
1	Big Data Computing	Dr. Rajiv Misra, IIT Patna	2024	https://nptel.ac.in/courses/106104189

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	Mini Project	20
Total		50

Course Articulation Matrix

[illegible]

Course Title	MOBILE COMPUTING AND APPLICATIONS		
Course Code	22IS663	L-T-P	(3-0-0) 3
Exam	3 Hrs.	Hours/Week	3
SEE	50 Marks	Total Hours	40
Course Objective: Students will be able to apply solutions to mobile computing applications.			
Course Outcomes: At the end of course, student will be able to:			
#	Course Outcomes (CO)	Mapping to POs	Mapping to PSOs
1.	Elucidate the various methodologies used in Wireless Communication Networks.	2	-
2.	Analyze various protocols of all layers for mobile and adhoc wireless Communication networks.	2	-
3.	Demonstrate and apply the knowledge for cellular networks design	2,5	-
4.	Develop skills of finding solutions and building software for mobile computing applications using wireless languages and J2ME	2,5	2
MODULE-1			10Hrs.
Introduction: Mobile computing, Types of Networks, Architecture for Mobile Computing, 3-tier Architecture, Design Considerations for Mobile Computing, Global system for mobile communication (GSM), Short Service Message (SMS), GSM Architecture, Entities, Call services, PLMN Interfaces, GSM Addresses and Identifiers, Network Aspects in GSM, Mobility Management, GSM Frequency Allocation, Mobile Computing Over SMS, Short Message Service (SMS), Value Added Services through SMS			
MODULE-2			10 Hrs.
GPRS: GPRS and Packet Data Network, GPRS Network Architecture, GPRS Network Operations, Data Services in GPRS, Applications for GPRS, Billing and Charging in GPRS. CDMA 3G and WiMAX : Spread Spectrum technology, IS-95, CDMA versus GSM, Wireless Data.			
MODULE-3			10 Hrs.
Mobile Client: Moving beyond desktop, Mobile handset overview, Mobile phones and their features, PDA, Design Constraints in applications for handheld devices. Mobile IP: Introduction, discovery, Registration, Tunneling, Cellular IP, Mobile IP with IPv6, Mobile OS .			
MODULE-4			10 Hrs.
Mobile Internet Applications: Thin client Architecture, the client, Middleware, messaging Servers, Processing a Wireless request, Wireless Applications Protocol (WAP) Overview, Wireless Languages: Markup Languages, HDML, WML, HTML, cHTML, XHTML, VoiceXML.			

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Mobile Computing, Technology, Applications and Service Creation	Dr. Ashok Talukder, Ms Roopa Yavagal , Mr . Hasan Ahmed	2nd	McGraw Hill publication	2017
2.	Mobile and Wireless Design Essentials	Martyn Mallik	3rd	Wiley	2003

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Mobile Computing	Raj kamal	3rd	Oxford University Press	2019
2	Wireless Communications and Networks, 3G and Beyond	Iti Saha Misra	2nd	McGraw Hill publication	2013

E Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Mobile Computing, Technology, Applications and Service Creation	Dr. Ashok Talukder, Ms Roopa Yavagal , Mr . Hasan Ahmed	2nd	McGraw Hill publication	2017

MOOC Course:

Sl.No	Course Name	Course offered by	Year	URL
1	Mobile computing	coursera	2023	https://www.mooc-list.com/tags/mobile-computing

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	1) Develop the mobile computing application – 10 M 2) Presentation - 5M 3) Preparation of the project report - 5M	20
Total		50

Course Title	Blockchain Technology																						
Course Code	22IS664	L-T-P	(3-0-0) 3																				
Exam	3 Hrs.	Hours/Week	3																				
SEE	50 Marks	Total Hours	40																				
Course Objective: The course provides the fundamentals, 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 fundamentals of Blockchain</td><td>1</td><td>-</td></tr> <tr> <td>2.</td><td>Illustrate the technologies of blockchain</td><td>2</td><td>-</td></tr> <tr> <td>3.</td><td>Describe the models of blockchain</td><td>1</td><td>-</td></tr> <tr> <td>4.</td><td>Analyse and demonstrate the Ethereum and Hyperledger fabric</td><td>2</td><td>-</td></tr> </table>				#	Course Outcomes	Mapping to PO's	Mapping to PSO's	1.	Understand the fundamentals of Blockchain	1	-	2.	Illustrate the technologies of blockchain	2	-	3.	Describe the models of blockchain	1	-	4.	Analyse and demonstrate the Ethereum and Hyperledger fabric	2	-
#	Course Outcomes	Mapping to PO's	Mapping to PSO's																				
1.	Understand the fundamentals of Blockchain	1	-																				
2.	Illustrate the technologies of blockchain	2	-																				
3.	Describe the models of blockchain	1	-																				
4.	Analyse and demonstrate the Ethereum and Hyperledger fabric	2	-																				
MODULE-1			10 Hrs.																				
Blockchain 101: Growth of blockchain, Distributed systems, History of blockchain:electronic cash, Blockchain,Types of blockchain,Consensus,CAP theorem and blockchain, Benefits and limitations of blockchain. Decentralization and Cryptography: Decentralization using blockchain, Methods of decentralization, Routes to decentralization, Decentralized organizations.																							
MODULE-2			10 Hrs.																				
Introduction to Cryptography & Crypto currencies: Cryptographic Hash Functions, Hash Pointers and Data Structures, Digital Signatures, Public Keys as Identities, A Simple Cryptocurrency, How Bitcoin Achieves Decentralization: Distributed consensus, Consensus without identity using a block chain, Incentives and proof of work, Putting it all together,																							
MODULE-3			10 Hrs.																				
Mechanics of Bitcoin: Bitcoin transactions, Bitcoin Scripts, Applications of Bitcoin scripts, Bitcoin blocks, The Bitcoin network, Limitations and improvements How to Store and Use Bitcoins: Simple Local Storage, Hot and Cold Storage, Splitting and Sharing Keys, Online Wallets and Exchanges, Payment Services, Transaction Fees, Currency Exchange Markets																							
MODULE-4			10 Hrs																				
Smart Contracts : Smart Contracts: Definition, Ricardian contracts. Ethereum 101: Introduction, Ethereum blockchain, Elements of the Ethereum blockchain, Precompiled contracts.																							

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Mastering Blockchain - Distributed ledgers, decentralization and smart contracts explained	Imran Bashir	3rd	Packt Publishing Ltd	2017
2	Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction.	Arvind Narayanan, Joseph Bonneau, Edward W. Felten, Andrew Miller, Steven Goldfeder and Jeremy Clark.,	2nd	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 Cryptocurrencies	Andreas M. Antonopoulos	First Edition	O'Reilly Media	2014

E Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Mastering Blockchain - Distributed ledgers, decentralization and smart contracts explained	Imran Bashir	3rd	ISBN 978-1-78712-544-5	2017
2	Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction.	Arvind Narayanan, Joseph Bonneau, Edward W. Felten, Andrew Miller, Steven Goldfeder and Jeremy Clark.,	2nd	Princeton University Press	2016

MOOC Course:

Sl.No	Course Name	Course offered by	Year	URL
1	Blockchain and its Applications	By Prof. Sandip Chakraborty, Prof. Shamik Sural , IIT Kharagpur	2022	https://onlinecourses.nptel.ac.in/noc22_cs44/preview
2	Blockchain	Dr.Mayank Aggarwal , Gurukul Kangri Vishwavidyalaya,Haridwar		https://onlinecourses.swayam2.ac.in/aic21_ge01/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	Presentation on course related topic -10 Marks Quiz- 10 Marks	20
Total		50

Course Articulation Matrix

[illegible]

Course Title	Web programming		
Course Code	21OEIS61	L-T-P	(3-0-0) 3
Exam	3 Hrs.	Hours/Week	3
SEE	50 Marks	Total Hours	40
Course Objective: Students will be able to develop 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 fundamentals of world wide web and web programming languages such as HTML, XHTML, Java script .	1	-
2	Apply the different scripting languages for dynamic web page development.	2	-
3	Knowledge in server-side programming languages and database management systems with their web applications	1	
4	Design and develop web solutions for real time applications.	5,9,10	2
MODULE-1			10 Hrs.
Fundamentals of Web: A Brief Introduction to the Internet, The World Wide Web, Web Browsers, Web Servers, Uniform Resource Locators, Multipurpose Internet Mail Extensions, HTTP, Security. XHTML: Origins and Evolution of HTML and XHTML, Basic Syntax, Standard XHTML Document Structure, Basic Text Markup, Images, Hypertext Tables, Forms, The Audio Element, The Video Element, Syntactic Difference between HTML and XHTML.			
MODULE-2			10 Hrs.
Cascading Style Sheets: Sheets, Style Specification Formats, Selector Forms, Property Value Forms, Font Properties, List Properties, Colour, Alignment of Text, The Box Model, Background Images, The and <div> Tags, Conflict Resolution. The Basics of JavaScript: Overview of JavaScript, Object Orientation and JavaScript, General Syntactic Characteristics, Primitives, Operations, and Expressions, Screen Output and Keyboard Input, Control Statements, Object Creation, and Modification, Arrays, Functions, Constructors, Pattern Matching Using Regular Expressions, Errors in Scripts.			
MODULE-3			10 Hrs.
JavaScript and XHTML Documents: The JavaScript Execution Environment, The Document Object Model, Element Access in JavaScript, Events and Event Handling, Handling Events from Body Elements, Handling Events from Button Elements, Handling Events from The Text Box and Password Elements Dynamic Documents with JavaScript: Introduction, Positioning Elements, Moving Elements, Element Visibility, Changing Colours and Fonts. Introduction to XML: Introduction, uses of XML, The Syntax of XML, Displaying Raw XML Documents, Displaying XML Documents with CSS.			
MODULE-4			10 Hrs
Introduction to PHP: Origins and Uses of PHP, Overview of PHP, General Syntactic Characteristics, Primitives, Operations and Expressions, Output, Control Statements, Arrays, Functions, Pattern Matching.			

Database Access Through the Web: Relational Databases, An introduction to Structured Query Language (Review), Architectures for Database Access, The MySQL Database System, Database Access with PHP and MySQL.

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Programming the World Wide Web	Robert W. Sebesta	8 th	Pearson Education.	2014

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Web Programming Building Internet Applications	Chris Bates	3rd	Wiley India	2014
2	Open Source Web Development with LAMP	James Lee, Brent Ware		Pearson Education	2013

E Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Programming the World Wide Web	Robert W. Sebesta	8 th	Pearson Education.	2014

MOOC Course:

Sl.No	Course Name	Course offered by	Year	URL
1	Modern Application Development	IIT Madras	2022	https://www.shiksha.com/online-courses/modern-application-development-course-nptel812

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	Web Page Design and Development	20
Total		50

Course Articulation Matrix

Course Outcome s	Program Outcomes [POs]													
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO1	3													
CO2		3												
CO3	3													
CO4					3				3	3				3

Course Title	Java Programming		
Course Code	21OEIS62	L-T-P	(3-0-0) 3
Exam	3 Hrs.	Hours/Week	3
SEE	50 Marks	Total Hours	40
Course Objective: Apply the principles of data science for solving 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.	Comprehend the fundamental concepts Object Oriented Programming	1,2	1
2.	Apply Object Oriented constructs for program development	2	1
3.	Analyze a java program for identifying bugs	2,3	1
4.	Analyze demonstrations showcasing the effective handling of exceptions, as well as understand the implementation of inheritance in Java packages.	5	1
MODULE-1			10 Hrs.
Object Oriented Concepts and Java: Concepts of Object-Oriented programming language: Object, Class, Message passing, inheritance, encapsulation, and polymorphism Difference between OOP and other conventional programming – advantages and disadvantages of OOP. Introduction to Java: Java and Java Applications, Java Development Kit(JDK), The Byte Code, The Java Buzzwords, Simple Java Programs using Control Statements and Blocks of code, Lexical Issues. Data Types, Variables, and Arrays The primitive Types, Integers, Floating-Point Types, Characters, Booleans, Variables, Type conversion and Casting, Arrays, Strings.			
MODULE-2			10 Hrs.
Operators: Arithmetic, Bitwise, Relational, Boolean Logical, Assignment Operator, The ‘?’ Operator, Operator Precedence. Program Control Statements: Input characters from the Keyword, if statement, Nested ifs, if-else-if Ladder, Switch Statement, Nested switch statements, for Loop, Enhanced for Loop, While Loop, do-while Loop, use break, Use continue, Nested Loops.			
MODULE-3			10 Hrs.
Introducing Classes, Objects and Methods: Class Fundamentals, Declaring Objects, Object Reference Variables, Methods, Constructors, the “This” keyword, Garbage collection, Overloading Methods, and constructors, Argument Passing, Returning Objects, Access Control, Nested and Inner Classes.			

MODULE-4	10 Hrs
Inheritance, Packages, and Interfaces: Inheritance Basics, Using Super, Multilevel Hierarchy, When Constructors are called, Method Overriding, Abstract Classes. Packages, Access Protection, Importing Packages, Interfaces Exception Handling: Exception-Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and Catch, Multiple catch Clauses, throw, Java's Built-in Exceptions, Customized exceptions.	

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Java the Complete Reference	Herbert Schildt	9 th	Tata McGraw Hill	2021
2	Programming with JAVA	Bala Guruswamy	7 th	Pearson	

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Introduction to JAVA Programming	Y. Daniel Liang	9 th	Pearson Education,2019	2019

MOOC Course:

Sl.No	Course Name	Course offered by	Year	URL
1	Programming In Java	Swayam	2021	https://onlinecourses.nptel.ac.in/noc22_cs47/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:	The student must present a demonstration of one program from the following list.	20
Total		50

Course Title	Internet of things		
Course Code	21OEIS63	L-T-P	(3-0-0)3
Exam	3 Hrs.	Hours/Week	3
SEE	50 Marks	Total Hours	40
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; IoT platform Design Methodology - IoT Design Methodology; Introduction; Case Study on IoT System for Weather Monitoring,			
MODULE-3			7 Hrs
IoT Physical Devices and End points - What is an IoT device; Exemplary Device- Raspberry Pi, Linux on Raspberry Pi, Raspberry Pi Interfaces, Other IoT devices. IoT Physical Servers & Cloud Offerings: Amazon Web Services for IoT, AmazonS3, Amazon RDS.			
MODULE-4			7 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.			

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Internet of Things - A Hands on Approach	Arshdeep Bahga and Vijay Madisetti		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		2012
2	Internet of Things: A Hands-On Approach Vijay Madisetti	Vijay Madisetti, ArshdeepBahga	1st		2014

MOOC Course:

Sl.No	Course Name	Course offered by	Year	URL
1	Design for Internet of things	IISC Bangalore	2017	https://nptel.ac.in/courses/108/108/108108098/

E-Book:

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

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	Project on Real time IOT Applications	20
Total		50

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													
CO2			2											
CO3		3												3
CO4					3					3				3

Course Title	Data Science		
Course Code	21OEIS64	L-T-P	(3-0-0) 3
Exam	3 Hrs.	Hours/Week	3
SEE	50 Marks	Total Hours	40
Course Objective: Apply the principles of data science for solving 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.	Understanding of techniques for data acquisition, cleaning, transformation, and storage.	1	1
2.	Describe various Data Science process like statistical modelling, Exploratory data analysis, Data visualization.	1	1
3.	Apply various feature selection algorithms for effective decision making.	3	1
4.	Develop effective visualization for the given data using R	5	1
MODULE-1			10 Hrs.
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 modelling, probability distributions, fitting a model.			
MODULE-2			10 Hrs.
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: RealDirect (online real estate firm). Three Basic Machine Learning Algorithms - Linear Regression			
MODULE-3			10 Hrs.
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			10 Hrs
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 and Rachel Schutt		O'Reilly	2019

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Mining of Massive Datasets	Jure Leskovek, Anand Rajaraman and Jeffery Ullman	3th	Tata McGraw-Hill	2004
2	Machine Learning: A Probabilistic Perspective	Kevin P. Murphy.	5th	Narosa publishing house	2013

MOOC Course:

Sl.No	Course Name	Course offered by	Year	URL
1	Data Science for Engineers	Swayam	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

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	Students must provide demonstrations on Linear Exploratory Data Analysis, Linear Regression, k-Nearest Neighbors (k-NN), k-means clustering, and Naive Bayes using the R language.	20
Total		50

Course Title	Swayam NPTEL		
Course Code	22SW01	L-T-P	(0-1 (A)-0) A
As part of the curriculum, students are required to register and complete one “Swayam NPTEL” course from the department-approved list. This entails: 1. Course Registration: Choose and register for any one course from the designated Swayam NPTEL courses. 2. Assignments: Complete assigned coursework and assignments as stipulated by the chosen Swayam course. 3. Examination: Take and pass the final examination for the course. 4. Certificate Submission: Submit the completion certificate to the department as proof of successful course completion.			

Course Title	Analytical Ability and Soft Skills		
Course Code	22ASK	L-T-P-C	(0-1-0)1
Exam Hrs.	1	Hours / Week	2
SEE	50 Marks	Total Hours	30
Course Objective: To Enhance problem solving skills and communication skills Course Outcomes (COs) : Upon completion of the course, students shall be able to:			
#	Course Outcomes		Mapping to POs
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
	Course Contents:		
MODULE – 1			
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 (40Hrs.)			
MODULE – 2			
Soft Skills: Basic grammar, Spotting errors, Sentence formation, Email writing, Public speaking, Client communication, Leadership, Managerial skills, Stress management, Presentation Skills (15Hrs)			
MODULE – 3			
Technical Skills: Review of C programming, Simple coding, Syntax rules, MCQs on C language. (15Hrs.)			
MODULE – 4			
Activities: GD, JAM, Mock Interview, Pick and speak, Presentation (14Hrs.)			

Course articulation matrix

[illegible]

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



Autonomous Programme
Bachelor of Engineering



Department Of
Information Science & Engineering

SCHEME and SYLLABUS
(2022 Admitted Batch)

Academic Year 2025-26



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
Department of Information Science & 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 focusing on knowledge dissemination and generation to address the emerging needs of information technology in diverse fields.

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



MALNAD COLLEGE OF ENGINEERING, HASSAN
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Department of Information Science & Engineering

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

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 the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.



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Department of Information Science & Engineering

PROGRAM OUTCOMES (POs)

6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAM SPECIFIC OUTCOMES

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



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

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
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING

Semester-wise Credit Distribution

Semester →	I	II	III	IV	V	VI	VII	VIII	Total Credits
Curricular Component ↓									
Basic Science Course (BSC)	4	4	4	1					13
Engineering Science Course (ESC)/ Emerging Technology Course (ETC)/Programming Language Course	3	6	3	3					15
Professional Core Course (PCC)	10	7	13	15	12	11	8		76
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	1			4				6
Ability Enhancement Course (AEC)/ Skill Enhancement Course (SEC)	2	2	1	1	3	1			10
Universal Human Value Course (UHV)			1	1					2
Total Credits	20	20	22	21	23	20	18	16	160



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THIRD SEMESTER

THIRD SEMESTER											
Sl. No	Course Category	Course Code	Course Title	Teaching Hours/Week				Exam Marks			Credits
				L	T	P	Total	CIE	SEE	Total	
1	BSC	22MAIS301	Mathematics for Information Science Engineering	3	2	0	5	50	50	100	4
2	IPCC	22IS302	Digital Design & Computer Organization	3	0	2	5	50	50	100	4
3	PCC	22IS303	Operating Systems	3	2	0	5	50	50	100	4
4	IPCC	22IS304	Data Structures and Applications	3	0	2	4	50	50	100	4
5	PCCL	22IS305	Unix Lab	0	0	2	2	50	50	100	1
6	ESC	22IS306X	ESC/ETC/PLC	2	0	2	4	50	50	100	3
7	UHV	22SCR	Social Connect and Responsibility	0	0	2	2	100	-	100	1
8	AEC/SEC	22IS307X	Ability Enhancement Course/Skill Enhancement Course - III	If the course is a Theory				50	50	100	1
				1	0	0	1				
				If the course is a laboratory							
				0	0	2	2				
9	BSC	22BCM301	Bridge Mathematics-I (Mandate Audit Course for Diploma entry students)	3	0	0	3	100	-	100	A
Total							35				22

Note: AEC, SEC, ETC courses are to be chosen suitably by the BOS of the programme

Engineering Science Course (ESC/ETC/PLC)

22IS306A	OOP with Java	22IS306C	Discrete Mathematical Structures
22IS306B	OOP with C++	22IS306D	Graph Theory and Combinatorics
Ability Enhancement Course – III			
22IS307A	R Programming	22IS307C	Data Visualization with Python
22IS307B	Data Analytics with Excel	22IS307D	Version Controller with Git



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FOURTH SEMESTER

FOURTH SEMESTER											
Sl. No	Course Category	Course Code	Course Title	Teaching Hours/Week				Exam Marks			Credits
				L	T	P	Total	CIE	SEE	Total	
1	PCC	22IS401	Software Engineering	2	2	0	4	50	50	100	3
2	IPCC	22IS402	Microprocessor and Microcontroller	3	0	2	4	50	50	100	4
3	IPCC	22IS403	Database Management Systems	3	0	2	5	50	50	100	4
4	IPCC	22IS404	Design and Analysis of Algorithms	3	0	2	5	50	50	100	4
5	ESC	22IS405X	ESC/ETC/PLC	2	0	2	4	50	50	100	3
6	UHV	22UHV	Universal Human Values	0	2	0	2	50	50	100	1
7	AEC/SEC	22IS406X	Ability Enhancement Course/Skill Enhancement Course - IV	If the course is a Theory				50	50	100	1
				1	0	0	1				
				If the course is a laboratory							
				0	0	2	2				
8	BSC	22BEIS407	Biology for Engineers	0	2	0	2	50	50	100	1
Total							28				21
Note: AEC, SEC, ETC courses are to be chosen suitably by the BOS of the programme											

Engineering Science Course (ESC/ETC/PLC)

22IS405A	C# and .Net Technologies	22IS405C	Optimization Techniques
22IS405B	Internet of Things	22IS405D	Probability, Statistics and queing
Ability Enhancement Course – III			
22IS406A	Green IT and Sustainability	22IS406C	Introduction to Web Technology
22IS406B	User Interface Design	22IS406D	Technical writing usingLatex



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FIFTH SEMESTER

Sl. No	Course Category	Course Code	Course Title	Teaching Hours/Week				Exam Marks			Credits
				L	T	P	Total	CIE	SEE	Total	
1	IPCC	22IS501	Computer Networks	3	0	2	5	50	50	100	4
2	PCC	22IS502	Theoretical Foundations of Computation	2	2	0	4	50	50	100	3
3	IPCC	22IS503	Full Stack Development	3	0	2	5	50	50	100	4
4	PCCL	22IS504	Data Visualization Lab	0	0	2	2	50	50	100	1
5	HSMC	22IS505	Entrepreneurship and Management	3	0	0	3	50	50	100	3
6	HSMC	22EVS	Environmental Studies	0	2	0	2	50	50	100	1
7	PEC	22IS5XX	Professional Elective Course - I	3	0	0	3	50	50	100	3
8	AEC	22RIP	Research Methodology and IPR	2	2	0	4	50	50	100	3
9	PI	22IS506	Mini Project	0	0	2	2	50	50	100	1
Total							30				23

Professional Elective Course I			
22IS551	Software Testing	22IS553	Object Oriented Modelling and Design
22IS552	Robotic Process Automation	22IS554	Service Oriented Architecture



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SIXTH SEMESTER

Sl. No	Course Category	Course Code	Course Title	Teaching Hours/Week				Exam Marks			Credits
				L	T	P	Total	CIE	SEE	Total	
1	PCC	22IS601	Cryptography, Network Security and Cyber Law	3	0	0	3	50	50	100	3
2	IPCC	22IS602	Artificial Intelligence and Machine Learning	3	0	2	5	50	50	100	4
3	IPCC	22IS603	Cloud Computing	3	0	2	5	50	50	100	4
4	PI	22IS604	Main Project Phase - I	0	0	4	4	50	50	100	2
5	PEC	22IS6XX	Professional Elective Course - II	3	0	0	3	50	50	100	3
6	OEC	22OEIS6X	Open Elective Course - I	3	0	0	3	50	50	100	3
7	OEC	22SW01	Swayam NPTEL – 1	0	1 (A)	0	1 (A)	-	-	-	A
8	AEC	22ASK	AEC/SEC	0	0	2	2	50	50	100	1
Total							25				20

Note: The course 22ASK Will be handled by tap office. It will be conducted during the vacation after the 5th semester.

Professional Elective Course - II

22IS661	Data Mining and Warehousing	22IS663	Mobile Computing Applications
22IS662	Big Data Technologies	22IS664	Block Chain Technology

Open Elective Course - I

22OEIS61	Web Technologies	22OEIS63	Internet of Things
22OEIS62	Java Programming	22OEIS64	Data Science



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SEVENTH SEMESTER

Sl. No	Course Category	Course Code	Course Title	Teaching Hours/Week				Exam Marks			Credits
				L	T	P	Total	CIE	SEE	Total	
1	IPCC	22IS701	Deep Learning	3	0	2	5	50	50	100	4
2	IPCC	22IS702	Data Science using R	3	0	2	5	50	50	100	4
3	PI	22IS703	Main Project Phase - II	0	0	8	8	50	50	100	4
4	PEC	22IS7XX	Professional Elective Course - III	3	0	0	3	50	50	100	3
5	OEC	22OEIS7X	Open Elective Course – II	3	0	0	3	50	50	100	3
Total							24				18

Professional Elective Course - III

22IS771	Virtual Reality and Augmented Reality	22IS773	Computer Vision Using OpenCV
22IS772	Parallel Computing	22IS774	Generative Artificial Intelligence

Open Elective Course - II

22OEIS71	Fundamentals of Database Management System	22OEIS73	Fundamentals of Block Chain
22OEIS72	Introduction to Big Data	22OEIS74	Introduction to Data Science



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EIGHTH SEMESTER

Sl. No	Course Category	Course Code	Course Title	Teaching Hours/Week				Exam Marks			Credits
				L	T	P	Total	CIE	SEE	Total	
1	PEC	22SW02	Professional Elective (NPTEL Online Course)	3	0	0	3	-	100	100	3
2	OEC	22SW03	Open Elective (NPTEL Online course)	3	0	0	3	-	100	100	3
3	PI	22INT	Internship (Research/Industry) (15-20 weeks)	0	0	12	12	100	100	200	10
Total							18				16



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Program Outcome (PO) and Program Specific Outcome (PSO) Mapping

Sl. No.	Subject Code	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	22IS701	✓	✓		✓							✓			
2	22IS702	✓	✓	✓		✓							✓		✓
3	22IS703			✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
4	22IS771	✓		✓		✓								✓	✓
5	22IS772	✓	✓	✓	✓	✓						✓		✓	✓
6	22IS773	✓		✓		✓									
7	22IS774	✓	✓	✓		✓	✓					✓		✓	✓
8	22OEIS71	✓	✓	✓	✓		✓					✓			
9	22OEIS72	✓	✓			✓									
10	22OEIS73	✓	✓							✓	✓		✓		
11	22OEIS74	✓	✓	✓		✓								✓	✓
12	22INT	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓



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Course Title	Deep Learning		
Course Code	22IS701	(L-T-P) C	(3-0-2) 4
Exam	3	Hours/Week	3
SEE	50 Marks	Total Hours	50 (36L + 14P)

Course Objective: To introduce students to the fundamental concepts and techniques of deep learning by building on machine learning foundations, enabling them to design, implement, and evaluate deep neural networks for solving real-world problems in areas such as image processing, sequence modeling, and pattern recognition.

Course Outcomes:

	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Understand the foundational concepts of machine learning and the motivations for deep learning.	1,4,2,11	-
2	Apply neural network architectures and training algorithms to build and train deep feedforward models.	1,3,5	1,2
3	Analyze and implement regularization techniques to improve model generalization and robustness.	2,4,5	-
4	Design and evaluate deep learning models for visual and sequential data using CNNs and RNNs.	1,3,5,11	1,2

MODULE - 1	9 Hours
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Basics of Machine Learning: Learning Algorithms, Capacity, Overfitting and Underfitting, Hyperparameters and Validation Sets, Estimator, Bias and Variance, Maximum Likelihood Estimation, Bayesian Statistics, Stochastic Gradient Decent, Building a Machine Learning Algorithm, Challenges Motivating Deep Learning.

Deep Feedforward Networks: Multilayer Perceptron, Example: Learning XOR, Gradient-Based Learning, Hidden Units, Architecture Design, Back-Propagation Algorithm

MODULE - 2	9 Hours
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Regularization: Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations, Bagging, Dropout.

Convolutional Networks: The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features.

MODULE - 3	9 Hours
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Sequence Modeling: Recurrent and Recursive Nets: Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks, Echo State Networks, The Long Short-Term Memory and Other Gated RNNs

MODULE - 4	9 Hours
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Practical Methodology: Performance Metrics, Default Baseline Models, Determining Whether to Gather More Data, Selecting Hyperparameters, Debugging Strategies, Example: Multi-Digit Number Recognition. **Applications:** Vision, NLP, Speech.



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Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Deep Learning (Adaptive Computation and Machine Learning Series)	Ian Good Fellow, Yoshua Bengio and Aaron Courville	4th	MIT Press (3 January 2017)	2020
2	Neural Networks and Learning Machines	Simon S. Haykin	3 rd	PHI Learning	2021

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
	Introduction to Artificial Neural Networks	Gunjan Goswami, S.K. Kataria & Sons	4th	PHI Learning	2012
	Fundamentals of Deep Learning: Designing Next- Generation Machine Intelligence Algorithms	Nikhil Buduma	3rd	O'Reilly Publications	2016

E Books and online course materials:

1. https://onlinecourses.nptel.ac.in/noc20_cs11/preview
2. https://onlinecourses.nptel.ac.in/noc25_cs21

Online Courses and Video Lectures:

1. <https://www.coursera.org/specializations/deep-learning>
2. <https://www.coursera.org/learn/neural-networks-deep-learning>

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Mark s
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30



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Activity Details	1. Integrated Lab Conduction – 10 Marks 2. Mini Project based on Deep Learning – 10 Marks Students shall design and implement a mini project applying deep learning techniques to a real-world problem in domains such as image recognition, natural language processing, or sequence prediction. The project must involve model building, training, evaluation, and visualization. Assessment will be based on problem formulation, network design, implementation quality, and final presentation.	20
Total		50

Laboratory Plan:

Lab Program	Program Details
1	Write a simple Python implementation of linear regression using SGD from scratch without using scikit-learn.
2	Design and implement a neural network to generate word embeddings for words in each document corpus using an embedding layer.
3	Write a program to demonstrate the working of a deep neural network (DNN) for a classification task using a suitable dataset (e.g., MNIST or Iris).
4	Design and implement a Convolutional Neural Network (CNN) to classify images from a standard dataset such as CIFAR-10 or MNIST.
5	Build and demonstrate an autoencoder neural network for compressing and reconstructing image data.
6	Design and implement a deep learning network for the classification of textual documents (e.g., using IMDB reviews dataset).

Course Articulation Matrix

Course Outcomes	Program Outcomes													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3	2		2							1			
CO2	3		2		2								3	2
CO3		2		3	2									
CO4	3		2		2						2		3	3



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Course Title	Data Science using R		
Course Code	22IS702	(L-T-P) C	(3-0-2) 4
Exam	3	Hours/Week	5
SEE	50 Marks	Total Hours	50 (36L + 14P)
Course Objective: Apply the principles of data science for solving 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.	Describe various Data Science processes like statistical modelling, Exploratory data analysis, Data visualization.	1, 2, 4, 5	1
2.	Apply various feature selection algorithms for effective decision making.	2, 3, 5	1, 2
3.	Develop and evaluate effective visualization for the given data and predictive models using R	2, 3, 5,12	1, 2
4.	Design and implement recommendation systems and apply dimensionality reduction techniques to build user-facing data products.	2, 3, 5,12	1, 2
MODULE - 1			9 Hours
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 modelling, probability distributions, fitting a model. Introduction to R, R Language Basics , Data Structures in R , Data Import & Export , Data Manipulation with dplyr , Data Cleaning & Pre-processing , Data Visualization with ggplot2 , Working with Dates and Times, Basic Statistics in R			
MODULE - 2			9 Hours
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: RealDirect (online real estate firm). Three Basic Machine Learning Algorithms - Linear Regression			
MODULE - 3			9 Hours
Three Basic Machine Learning Algorithms (continued...): 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			9 Hours
Recommendation Systems: Building a User Facing Data Product Algorithmic ingredients of a Recommendation Engine, Dimensionality Reduction, Singular Value Decomposition, Principal Component Analysis, Exercise: build your own recommendation system. 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 and Rachel Schutt	3rd	O'Reilly	2023



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Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Mining of Massive Datasets	Jure Leskovek, Anand Rajaraman and Jeffery Ullman	7th	Tata McGraw-Hill	2021
2	Machine Learning: A Probabilistic Perspective	Kevin P. Murphy.	8th	Narosa publishing house	2020

Online Courses and Video Lectures:

1. https://onlinecourses.nptel.ac.in/noc21_cs69/preview
2. <https://www.coursera.org/specializations/generative-ai-for-data-scientists>

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	Integrated Lab Conduction – 10 Marks Mini Project execution – 10 Marks Students are required to identify a real-world problem, apply relevant data science techniques using R, and present their findings through a working prototype and report. Evaluation will be based on innovation, implementation, and presentation.	20
Total		50

Laboratory Plan:

Lab Program	Program Details
1	Perform EDA on a built-in dataset (e.g., mtcars or iris). Show structure, summary, boxplots, and histograms.
2	Implement a simple linear regression model using the mtcars dataset. Visualize and interpret the result.



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Course Title	MAIN PROJECT WORK PHASE - 2		
Course Code	22IS703	(L-T-P) C	(0-0-8) 4
Exam	3	Hours/Week	8
SEE	50 Marks	Total Hours	40

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Implement the design with appropriate techniques, resources and contemporary tools Implement the design with appropriate techniques, resources and contemporary tools	3,5	1,2
2	Communicate effectively with team members and mentors, make presentations and prepare technical document	9,10,11,12	2
3	Use ethical practices in all endeavors	6, 7, 8	-
4	Share the responsibilities for carrying out the project & playing individual roles appropriately	9	2

The project teams will implement the project started in their seventh semester

The project work is to be evaluated in three stages:

- **Stage I (30M)** - First internal evaluation shall be taken up during this phase. This includes presentation on fine tuning of SRS & Design carried out in seventh semester.
- **Stage II (20 M)** – Mid phase evaluation shall be taken up during this phase. This includes presentation, intermediate project demonstration, draft copy of the paper
- **Stage III (50 M)** – Final project Demo, report submission and details of technical paper publication.

The evaluation of the project stages 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. For Multidisciplinary projects guides will be allotted from each concerned branch.

Course Articulation Matrix

Course Outcomes	Program Outcomes													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1			3		3								2	2
CO2									3	3	3	3		2
CO3						3	3	3						
CO4									3					2



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Course Title	Virtual Reality and Augmented Reality		
Course Code	22IS771	(L-T-P)C	(3-0-0) 3
Exam	50	Hours/Week	3
SEE	50	Total Hours	40

Course Objective: The course provides the basics of VR, AR, and MR, and creates simple interactive applications using Unity and Blender.

Course Outcomes: After completing the course, the students will be able to

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Describe the basics, history, and uses of Virtual Reality (VR), Augmented Reality (AR), and Mixed Reality (MR), along with the related hardware, software, and human perception	1	1,2
2	Apply Unity programming skills to create and manipulate scenes, objects, and user interactions in virtual environments.	3,5	1,2
3	Develop simple interactive applications using modeling tools like Blender and integrate them with Unity for animation and particle effects.	1,3,5	1,2
4	Analyze different tracking technologies, calibration methods, and computer vision	1,2,5	2

MODULE-1

10 Hrs.

Introduction: Virtual Reality, Augmented Reality, Mixed Reality, applications. **Birds-eye view:** Hardware, Software, Human Physiology and perception, History of VR and AR **Programming with Unity:** Unity Basics, Manipulating the Scene, Code blocks and Methods, Debugging Conditional and looping statements.

MODULE-2

10 Hrs.

Geometry of Virtual Worlds: Geometric models, Transforming models, 2D and 3D rotation yaw, pitch, and roll. Viewing Transformations, Chaining the Transformations **Programming with Unity:** Working with objects, Working with Scripts, Player movement, Camera Movement, Menu and UI, Advanced 3D movement

MODULE-3

10 Hrs.

Mouse-Aimed camera: First Person Controller, Third Person Controller **Modeling Tools:** An introduction to different modeling tools, Blender, Modeling of an object, Sculpting objects, Importing from Blender to Unity, Modifiers, Particle system, Animation.

MODULE-4

10 Hrs.

Tracking: Definition and scope, Applications of Tracking: Tracking, Calibration, and Registration, Characteristics of Tracking Technology, Stationary Tracking Systems, Mobile Sensors, Optical Tracking, Sensor Fusion Computer Vision for Augmented Reality: Marker-based tracking, Marker-less tracking



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Prescribed Text Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1.	Virtual Reality	Steven M. LaValle	-	-	2017
2.	Game Programming with Unity and C#	Casey Hardman	-	Apress	2020
3.	Augmented Reality Principles and Practice	Dieter Schmalstieg Tobias Höllerer	-	Pearson Education	2016

Reference Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1.	AR and VR Using the WebXR API	Rakesh Baruah	-	-	2021

MOOC Courses:

1. https://iitvirtualrealitycourse.com/iit-delhi-executive-programme-in-virtual-and-augmented-reality/?utm_source=google&utm_medium=search&utm_campaign=IITD_EPVAR_02_0825_Google-search_P-01662&utm_term=ar%20course&gad_source=1&gad_campaignid=22628972876&gbraid=0AAAAp_hJCZXFxnZBPcmZGqPaESOd6I8kZ&gclid=CjwKCAjw6s7CBhACEiwAuHQcko1piaCfNIMFQIwa0JCr-UEK3s2i471qqLGjBQRzjKLQGUqmijobthoCeH0QAyD_BwE
2. <https://elearn.nptel.ac.in/shop/completed-courses/short-term-programs-completed/foundation-course-on-virtual-reality-and-augmented-reality/?v=c86ee0d9d7ed>

E Books and online course materials:

1. <http://vr.cs.uiuc.edu/>
2. <https://doi.org/10.1007/978-1-4842-5656-5>

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: 1. Activity 1: Presentation on a course-related topic – 15 Marks: Each student will deliver a presentation on a topic relevant to Virtual Reality, Augmented Reality, or Mixed Reality, including application scenarios or tools like Unity and Blender. 2. Activity 2: Quiz covering core concepts from the syllabus – 5 Marks	20
Total		50



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Course Title	Parallel Computing		
Course Code	22IS772	(L-T-P)C	(3-0-0) 3
Exam	50	Hours/Week	3
SEE	50	Total Hours	40

Course Objective: To introduce the fundamentals of parallel computing and develop practical skills in programming with OpenMP, MPI, CUDA C, and OpenACC for building efficient parallel applications.

Course Outcomes: After completing the course, the students will be able to

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Describe the fundamentals of multi-core and many-core architectures, including their design principles and performance characteristics.	1, 2, 11	1
2	Apply parallel programming constructs to develop programs that leverage concurrency and shared memory/multi-threading models.	1, 3, 5	1, 2
3	Analyze the efficiency, scalability, and performance of parallel programs on multi-core and many-core systems.	1, 2, 4, 5	1, 2
4	Design and implement parallel computing solutions for real-world problems using CPU and GPU architectures.	1, 3, 4, 5, 11	1, 2

MODULE-1

10 Hrs.

Parallel Hardware and Parallel Software: Background- The von Neumann architecture, Processes, multitasking, and threads, Modifications to the von Neumann Model- The basics of caching, Cache mappings, Caches and programs: an example, Virtual memory, Instruction-level parallelism, Hardware multithreading, Parallel Hardware, Parallel Software, Input and Output, Performance - Speedup and efficiency, Amdahl's law, Scalability, Taking timings, Parallel Program Design- An example, Writing and Running Parallel Programs.

MODULE-2

10 Hrs.

Shared -Memory Programming with OpenMP: Compiling and running OpenMP programs, The program, Error checking, The Trapezoidal Rule, A first OpenMP version, Scope of Variables, The Reduction Clause, The parallel for Directive, Caveats, Data dependences, Finding loop-carried dependences, Estimating π , More on scope, More About Loops in OpenMP: Sorting, Bubble sort, Odd-even transposition sort, Scheduling Loops, The schedule clause, The static schedule type, The dynamic and guided schedule types, The runtime schedule type, The atomic directive, Critical sections and locks, Using locks in the message-passing program, critical directives, atomic directives, or locks, Caches, Cache Coherence, and False Sharing, Thread-Safety.

MODULE-3

10 Hrs.

Distributed-Memory Programming with MPI: Compilation and execution, MPI programs, MPI Init and MPI Finalize, Communicators- MPI Comm size and MPI Comm rank, SPMD programs, Communication- MPI Send, MPI Recv, Message matching, The status_p argument, Semantics of MPI Send and MPI Recv, The Trapezoidal Rule in MPI- The trapezoidal rule, Parallelizing the trapezoidal rule, Dealing with I/O- Output, Input, Collective Communication-Tree-structured communication, MPI Reduce, Collective vs. point-to-point communications, MPI All reduce, Broadcast, Data distributions, Scatter, Gather, All gather, MPI Derived Datatypes, Performance Evaluation of MPI Programs- Taking timings, Results, Speedup and efficiency, Scalability, A Parallel Sorting Algorithm- serial sorting algorithms, Parallel odd-even transposition sort, Safety in MPI programs.

MODULE-4

10 Hrs.



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Parallel Programming in CUDA C: Age of Parallel processing, Rise of GPU Computing, Applications of CUDA, Introduction to CUDA C, Querying Devices, Using Device Properties, CUDA Parallel programming, Thread Cooperation- Splitting Parallel Blocks, Shared Memory and Synchronization.

Parallel Programming in OpenACC: OpenACC Syntax, Compute Constructs, Data environment, Loop level parallelism- Kernels Versus Parallel Loops, Three Levels of Parallelism, Other Loop Constructs, Programming Tools for OpenACC - Common Characteristics of Architectures, Compiling OpenACC Code.

Prescribed Text Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1.	An Introduction to parallel programming	Peter Pacheco		Morgan Kaufmann	2011
2.	CUDA by Example- An introduction to general -purpose GPU programming	Jason Sanders and Edward Kandrot		Addison - Wesley	2011

Reference Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1.	OpenACC for Programmers: Concepts and Strategies	Sunita Chandrasekaran, Guido Juckeland	1	Addison- Wesley	2018

E Books and online course materials:

1. [https:// http://vr.cs.uiuc.edu/](https://http://vr.cs.uiuc.edu/)
2. [https:// doi.org/10.1007/978-1-4842-5656-5](https://doi.org/10.1007/978-1-4842-5656-5)

Mooc Courses:

1. https://onlinecourses.nptel.ac.in/noc24_cs63/preview

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: Activity 1: Presentation on a course-related topic – 15 Marks Each student will present a topic related to parallel computing paradigms, tools (such as OpenMP, MPI, CUDA, or OpenACC), or real-world applications, demonstrating conceptual clarity and relevance. Activity 2: Quiz covering core concepts from the syllabus – 5 Marks	20
Total		50



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Course Articulation Matrix

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2									1		1	
CO2	3		2		3								2	3
CO3	2	3		3	2								2	2
CO4	3		3	2	3						2		3	3



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

Course Title	Computer Vision Using OpenCV		
Course Code	22IS773	(L-T-P) C	(3-0-0) 3
Exam	3	Hours/Week	3
SEE	50 Marks	Total Hours	40
Course Objective: Introduce the students to the applications of computer vision. Course outcomes: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Apply state-of-the-art architectures such as R-CNN and YOLO for object detection.	1	-
2.	Analyze images in the frequency domain using the Discrete Fourier Transform (DFT) and understand the properties of the 2-D DFT.	3	-
3.	Critically evaluate the performance and limitations of different image representation, segmentation, and feature extraction techniques.	3,5	-
4.	Develop video analytics techniques to real-world problems.	3,5	-
MODULE - 1			10
Image Representation and Description: Representation schemes, Boundary descriptors, Region descriptors Binary Machine Vision: Thresholding, Segmentation, Connected component labeling, Hierarchical segmentation, Spatial clustering, Split& merge, Rule-based Segmentation, Motion-based segmentation. Area Extraction: Concepts, Data-structures, Edge, Line-Linking, Hough transform, Line Fitting, Curve fitting (Least-square fitting).			
MODULE - 2			10
Introduction to Computer Vision: Basic concepts: pixel representation of an image, Image in frequency domain, different color models, and their transformation, Filtering and Convolution, Image preprocessing using PIL/Pillow, OpenCV, and Keras: reading multiple images from a directory, plotting, enhancement, filtering, re-scaling, morphological operations and image data augmentation.			
MODULE - 3			10
Image Enhancement and Filtering: Color Spaces, Color Transforms, Image Filtering, Image Smoothing, Image Gradients. Advanced Image Processing and Computational Photography: Hough Transforms, High Dynamic Range Imaging, Seamless Cloning, Image Inpainting. Geometric Transforms and Image Features: Geometric Transforms, Image Features, Feature Matching, Application: Image Alignment, Application: Creating Panorama, Application: Finding Known Objects using OpenCV			
MODULE - 4			10
Deep Learning with OpenCV: Image Classification- Image Classification using Caffe and Tensorflow, Object Detection - Single Shot MultiboxDetector(SSD), You Only Look Once Detector(YOLO), Face Detection-SSD based Face Detector, Human Pose Estimation-Open Pose.			



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Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Deep Learning for Natural Language Processing Creating Neural Networks with Python	Palash Goyal, Sumit Pandey, Karan Jain	1 st	Apress (Berkeley, CA)	2018
2	Introductory techniques for 3-D Computer Vision	Emanuele Trucco and Alessandro Verri	1st	Prentice Hall (Upper Saddle River, NJ)	1998
3	Multiple View Geometry in Computer Vision	Richard hartley and Andrew Zisserman	2nd	Cambridge University Press	2004

Reference Books:

Sl. No	Title	Authors	Publisher	Edition	Year
1	Speech Communications: Human and Machine	D. O'Shaughnessy	IEEE Press / Wiley	2nd	2007
2	Vector Quantization and Signal Compression	A. Gersho, R. M. Gray	Kluwer Academic / Springer	1st (reprinted)	1991
3	Digital Processing of Speech Signals	L. R. Rabiner, R. W. Schafer	Prentice Hall / Pearson	1st	1978
4	Introduction to Data Compression	K. Sayood	Morgan Kaufmann / Elsevier	5th	2017
5	Natural Language Understanding	James Allen	Pearson / Benjamin Cummings	2nd	1995
6	Information Storage and Retrieval Systems: Theory & Implementation	G. J. Kowalski, M. T. Maybury	Springer	2nd	2002
7	Natural Language Processing and Text Mining	Anne Kao, Stephen R. Poteet (eds.)	Springer-Verlag London / Springer Science	1st	2010

E Books and online course materials:

1. <https://github.com/PacktPublishing/Learning-OpenCV-4-Computer-Vision-with-Python-Third->



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- [Edition?utm_source=chatgpt.com](#)
2. https://github.com/PacktPublishing/Learning-OpenCV-4-Computer-Vision-with-Python-Third-Edition?utm_source=chatgpt.com

Online Courses and Video Lectures:

1. https://www.coursera.org/learn/introduction-computer-vision-watson-opencv?utm_source=chatgpt.com
2. https://www.mooc-list.com/tags/opencv?utm_source=chatgpt.com



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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: Activity 1: Infrastructure Automation with Terraform – 15 Marks Activity 2: Quiz covering core concepts from the syllabus – 5 Marks	20
Total		50

Course Articulation Matrix

Course Outcomes	Program Outcomes													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3			3			3			3		2	
CO2	3	3	3		3						3		2	2
CO3	3	3	3	3	2						3		2	2
CO4	3	3	3	3	2						3		2	2



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

Course Title	Generative Artificial Intelligence		
Course Code	22IS774	(L-T-P) C	(3-0-0) 3
Exam	3	Hours/Week	3
SEE	50 Marks	Total Hours	40

Course Objective: To provide foundational understanding of generative models and equip students with practical skills in building and evaluating Generative AI applications using models such as VAEs, GANs, diffusion models, and LLMs.

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 and principles of Generative Artificial Intelligence to solve engineering and domain-specific problems.	1,2,3,11	1,2
2.	Design and implement generative AI models using modern tools, techniques, and frameworks.	1,3,4,5	1,2
3.	Critically analyze advanced topics and real-world applications of Generative AI across diverse domains.	1,2,3,4,11	1,2
4.	Identify and address ethical challenges in Generative AI, emphasizing fairness, accountability, transparency, and human-centered design.	6,11	2

MODULE - 1	10
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Introduction to Generative Deep Learning: Generative Modeling, What Is Generative Modeling?, Historical perspective on Generative AI, Generative Versus Discriminative Modeling, Introduction to Large Language Models (LLMs), Applications of Large Language Models, Limitations and Risks of Large Language Models

MODULE - 2	10
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Variational Autoencoders Introduction: Autoencoders, The Autoencoder Architecture the Encoder, The Decoder, Joining the Encoder to the Decoder, Analysis of the Autoencoder,
Building a Variational Autoencoder: The Encoder, The Loss Function, Analysis of the Variational Autoencoder, Using VAEs to Generate Faces, Training the VAE, Analysis of the VAE, Generating New Faces, Latent Space Arithmetic, Morphing Between Faces

MODULE - 3	10
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Generative Adversarial Networks: Introduction to GAN (GAN), The Discriminator, The Generator,
Cycle GAN Overview: The Generators (U-Net), The Discriminators, Compiling the Cycle GAN, Training the Cycle GAN, Analysis of the Cycle GAN, Creating a Cycle GAN to Paint Like Monet, the Generators (ResNet), Analysis of the Cycle GAN,
Neural Style Transfer: Content Loss, Style Loss, Total Variance Loss, Running the Neural Style Transfer, Analysis of the Neural Style Transfer Model

MODULE - 4	10
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Diffusion Models: Introduction, Denoising Diffusion Models (DDM), The Flowers Dataset, The Forward Diffusion Process, The Reparameterization Trick, Diffusion Schedules, the Reverse Diffusion Process, Energy-Based Models Introduction,
Energy-Based Models: The MNIST Dataset, The Energy Function, Sampling, Using Langevin Dynamics,
Bias and Fairness in Generative AI: Understanding Bias in AI, Types of biases (algorithmic, data, societal), Fairness Metrics, Statistical parity, equal opportunity, disparate impact, Mitigation Strategies, Pre-



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processing, in-processing, and post-processing techniques,

Ethical Design and Deployment of Generative AI: Ethical AI Design Principles, Human-centered design, ethical by design, Deployment Challenges, Real-world implementation, monitoring, and feedback loops, Responsible AI Frameworks, Guidelines and best practices for ethical deployment

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Generative Deep Learning: Teaching Machines to Paint, Write, Compose, and Play	David Foster	Second edition	O'Reilly Media	2023

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Deep Learning (Adaptive Computation and Machine Learning Series)	Ian Good Fellow, YoshuaBengio and Aaron Courville	4th	MIT Press (3 January 2017)	2020
2	Neural Networks and Learning Machines	Simon S. Haykin	3 rd	PHI Learning	2021

E Books and online course materials:

1. https://onlinecourses.nptel.ac.in/noc20_cs11/preview
2. https://onlinecourses.nptel.ac.in/noc25_cs21

Online Courses and Video Lectures:

1. <https://www.coursera.org/specializations/deep-learning>
2. <https://www.coursera.org/learn/neural-networks-deep-learning>



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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: Activity 1: Presentation on a course-related topic – 15 Marks Each student will present on a Generative AI model or application (e.g., VAEs, GANs, Diffusion Models, LLMs), covering technical workflow, real-world use cases, or ethical implications. Activity 2: Quiz covering core concepts from the syllabus – 5 Marks	20
Total		50

Proposed Assessment Plan (for 50 marks of CIE):

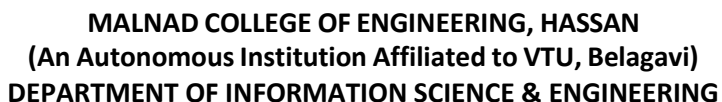
Course Articulation Matrix

Course Outcomes	Program Outcomes													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3	2	2								2		3	2
CO2	3		3	2	3								3	3
CO3	2	2	3	2	2						2		2	3
CO4						3					3			2



MALNAD COLLEGE OF ENGINEERING, HASSAN
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Course Title	Fundamentals of Database Management System		
Course Code	22OEIS71	(L-T-P)C	(3-0-0) 3
Exam	50	Hours/Week	3
SEE	50	Total Hours	40
Course Objective: Acquire the knowledge, skills and tools to manage big data. 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, architecture, and advantages of database systems in real-world applications.	1,11	-
2	Interpret and design Entity-Relationship diagrams for simple scenarios.	1,2,3	-
3	Create and manipulate relational database tables using basic SQL commands.	1,3,4,5,11	-
4	Illustrate the role of transactions and good design practices in ensuring data integrity and consistency.	1,2,6,11,12	-
MODULE-1			10
Introduction to Databases: Need for Databases, Characteristics of Database Approach, Advantages of Using DBMS, Real-life Examples of Databases, Users of Database Systems, Basic Concepts of Data Models, Schemas and Instances, Three-schema Architecture, Introduction to DBMS Software, Overview of Database Languages and Interfaces, Introduction to ER Model, Entity Types, Attributes, Keys, Relationship Types, ER Diagrams			
MODULE-2			10
Relational Model Concepts: Tables (Relations), Rows and Columns, Primary Keys and Foreign Keys, Basic Relational Operations – Selection, Projection, Joins (only concept), Examples of Simple Queries in Tabular Format, Introduction to SQL: SQL Data Types, Creating Tables, Inserting Data, Basic SQL Queries – SELECT, WHERE, ORDER BY, GROUP BY, Simple Aggregate Functions			
MODULE-3			10
Modifying Data: INSERT, DELETE, UPDATE, Altering Table Structure, Using Views in SQL, Simple Use Cases of Views, Basic Constraints – NOT NULL, UNIQUE, PRIMARY KEY, FOREIGN KEY, Introduction to Database Design – Good Table Design Practices, Redundancy and Anomalies, Overview of Normalization (only intuitive understanding – 1NF, 2NF, 3NF – no theory)			
MODULE-4			10
Introduction to Transactions: What is a Transaction?, Real-life Examples (Banking, Railway Booking), Importance of ACID Properties (intuitive), Concept of Concurrent Transactions (simple illustration), SQL Support for Transactions – COMMIT and ROLLBACK, Database Use Cases in Real World – Banking, Inventory, Library, Healthcare, Education			



Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	Hadoop for Dummies	Dirk deRoos, Paul C. Zikopoulos, Bruce Brown, Rafael Coss, Roman B. Melnyk	2nd	John Wiley & Sons	2017
2	Data Analytics	Anil Maheshwari	1st	McGraw Hill Education	2017

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	Big Data Analytics Introduction to Hadoop, Spark and Machine Learning	Raj kamal and Preethi Saxena	-	McGraw Hill Education	2018
2	Hadoop 2 Quick-Start Guide: Learn the Essentials of Big Data Computing in the Apache Hadoop 2 Ecosystem	Douglas Eadline	1st	Pearson Education	2016

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

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: Activity 1: Presentation on a course-related topic – 15 Marks Each student will present on a topic related to database systems—such as data modeling, SQL operations, normalization, or real-world DBMS applications—demonstrating clarity of concept and relevance. Activity 2: Quiz covering core concepts from the syllabus – 5 Marks	20
Total		50

[illegible]



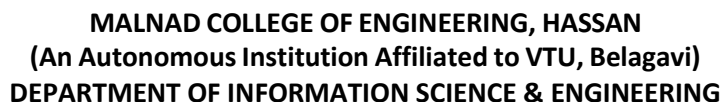
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CO3	3		3	1	2						2			
CO4	2	2		1		2					2			



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Course Title	Introduction To Big Data																						
Course Code	22OEIS72	(L-T-P)C	(3-0-0) 3																				
Exam	50	Hours/Week	3																				
SEE	50	Tota Hours	40																				
Course Objective: Acquire the knowledge, skills and tools to manage big data. Course Outcomes: At the end of course, student will be able to: <table border="1"> <thead> <tr> <th>#</th><th>Course Outcomes</th><th>Mapping to PO's</th><th>Mapping to PSO's</th></tr> </thead> <tbody> <tr> <td>1</td><td>Describe the concepts of HDFS, MapReduce framework, Data mining techniques for data analytics.</td><td>1</td><td>-</td></tr> <tr> <td>2</td><td>Describe architectural elements of HDFS, Map Reduce, YARN.</td><td>1</td><td>-</td></tr> <tr> <td>3</td><td>Apply big data concepts and techniques to address issues in a given scenario.</td><td>2</td><td>-</td></tr> <tr> <td>4</td><td>Demonstrate the MapReduce programming model to process the big data along with Hadoop tools.</td><td>5</td><td>-</td></tr> </tbody> </table>				#	Course Outcomes	Mapping to PO's	Mapping to PSO's	1	Describe the concepts of HDFS, MapReduce framework, Data mining techniques for data analytics.	1	-	2	Describe architectural elements of HDFS, Map Reduce, YARN.	1	-	3	Apply big data concepts and techniques to address issues in a given scenario.	2	-	4	Demonstrate the MapReduce programming model to process the big data along with Hadoop tools.	5	-
#	Course Outcomes	Mapping to PO's	Mapping to PSO's																				
1	Describe the concepts of HDFS, MapReduce framework, Data mining techniques for data analytics.	1	-																				
2	Describe architectural elements of HDFS, Map Reduce, YARN.	1	-																				
3	Apply big data concepts and techniques to address issues in a given scenario.	2	-																				
4	Demonstrate the MapReduce programming model to process the big data along with Hadoop tools.	5	-																				
MODULE-1			10																				
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 Storing Data in Hadoop: The Hadoop Distributed System – Data Storage in HDFS, Sketching Out the HDFS Architecture, HDFS Federation, HDFS High Availability.																							
MODULE-2			10																				
MapReduce Programming – Thinking in Parallel, Seeing the Importance of Map Reduce, Doing Things in Parallel: Breaking Big Problems into Many Bite-Size Pieces, Writing Map Reduce Applications, Getting Your Feet Wet: Writing a Simple Map Reduce Application. Frameworks for Processing Data in Hadoop: YARN and Map Reduce – Running Application Before Hadoop 2, Seeing a World Beyond Map Reduce, Real-time and Streaming Applications																							
MODULE-3			10																				
Data Warehousing: Introduction, Design Consideration, DW Development Approaches, DW Architectures Data Mining: Introduction, Gathering, and Selection, data cleaning and preparation, outputs of Data Mining, Data Mining Techniques.																							
MODULE-4			10																				
Text Mining: Introduction, Text Mining Applications, Text Mining Process, Term Document Matrix, Mining the TDM, Comparison, Best Practices Web Mining: Introduction, Web Content Mining, Web Structured Mining, Web Usage Mining, Web Mining Algorithms..																							



Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	Hadoop for Dummies	Dirk deRoos, Paul C. Zikopoulos, Bruce Brown, Rafael Coss, Roman B. Melnyk	2nd	John Wiley & Sons	2017
2	Data Analytics	Anil Maheshwari	1st	McGraw Hill Education	2017

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	Big Data Analytics Introduction to Hadoop, Spark and Machine Learning	Raj kamal and Preethi Saxena	-	McGraw Hill Education	2018
2	Hadoop 2 Quick-Start Guide: Learn the Essentials of Big Data Computing in the Apache Hadoop 2 Ecosystem	Douglas Eadline	1st	Pearson Education	2016

1. https://onlinecourses.nptel.ac.in/noc20_cs92/preview

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: Activity 1: Presentation on a course-related topic – 15 Marks Each student will deliver a presentation on big data topics such as Hadoop ecosystem, MapReduce, Data Mining, Text Mining, or Web Mining, showcasing theoretical knowledge and practical relevance. Activity 2: Quiz covering core concepts from the syllabus – 5 Marks	20
Total		50

[illegible]



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Course Title	Fundamentals of Block Chain		
Course Code	22OEIS73	(L-T-P)C	(3-0-0) 3
Exam	50	Hours/Week	3
SEE	50	Total Hours	40

Course Objective: The course provides the fundamentals, models and technologies of Block chain.

Course Outcomes: After completing the course, the students will be able to

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Understand the types, benefits and limitations of blockchain and bitcoin.	1	-
2	Explore the blockchain decentralization, cryptography concepts and smart contracts.	2	-
3	Comprehend the blockchain applications outside of currencies.	1	-
4	Demonstrate topics and participate in quizzes to assess knowledge.	9,10,12	-

MODULE-1

10 Hrs.

Blockchain 101: Distributed systems, History of blockchain: Introduction to Blockchain, Types of blockchain, Tiers of blockchain technology, CAP theorem and blockchain, Benefits and limitations of blockchain.

MODULE-2

10 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

10 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.

MODULE-4

10 Hrs.

Ethereum 101: Introduction, Ethereum blockchain, Ethereum Network, Components of the Ethereum blockchain The Ethereum Virtual Machine (EVM) **Blockchain-Outside of Currencies:** Internet of Things, Government, Health, Finance, Media.

Prescribed Text Books:

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



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

Course Title	Introduction to Data Science		
Course Code	22OEIS74	(L-T-P) C	(3-0-0) 3
Exam	3	Hours/Week	3
SEE	50 Marks	Total Hours	40
Course Objective: Apply the principles of data science 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 Data Science processes like statistical modelling, Exploratory data analysis, Data visualization.	1, 2, 4, 5	1
2.	Apply various feature selection algorithms for effective decision making.	2, 3, 5	1, 2
3.	Develop effective visualization for the given data using R	2, 3, 5	1, 2
4.	Develop and evaluate predictive models using machine learning techniques in R.	2, 3, 5	1, 2
MODULE - 1			10
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 modelling, probability distributions, fitting a model.			
MODULE - 2			10
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: RealDirect (online real estate firm). Three Basic Machine Learning Algorithms - Linear Regression			
MODULE - 3			10
Three Basic Machine Learning Algorithms (Continued...): 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			10
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			



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Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Doing Data Science, Straight Talk from The Frontline.	Cathy O'Neil and Rachel Schutt	3rd	O'Reilly	2023

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Mining of Massive Datasets	Jure Leskovek, Anand Rajaraman and Jeffery Ullman	3th	Tata McGraw-Hill	2014
2	Machine Learning: A Probabilistic Perspective	Kevin P. Murphy.	5th	Narosa publishing house	2013

Online Courses and Video Lectures:

3. https://onlinecourses.nptel.ac.in/noc21_cs69/preview
4. <https://www.coursera.org/specializations/generative-ai-for-data-scientists>

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: Activity 1: Presentation on a course-related topic – 15 Marks Students are required to deliver a presentation on a selected topic related to Data Science, demonstrating their understanding of key concepts, tools, or real-world applications. Evaluation will be based on content clarity, technical depth, presentation skills, and relevance to the course. Activity 2: Quiz covering core concepts from the syllabus – 5 Marks	20
Total		50



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Course Title	Internship (Research / Industry) (14-16 Weeks)		
Course Code	22INT	(L-T-P) C	(0-0-12) 10
Exam	3	Weeks	14-16
SEE	100 Marks	Total Hours	--
Course Objective: It involves a short theoretical or experimental research project supervised by a researcher/ To bridge the gap between the theoretical knowledge obtained in the classrooms and the practical skills required in the actual workplace Course Outcomes: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Get exposure to real world job environment and gain practical experience	1,2,3,4,5,10,11,12	1,2
2	Generating technical paper/s and publish in refereed journal/s and conferences	1,2,8,9,10,11,12	2
Guidelines for Research Internship III			
Purpose	It involves a short theoretical or experimental research project supervised by a researcher.		
Skills acquired	• Planning and scheduling. • Documentation. • Critical thinking. • Data collection. • Data analysis. • Appreciating and practicing the ethical values.		
Expected Outcomes	• Generating technical paper/s and publish in refereed journal/s. • Possibility of acquiring an intellectual ownership and patent. • Build a prototype for an idea on which the research was carried out. • File patent/s.		
Selection	• In consultation with a researcher/ researchers working in MCE researchCentre • A research institute • Company's R and D department.		
Team Size	Can be carried out either individually or in a team(Upto 5 students)		
Venue	Laboratory of college research institute Company's R and D department.		



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Supervision	Internship shall be carried out under the supervision of a faculty mentor* at the department level For all students attending in-house internship, the attendance should be maintained by the Faculty mentor
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Parameters for Assessment	Diary Report presentation skill Technical Paper Recommendation Letter from the guide
Evaluation	CIE (100 Marks)–The CIE marks shall be awarded by a committee* consisting of the faculty mentor and two faculty members of the Department, one of whom shall be the Guide (applicable for in-house interns). The schedule for evaluation will be announced by chairman BOE at the end of the semester. The Evaluation can be done in <i>phases as decided by the internal BOS</i> of the department. The contents of the report and the evaluation Rubrics will be set by the Department based on the assessment parameters SEE (100 Marks)– Contribution to the internship and the performance of each group member shall be assessed individually in semester end examination (SEE) conducted at the department. Marks shall be awarded based on the evaluation of the diary, report, presentation skill and viva voce

***For interdisciplinary internship its necessary to involve an expert from each discipline**

Guidelines for Industry Internship III

Purpose	To bridge the gap between the theoretical knowledge obtained in the classrooms and the practical skills required in the actual workplace
Skills acquired	- Applying the theoretical knowledge in a practical scenario - Build confidence in applying the skills learnt - Documentation - Communication - Appreciating and practicing the ethical values
Expected Outcomes	- Get exposure to a real world job environment and gain practical experience - Build confidence in applying the skills learnt. - Enhances Placement Opportunity
Selection	- Can select individually - Can seek the help from the department
Team Size	Can be carried out either individually or in a team (not exceeding 5 students).
Venue	In a domain specific organization
Supervision	Internship shall be carried out under the supervision of a faculty mentor* at the department level. One faculty mentor can supervise a maximum of 20 students.



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Parameters for Assessment	Diary Report presentation skill Recommendation Letter from the guide
Evaluation	CIE (100 Marks) -The CIE marks shall be awarded by a committee* consisting of the faculty mentor and two faculty members of the Department, one of whom shall be the Guide (applicable for in-house interns). The schedule for evaluation will be announced by chairman BOE at the end of the semester. The Evaluation can be done in <i>phases as decided by the internal BOS</i> of the department. The contents of the report and the evaluation Rubrics will be set by the Department based on the assessment parameters SEE (100 Marks)- Contribution to the internship and the performance of each group member shall be assessed individually in semester end examination (SEE) conducted at the department. Marks shall be awarded based on the evaluation of the diary, report, presentation skill and viva voce
*For interdisciplinary internship its necessary to involve an expert from each discipline	

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3					3	3	3		
CO2	3	3						3	2	2	3	3		