

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
(2023 Admitted Batch)**

Third semester- Eight semester



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 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.



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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, modelling, 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 modelling 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. **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, human values, diversity and inclusion; adhere to national & international laws. (WK9)
9. **Individual and collaborative team work:** Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary settings.
10. **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.
11. **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.
12. **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

Curricular Component ↓ / Semester →	I	II	III	IV	V	VI	VII	VIII	Total Credits
Basic Science Course (BSC)	8	8	4	5	-	-	-	-	25
Engineering Science Course (ESC)/ Emerging Technology Course (ETC)/Programming Language Course	9	9	3	3	-	-	-	-	24
Professional Core Course (PCC)	-	-	12	12	12	11	8	-	55
Professional Elective Course (PEC)	-	-	-	-	3	3	3	3	12
Open Elective Course (OEC)	-	-	-	-	-	3	3	3	9
Project/Mini Project/Internship (PI)	-	-	-	-	1	2	4	10	17
Humanities and Social Sciences, Management Course (HSMC)	1	2	-	-	4	-	-	-	7
Ability Enhancement Course (AEC)/ Skill Enhancement Course (SEC)	2	1	1	1	3	1	-	-	9
Universal Human Value Course (UHV)	-	-	1	1	-	-	-	-	2
Total Credits	20	20	21	22	23	20	18	16	160

Scheme of Teaching and Examinations 2023-24

Outcome-Based Education (OBE) and Choice Based Credit System (CBCS) (Effective from the academic year 2023-24)

Sl.No	CourseCode	CourseTitle	TD	Teaching Hours/Week			Examination			Credits
				L	T	P	CIE Marks	SEE Marks	TotalMarks	
1	23MATC11/ 23MATM11/ 23MATE11	Mathematics for CV/ME/EC Stream	Mathematics	2	2	2	50	50	100	04
2	23PHYC12/ 23PHYM12/ 23PHYE12	Physics for CV/ME/EC stream	Physics	2	2	2	50	50	100	04
3	23CIV13/ 23EME13/ 23BEE13 /23EEE13	Engg. Mechanics/ Elements of Mech. Engg./Basic Electronics/ Elements of Electrical Engg.	CV/ME/ EC/EEE	2	2	0	50	50	100	03
4	23ESC14x	Engineering Science Course-I	Respective Engg. department	3	0	0	50	50	100	03
5	23ETC15x	Emerging Technology Course	Any department	3	0	0	50	50	100	03
6	23ENG16	Communicative English	Humanities	1	0	0	50	50	100	01
7	23KSK17/ 23KBK17	Samskrutika Kannada/ Balake Kannada	Humanities	1	0	0	50	50	100	01
8	23IDT18	Innovation and Design Thinking	Mechanical (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 2023-24

Outcome-Based Education (OBE) and Choice Based Credit System (CBCS) (Effective from the academic year 2023-24)

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

Scheme of Teaching and Examinations 2023-24

Outcome-Based Education (OBE) and Choice Based Credit System (CBCS) (Effective from the academic year 2023-24)

II Semester PHYSICS CYCLE STREAMS: Computer Science										
Sl.No	CourseCode	CourseTitle	TD	Teaching Hours/Week			Examination			Credits
				L	T	P	CIE Marks	SEE Marks	TotalMarks	
1	23MATS21	Mathematics for CS Stream-II	Mathematics	2	2	2	50	50	100	04
2	23PHYS22	Physics for CS stream	Physics	2	2	2	50	50	100	04
3	23PPC23	Principles of Programming Using C	CS	2	0	2	50	50	100	03
4	23ESC24x	Engineering Science Course-II	Respective Engg. department	3	0	0	50	50	100	03
5	23ETC25x	Emerging Technology Course	Any department	3	0	0	50	50	100	03
6	23PWS26	Professional Writing Skills in English	Humanities	1	0	0	50	50	100	01
7	23KSK27/ 23KBK27	Samskrutika Kannada/ Balake Kannada	Humanities	1	0	0	50	50	100	01
8	23IDT28	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,										

Outcome-Based Education (OBE) and Choice Based Credit System (CBCS) (Effective from the academic year 2023-24)

II semester		CHEMISTRY CYCLE			STREAMS: Civil, Mechanical, and Electrical					
Sl. No	CourseCode	CourseTitle	TD	Teaching Hours/Week			Examination			Credits
				L	T	P	CIE Marks	SEE Marks	Total Marks	
1	23MATC21// 23MATM21/ 23MATE21	Mathematics for CV/ME/EE Stream-II	Mathematics	2	2	2	50	50	100	04
2	23CHEC22/ 23CHEM22/ 23CHEE22	Chemistry for CV/ME/EE Stream	Physics	2	2	2	50	50	100	04
3	23CED23	Computer-Aided Engineering Drawing	CV/ME	2	0	2	50	50	100	03
4	23ESC24x	Engineering Science Course-II	Respective Engg. department	3	0	0	50	50	100	03
5	23PLC25x	Programming Language Course	Any department	2	0	2	50	50	100	03
6	23PWS26	Professional Writing Skills in English	Humanities	1	0	0	50	50	100	01
7	23ICO27	Indian Constitution	Humanities	1	0	0	50	50	100	01
8	23SFH28	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,										

Malnad College of Engineering, Hassan

List of Elective Courses

I Semester B. E.

(ESC-I) Engineering Science					(ETC-I) Emerging Technology Courses-I				
Code	Title	L	T	P	Code	Title	L	T	P
23ESC141	Introduction to Civil Engineering	3	0	0	23ETC15A	Smart Materials and Systems	3	0	0
23ESC142	Introduction to Electrical Engineering	3	0	0	23ETC15B	Green Buildings	3	0	0
23ESC143	Introduction to Electronics Engineering	3	0	0	23ETC15C	Introduction to Nano Technology	3	0	0
23ESC144	Introduction to Mechanical Engineering	3	0	0	23ETC15D	Introduction to Sustainable Engineering	3	0	0
23ESC141	Introduction to C Programming	2	0	2	23ETC15E	Renewable Energy Sources	3	0	0
					23ETC15F	Waste Management	3	0	0
					23ETC15G	Emerging Applications of Biosensors	3	0	0
					23ETC15H	Introduction to Internet of Things (IOT)	3	0	0
					23ETC15I	Introduction to Cyber Security	3	0	0
					23ETC15J	Introduction to Electric Vehicle Technology	3	0	0
(PLC-I) Programming Language Courses-I					22ETC15K	Introduction to Embedded System	3	0	
Code	Title	L	T	P					
23PLC15A	Introduction to Web Programming	2	0	2					
23PLC15B	Introduction to Python Programming	2	0	2					
23PLC15C	Basics of JAVA programming	2	0	2					
23PLC15D	Introduction to C++ Programming	2	0	2					

Malnad College of Engineering, Hassan

List of Elective Courses

II Semester B. E.

(ESC-I) Engineering Science					(ETC-I) Emerging Technology Courses-II				
Courses-II									
Code	Title	L	T	P	Code	Title	L	T	P
23ESC241	Introduction to Civil Engineering	3	0	0	23ETC25A	Smart Materials and Systems	3	0	0
23ESC242	Introduction to Electrical Engineering	3	0	0	23ETC25B	Green Buildings	3	0	0
23ESC243	Introduction to Electronics Engineering	3	0	0	23ETC25C	Introduction to Nano Technology	3	0	0
23ESC244	Introduction to Mechanical Engineering	3	0	0	23ETC25D	Introduction to Sustainable Engineering	3	0	0
23ESC245	Introduction to C Programming	2	0	2	23ETC25E	Renewable Energy Sources	3	0	0
					23ETC25F	Waste Management	3	0	0
					23ETC25G	Emerging Applications of Biosensors	3	0	0
					23ETC25H	Introduction to Internet of Things (IOT)	3	0	0
					23ETC25I	Introduction to Cyber Security	3	0	0
					23ETC25J	Introduction to Electric Vehicle Technology	3	0	0
(PLC-I) Programming Language Courses-II						Introduction to Embedded System	3	0	0
Code	Title	L	T	P					
23PLC25A	Introduction to Web Programming	2	0	2					
23PLC25B	Introduction to Python Programming	2	0	2					
23PLC25C	Basics of JAVA programming	2	0	2					
23PLC25D	Introduction to C++ Programming	2	0	2					



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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	23MAIS301	Mathematics for Information Science Engineering-I	3	1	2	6	50	50	100	4
2	IPCC	23IS302	Digital Design & Computer Organization	3	0	2	5	50	50	100	4
3	IPCC	23IS303	Operating Systems	3	0	2	5	50	50	100	4
4	PCC	23IS304	Data Structures and Applications	3	0	0	3	50	50	100	3
5	PCCL	23IS305	Unix Lab	0	0	2	2	50	50	100	1
6	ESC	23IS306A	ESC/ETC/PLC	2	0	2	4	50	50	100	3
7	UHV	23SCR	Social Connect and Responsibility	0	0	2	2	100	-	100	1
8	AEC/SEC	23IS307B	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	MC	23NYP1	NSS,YOGA,PE	0	0	2	2	100	-	100	A
10	BSC	23BCM301	Bridge Mathematics-I (Mandate Audit Course for Diploma entry students)	3	0	0	3	100	-	100	A
Total							33	650	350	1000	21
Note: AEC, SEC, ETC courses are to be chosen suitably by the BOS of the programme											

Engineering Science Course (ESC/ETC/PLC)			
23IS306A	OOP with Java	23IS306C	Discrete Mathematical Structures
23IS306B	OOP with C++	23IS306D	Graph Theory and Combinatorics
Ability Enhancement Course – III			
23IS307A	R Programming	23IS307C	Data Visualization with Python
23IS307B	Data Analytics with Excel	23IS307D	Version Controller with GiT



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FOURTH SEMESTER											
Sl. No	Course Category	Course Code	Course Title	Teaching Hours/Week				Exam Marks			Credits
				L	T	P	Total	CIE	SEE	Total	
1	BSC	23MAIS401	Mathematics for Information Science Engineering-II	3	1	2	6	50	50	100	4
2	IPCC	23IS402	Microprocessor and Microcontroller	3	0	2	5	50	50	100	4
3	IPCC	23IS403	Database management Systems	3	0	2	5	50	50	100	4
4	PCC	23IS404	Design and Analysis of Algorithms	3	0	0	3	50	50	100	3
5	ESC	23IS405X	ESC/ETC/PLC	2	0	2	4	50	50	100	3
6	UHV	23UHV	Universal Human Values	0	2	0	2	50	50	100	1
7	AEC/SEC	23IS406	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	MC	23NYP2	NSS,YOGA,PE	0	0	2	2	100	-	100	A
9	BSC	23BEIS407	Biology for Engineers	0	2	0	2	50	50	100	1
10	PCCL	23IS408	Design and Analysis of Algorithms laboratory	0	0	2	2	50	50	100	1
Total							34	550	450	1000	22
Note: AEC, SEC, ETC courses are to be chosen suitably by the BOS of the programme											

Engineering Science Course (ESC/ETC/PLC)			
23IS405A	C# and .Net Technologies	23IS405C	Optimization Techniques
23IS405B	Internet of Things	23IS405D	Probability, Statistics and queuing
Ability Enhancement Course – III			
23IS406A	Green IT and Sustainability	23IS406C	Introduction to web technology
23IS406B	UI/UX laboratory	23IS406D	Technical writing using LATEX



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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	23IS501	Computer Networks	3	0	2	5	50	50	100	4
2	PCC	23IS502	Theoretical Foundations of Computation	2	2	0	4	50	50	100	3
3	IPCC	23IS503	Software Engineering	3	0	2	5	50	50	100	4
4	PCCL	23IS504	Data Visualization Lab	0	0	2	2	50	50	100	1
5	HSMC	23IS505	Entrepreneurship and Management	3	0	0	3	50	50	100	3
6	HSMC	23EVS	Environmental Studies	0	2	0	2	50	50	100	1
7	PEC	23IS5XX	Professional Elective Course - I	3	0	0	3	50	50	100	3
8	MC	23NYP3	NSS,YOGA,PE	0	0	2	2	100	-	100	A
9	PI	23IS506	Mini Project	0	0	2	2	50	50	100	1
10	AEC	23RIP	Research Methodology and IPR	3	0	0	3	50	50	100	3
Total							31	500	400	900	23

Professional Elective Course I

23IS551	Computer vision and Image Processing	23IS553	Full Stack Development
23IS552	Robotic Process Automation	23IS554	Supply Chain Analytics



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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	23IS601	Cryptography, Network Security and Cyber Law	3	0	0	3	50	50	100	3
2	IPCC	23IS602	Artificial Intelligence and Machine Learning	3	0	2	5	50	50	100	4
3	IPCC	23IS603	Cloud Computing	3	0	2	5	50	50	100	4
4	PI	23IS604	Main Project Phase - I	0	0	4	4	50	50	100	2
5	PEC	23IS6XX	Professional Elective Course - II	3	0	0	3	50	50	100	3
6	OEC	23OEIS6X	Open Elective Course - I	3	0	0	3	50	50	100	3
7	MC	23NYP4	NSS,YOGA,PE	0	0	2	2	100	-	100	A
8	AEC	23ASK	Analytical Ability and Soft Skills	0	0	2	2	50	50	100	1
Total							27	450	350	800	20

Professional Elective Course - II

23IS661	Storage Area Networks	23IS663	Automated Software Testing
23IS662	Big data Technologies	23IS664	Block Chain Technology

Open Elective Course - I

23OEIS61	Responsible AI	23OEIS63	Information and Network Security
23OEIS62	Introduction to Machine Learning	23OEIS64	Prompt engineering



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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	23IS701	Deep Learning	3	0	2	5	50	50	100	4
2	IPCC	23IS702	Data Science using R	3	0	2	5	50	50	100	4
3	PI	23IS703	Main Project Phase - II	0	0	8	8	50	50	100	4
4	PEC	23IS7XX	Professional Elective Course - III	3	0	0	3	50	50	100	3
5	OEC	23OEIS7X	Open Elective Course –II	3	0	0	3	50	50	100	3
Total							24	250	250	500	18

Professional Elective Course - III			
23IS771	Virtual Reality and Augmented Reality	23IS773	DevOps: Bridging Development and Operations
23IS772	Parallel Programing	23IS774	Generative Artificial Intelligence

Open Elective Course - II			
23OEIS71	Fundamentals of Database Management System	23OEIS73	Fundamentals of Block Chain
23OEIS72	Introduction to Big Data	23OEIS74	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	23SW01	Professional Elective (Online Course)	3	0	0	3	50	50	100	3
2	OEC	23SW02	Open Elective (Online course)	3	0	0	3	50	50	100	3
3	PI	23INT	Internship (Research/Industry) (15-20 weeks)	0	0	12	12	100	100	200	10
Total							18	200	200	400	16



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#	Course	Course code	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	Computer Networks	23IS501	✓	✓	✓	✓	✓							
2	Theoretical Foundations of Computation	23IS502	✓		✓		✓							
3	Software Engineering	23IS503	✓	✓	✓	✓	✓		✓	✓	✓	✓		
4	Entrepreneurship and Management	23IS505	✓	✓				✓					✓	
5	Full Stack Development	23IS553	✓	✓	✓		✓						✓	
6	Research Methodology and IPR	23RIP		✓	✓	✓							✓	✓
7	Cryptography, Network Security and Cyber Law	23IS601	✓	✓			✓			✓				
8	Artificial Intelligence and Machine Learning	23IS602		✓	✓		✓				✓	✓		
9	Cloud Computing	23IS603		✓	✓		✓			✓				
10	Big data technologies	23IS662	✓	✓	✓		✓							
11	Automated Software Testing	23IS663	✓		✓	✓	✓							
12	Block Chain Technology	23IS664	✓			✓	✓	✓		✓			✓	

Course Title	Mathematics for Information Science Engineering - I		
Course Code	23MAIS301	L-T-P	(3-1-2) 4
Exam	3 Hrs.	Hours/Week	6
SEE	50 Marks	Total Hours	65(40L+13T+12P)
Course Objective: Students will be able to use appropriate data structures for solving problems. Course outcomes: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Utilise the concept of consistency of system of equations to solve the engineering application problems and compute the number of linearly independent vectors.	1	-
2.	Examine for the existence of diagonalization of matrix, find the suitable matrix of transformations so as to get the required image and analyse the system of equations to compute the number of linearly independent Eigen vectors.	1,2	-
3.	Compute Fourier series of a given function, the orthogonal basis, QR factors of Matrices, and solve homogeneous differential equations using matrices	1	-
4.	Write the python programme for the mathematical procedures connected with linear algebra, Fourier series and Model the real life problems/engineering application problems	1,2,5	-
MODULE – 1			10 Hrs.
Linear Algebra: Importance of Matrices in engineering. Rank of a matrix. Consistency of nonhomogeneous and homogeneous system of equations, Solution of the system of linear equations by Gauss elimination method and Gauss – Seidel iterative method. Linearly dependent and independent vectors. Applications of solution of system of equations to balance the chemical equations. Self-Study --Traffic flow problem, to find the suitable combination of food stuff so as to get the desired nutrients as prescribed by a dietician.			
MODULE – 2			10 Hrs.
Linear algebra: Orthogonal matrices, Gram Schmidt process, QR-factorization, symmetric matrices and quadratic forms, Matrix method to solve homogeneous differential equations of order 2, degree 1. Special matrices-matrix of rotation, reflection, translation. To find the matrix of transformation when the image of some points is given. Self-study: Linear models in business and engineering. Partition matrices, Matrix factorization, Application to computer graphics.			
MODULE -3			10 Hrs.
Linear Algebra: Eigen values and Eigenvectors, properties, Illustrative examples, Applications-Stretching of an elastic membrane, to determine the growth of a population model. Role of Eigen values, eigenvectors in determining natural frequency, Rayleigh power method to find the highest Eigen value. Diagonalization and powers of 3X3 matrices when Eigen values are already given.			

Self-Study-- Stability analysis of differential equations which governs the dynamical systems using the concept of Eigen value, eigenvectors. Applications of system of equations, linear transformation in computer science. Application of Eigen value eigenvectors in data compression, Signature testing, Face recognition. Google page ranking.	
MODULE -4	10 Hrs.
Fourier Series: Periodic functions and their graphical representation, to find the function for standard graphs, to find Fourier series by change of interval method, To represent the experimental data as a Fourier series using the method - Practical harmonic analysis. application of Fourier series in engineering-To represent the signal (wave form) in terms of Fourier series, Fourier series representation for the excitation described by the wave form, graphs of Fourier series approximating the given function Self-Study-- Half range series method. Applications of Fast Fourier transforms, Discrete Fourier transforms in information science engineering.	
TUTORIAL: 1. Need to study in rank of a matrix. 2. Examples on rank of a matrix and consistency. 3. Importance of solution of system of equation in application problems traffic flow. 4. Examples on Eigen values and Eigen vectors and diagonalization. 5. A report on role of Eigen values and Eigen vector in engineering. 6. To fit a Fourier series to the experimental data. 7. Examples on Fourier series(change of interval method) 8. A report the application of Fourier series in engineering. 9. Application to Fourier series connected with practical harmonic analysis. 10. Understanding the concept of QR factorization.	
Lab components: 1. Find the rank of matrix 2. Solve the system of linear equations 3. Visualization of matrix transformation by rotation, reflection, shear and by composition of transformations 4. Compute Eigen values and Eigen vectors, 5. Diagonalization of given matrix 6. To represent the signal (wave form) in terms of Fourier series 7. To represent the experimental data as a Fourier series using the method - Practical harmonic analysis.	
ACTIVITIES: a. To represent saw tooth periodic motion of a follower operated by a Cam which rotates uniformly, in the form of Fourier series b. Application of Fourier series to Laplace equation, heat conduction. c. Fourier series representation for the excitation described by the wave form,	

- d. Role of Eigen values, eigenvectors in determining natural frequency, mode shapes of equations of motions (Spring mass system).
- e. Lenovo input output method – application to balance the economy of a Country.
- f. Applications of factorization of matrices-Google recommendation.
- g. Jordan canonical form when minimal polynomial and characteristic polynomial is given and its application in Engineering.
- h. Diagonalize a matrix and determining the principal stresses.
- i. Application of Laplace transformation.
- j. Application of Eigen value, Eigen vectors in data compression, Signature testing, Face recognition. Google page ranking.
- k. Least square solution of system of equations- a matrix approach

Note – 1. Theorems and properties without proof. Applicable to all the Modules.

2. Self study part is not included for Semester End Examination.

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Higher Engineering Mathematics	Dr. B. S. Grewal,	44 th edition	Khanna Publications	2016

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Advanced engineering mathematics	R K Jain and S R K Iyengar	2nd	Narosa publishers	2005
2	Calculus	Thomas Finney	2nd	Pearson education	2002

E Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Higher Engineering Mathematics	Dr. B. S. Grewal,	44 th edition	Khanna Publications	2016

MOOC Course:

Sl.No	Course Name	Course offered by	Year	URL
1	NPTEL	IIT Madars	2021	http://nptel.ac.in/courses.phd?disciplineID=111

Course Title	Digital Design and Computer Organization																						
Course Code	23IS302	(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 be able to design synchronous and asynchronous circuits. Also will understand the basic organization of a computer. Course outcomes: At the end of course, student will be able to: <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 behavior of basic components of Digital circuits and Apply different methods for simplifying Boolean equations and design circuits</td><td>1</td><td>-</td></tr> <tr> <td>2</td><td>Analyze the working/functionality of different data processing circuits, memory organizations and cache mapping policies.</td><td>3</td><td>-</td></tr> <tr> <td>3</td><td>Understand the instruction execution mechanism of a computer, working of processing unit, input/output operations,</td><td>1</td><td>-</td></tr> <tr> <td>4</td><td>Carry out the task of implementing combinational and sequential logic circuit from functional description of digital systems</td><td>5</td><td>-</td></tr> </table>				#	Course Outcomes	Mapping to PO's	Mapping to PSO's	1	Describe the behavior of basic components of Digital circuits and Apply different methods for simplifying Boolean equations and design circuits	1	-	2	Analyze the working/functionality of different data processing circuits, memory organizations and cache mapping policies.	3	-	3	Understand the instruction execution mechanism of a computer, working of processing unit, input/output operations,	1	-	4	Carry out the task of implementing combinational and sequential logic circuit from functional description of digital systems	5	-
#	Course Outcomes	Mapping to PO's	Mapping to PSO's																				
1	Describe the behavior of basic components of Digital circuits and Apply different methods for simplifying Boolean equations and design circuits	1	-																				
2	Analyze the working/functionality of different data processing circuits, memory organizations and cache mapping policies.	3	-																				
3	Understand the instruction execution mechanism of a computer, working of processing unit, input/output operations,	1	-																				
4	Carry out the task of implementing combinational and sequential logic circuit from functional description of digital systems	5	-																				
MODULE-1			9 Hrs.																				
Digital Logic: Overview of Basic Gates and Universal Logic Gates, AND-OR-Invert Gates, Positive and Negative Logic. Combinational Logic Circuits: Boolean Laws and Theorems, Sum-of-Products Method, Truth Table to Karnaugh Map, Pairs, Quads, and Octets, Karnaugh Simplifications, Don't Care Conditions, Product-of-Sums method, Sum-of-Products method Simplification by Quine-McCluskey Method Data-Processing Circuits: Multiplexers, Demultiplexers, EX-OR gates, Parity Generators and Checkers																							
MODULE-2			9 Hrs.																				
Data-Processing Circuits (contd.): Magnitude Comparator. Arithmetic Circuits: Arithmetic Building Blocks, Flip-Flops: RS Flip-Flops, Gated Flip-Flops, Edge-triggered RS, D, JK Flip-Flops, JK Master-Slave Flip-Flops, Various Representations of Flip-Flops, Registers: Registers: Types of Registers, Serial In-Serial Out, Serial In-Parallel Out, Parallel In-Serial Out, Parallel In-Parallel Out. Counters: Asynchronous Counters.																							
MODULE-3			9 Hrs.																				
Basic Structure of Computers: Basic Operational Concepts, Numbers, Arithmetic Operations and Characters, Memory Location and Addresses. Input/Output Organization: Interrupts – Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices. Direct Memory Access, Standard I/O Interfaces – PCI Bus, USB.																							
MODULE-4			9 Hrs																				
Memory System: Basic Concepts, Semiconductor RAM Memories (till Asynchronous DRAMS), Read Only Memories, Cache Memories – Mapping Functions. Arithmetic: Multiplication of positive numbers, Signed Operand Multiplication, Fast multiplication-Bit pair recoding of multipliers, Integer Division. Basic Processing Unit: Some Fundamental Concepts, Execution of a Complete Instruction.																							

Prescribed Text Books:

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

Reference Books:

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

E Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	COMPUTER ORGANIZATION AND EMBEDDED SYSTEMS	Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Naraig Manjikian	6 th	Tata McGraw Hill	2012

MOOC Course:

Sl.No	Course Name	Course offered by	Year	URL
1	Computer architecture and organization	Prof. Indranil Sengupta, Prof. Kamalika Datta IIT Kharagpur	2021	https://onlinecourses.nptel.ac.in/noc21_cs61/preview
2	Digital Design with Verilog	Prof. Chandan Karfa, Prof. Aryabartta Sahu IIT Guwahati	2024	https://onlinecourses.nptel.ac.in/noc24_cs61/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

Laboratory Plan:

Lab Program	Program Details
1	Realize the behavior of following gates: i) AND ii) OR 3) NOT 4) NOR 5) NAND
2	Design and implement BCD to Excess-3 code converter
3	Simplify and realize given Boolean expressions using logic gates ($y = C' + A'D' + B'D'$).
4	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
5	Design and implement a 3 stage Asynchronous Counter using J-K flip flops to count down from 7 to n .
6	Design Verilog code to realize all the logic gates
7	realize the simplified logic expression using multiplexer and simulate the same using VHDL/ Verilog
8	realize the simplified logic expression using de-multiplexer and simulate the same using VHDL/ Verilog
9	Realize the truth tables of half adder and simulate the same using VHDL/ Verilog
10	Realize a Verilog code for the following flip-flops: SR, D, JK and simulate the same using VHDL/ Verilog

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			3		3				

Course Title	Operating Systems																						
Course Code	23IS303	(L-T-P)C	(3-0-2) 4																				
Exam	3 Hours	Hours/Week	5																				
SEE	50 Marks	Total Hours	50 (36L+14P)																				
Course Objective: Students will be able to implement different components of operating systems. Course outcomes: At the end of course, student will be able to: <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 various concepts and functionalities of operating systems</td><td>1,2</td><td>-</td></tr> <tr> <td>2</td><td>Apply different Process scheduling , Disk Scheduling and memory management Algorithms</td><td>3</td><td>-</td></tr> <tr> <td>3</td><td>Apply different mechanisms for handling deadlocks and synchronization problems</td><td>3</td><td>-</td></tr> <tr> <td>4</td><td>Implement various CPU scheduling algorithms , disk scheduling, page replacement algorithms</td><td>2,3</td><td>-</td></tr> </table>				#	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	-
#	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.																							

Prescribed Text Books:

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

Reference Books:

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

E Books:

Sl.No	Book Title	Link
1	Operating System Concepts	https://drive.uqu.edu.sa/_/mskhayat/files/MySubjects/2017SS%20Operating%20Systems/Abraham%20Silberschatz-Operating%20System%20Concepts%20(9th,2012_12).pdf

MOOC Course:

Sl.No	Course Name	Course offered by	Year	URL
1	Fundamentals of Operating System	NPTEL	2024	https://nptel.ac.in/courses/106/105/106105214/

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 Program Execution	20
Total		50

Laboratory Plan:

Program Details	
1.	Write a C program for performing the following file handling operations - Creation of the new file - Opening an existing file - Reading from the file - Writing to the file - Appending the file - Copying the file - Renaming the file
2.	Design and develop C program for implementing first come first serve and shortest jobfirst algorithm
3.	Design and develop C program for implementing round robin scheduling algorithms.
4.	Design and develop C program to implement first in first out and optimal page replacement algorithm.
5.	Design and develop C program to implement the producer consumer program using semaphore.
6.	Design and develop C program to simulate banker's algorithm to avoid a deadlock.
7.	Design and develop C program to simulate the best fit and the worst fit contagious memory allocation techniques.
8.	Design and develop C program to simulate the following disk scheduling algorithms - FCFS - Scan - SSTF - LOOK

Course Articulation Matrix

[illegible]

Course Title	Data Structures and Applications		
Course Code	23IS304	(L-T-P)C	(3-0-0) 3
Exam	3 Hrs.	Hours/Week	3
SEE	50 Marks	Total Hours	40
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			10 Hrs.
Introduction to Data Structures: Definition, Classification of Data Structures, Dynamic Memory Allocation – Introduction, Dynamic memory allocation, malloc, calloc, free and realloc. The Stack - Definition and examples: Primitive operations, Example. Representing stacks in C: Implementing the pop operation, testing for exceptional conditions, implementing the push operation. Infix, postfix and prefix: Basic definitions and examples, evaluating a postfix expression, Program to evaluate a postfix expression, converting an expression from infix to postfix, Program to convert an expression from infix to postfix.			
MODULE – 2			10 Hrs.
Recursion: Recursive definition and processes: Factorial function, Multiplication of natural numbers, Fibonacci sequence, Binary search, Properties of recursive definition or algorithm. Recursion in C: Factorial of a number, generation of Fibonacci numbers, Binary searching, Concept of Recursive chains, Towers of Hanoi problem, Queues and lists: The queue and its sequential representation: C implementation of queues, 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			10 Hrs.
Lists in C: Array implementation of lists, Limitations of array implementation, allocating and freeing dynamic variables, linked lists using dynamic variable, Queues as lists in C, Examples of list operations in C, Non integer and non-homogeneous lists. Other list structures: Circular lists, Stack as a circular list, Queue as a circular list.			

MODULE -4	10 Hrs.
Trees - Binary trees: Operations on binary trees, Applications of binary trees. Binary tree representation: Node representation of binary tree, Internal and external node, Implicit array representation of binary trees, choosing a binary tree representation, Binary tree traversals in C, Threaded binary trees.	

Prescribed Text Books:

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

Reference Books:

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

E Books:

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

M00C Course:

Sl.No	Course Name	Course offered by	Year	URL
1	Data Structures and algorithms		2022	https://nptel.ac.in/courses/106/102/106102064/

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Three tests conducted for 20 marks each and reduced to 10 marks	30
AAT	Demonstration activity- Students will demonstrate concepts of Tower of Hanoi, Tree constructions, Queues & List , etc., using real Life activities.	20
Total		50

Course Articulation Matrix

[illegible]

Course Title	UNIX LABORATORY		
Course Code	23IS305	(L-T-P)C	(0-0-2) 1
Exam	3 Hrs.	Hours/Week	2
SEE	50 Marks	Total Hours	28

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

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Execute the basic UNIX commands.	2	-
2.	Demonstrate and develop UNIX shell scripts	3	1
3.	Illustrate and construct UNIX shell scripts, similarly, craft scripts related to AWK.	3	1

Laboratory Plan:

Part A : Execution of following basic UNIX commands

Lab Program	Program Details
1	ls ,ls -l , ls-lh , ls-a , ls-R , ls -d, cat, cd ,od , mkdir,echo ,date , mv , cal ,wc,pwd,rmdir,rm ,touch,sort ,read, clear,ps-u , ps whoami, alias , find ,test,expr,set ,shift ,type ,grep ,sed,awk,tr,chmod,job,cut,paste,top,env,Bash

Part B : Design and Develop a shell scripts for following statements

Lab Program	Program Details
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.	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 current directory
6.	Write a shell script that accepts a filename as argument and display its creation time if file exists and if it does not send 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 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 number.
9.	Write an awk script to compute gross salary of an employee accordingly to rule given below. If basic salary is < 10000 then HRA=15% of basic & DA=45% of basic If basic salary is >=10000 then HRA=20% of basic & DA=50% of basic.
10.	Write an awk script to delete duplicated line from a text file. The order of the original lines must remain unchanged.

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	UNIX :Concepts and Applications	Sumitabha Das	4th	Tata McGraw-Hill,	2018.

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Unix & Shell Programmng	M. G. Venkateshmurthy	4th	Pearson Education	2018
2	UNIX and Shell Programming	Behrouz A. Forouzan and Richard F. Gilberg	4th	A Textbook, 1st Edition, Thomson Course Technology	2018

M00C Course:

Sl.No	Course Name	Course offered by	Year	URL
1	Linux Programming & Scripting	NPTEL	2021	https://archive.nptel.ac.in/courses/17/106/117106113/
2	Linux Basics	NPTEL	2022	https://nptel.ac.in/courses/1171061133

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Conduct two tests, each worth 25 marks, and combine them to make a total of 50 marks.	50
Total		50

Note:

Part A: Students need to execute two commands.

Part B: Students need to execute one shell script.

Course Articulation Matrix

[illegible]

Course Title	OBJECT ORIENTED PROGRAMMING WITH JAVA		
Course Code	23IS306A	(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 PO's	Mapping to PSO's
1	Comprehend the fundamental concepts of Object Oriented Programming	1, 2	1
2	Apply Object Oriented constructs for program development	2	1
3	Develop computer programs to solve real world problems in Java	1, 2	1
4	Use any tool to develop and debug JAVA code.	5	1
MODULE-1			7 Hrs.
The History & Evaluation of Java: Java's Lineage, The Creation of Java, The Evaluation of Java, Java SE 8 An Overview of Java: Object-Oriented Programming (Two Paradigms, Abstraction, The Three OOP Principles), Using Blocks of Code, Lexical Issues (Whitespace, Identifiers, Literals, Comments, Separators, The Java Keywords). Data Types, Variables, and Arrays: The Primitive Types (Integers, Floating-Point Types, Characters, Booleans), Variables, Type Conversion and Casting, Automatic Type Promotion in Expressions, Arrays, Introducing Type Inference with Local Variables.			
MODULE-2			7 Hrs.
Operators: Arithmetic Operators, Relational Operators, Boolean Logical Operators, The Assignment Operator, The ?Operator, Operator Precedence, Using Parentheses. Control Statements: Java's Selection Statements (if, The Traditional switch), Iteration Statements (while, do-while, for, The For-Each Version of the for Loop, Local Variable Type Inference in a for Loop, Nested Loops), Jump Statements (Using break, Using continue, return). Introducing Classes: Class Fundamentals, Declaring Objects, Assigning Object Reference Variables, Introducing Methods, Constructors, The this Keyword, Garbage Collection.			
MODULE-3			6 Hrs.
Methods and Classes: Overloading Methods, Objects as Parameters, Argument Passing, Returning Objects, AccessControl, Understanding static, Introducing final, Introducing Nested and Inner Classes. Inheritance: Inheritance Basics, Using super, Creating a Multilevel Hierarchy, When Constructors Are Executed, Method Overriding, Dynamic Method Dispatch, Using Abstract Classes, Using final with Inheritance			
MODULE-4			6 Hrs
Interfaces: Interfaces, Default Interface Methods, Use static Methods in an Interface Exception Handling: Exception-Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and Catch, Multiple catch Clauses, throw, Java's Built-in Exceptions, Customized exceptions.			

Prescribed Text Books:

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

Reference Books:

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

E Books:

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

M00C Course:

SLNo	Course Name	Course offered by	Year	URL
1	Programming in Java	IIT Kharagpur	2024	https://onlinecourses.nptel.ac.in/noc24_cs105/preview
2	Object Oriented Programming in Java	University of California San Diego	2023	https://www.coursera.org/learn/object-oriented-java

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

Course Title	OBJECT ORIENTED PROGRAMMING WITH C++		
Course Code	22IS306B	(L-T-P)C	(2-0-2)3
Exam	3Hrs	Hours/Week	4
SEE	50 Marks	Total Hours	40 (26L+14P)
Course Objective : Students will be able to apply object oriented programming concepts in development of applications. Course outcomes: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Describe all concepts of OOPs	1	
2.	Conduct experiments to demonstrate OOPs concepts	2	1
3.	Develop solutions to problems using OOPs principles	2	1
MODULE – 1			7 Hrs.
Principles of Object Oriented Programming: Object Oriented Programming Paradigm; Basic concepts of Object Oriented Programming; A Simple C++ Program; More C++ Statements; An Example with Class; Structure of C++ Program; Creating the Source File; Compiling and linking. Functions in C++: Introduction; The Main Function; Function Prototyping; Call by Reference; Return by Reference; Inline Function; Default Arguments; Const Arguments; Functions Overloading;			
MODULE – 2			7 Hrs.
Classes and Objects: Specifying a Class; Defining Member Functions; A C++ Program with Class; Making an Outside Function Inline; Nesting of Member Functions; Memory Allocation for Objects; Static Data Members; Static Member Functions; Array of Objects; Objects as Function Arguments; Constructors and Destructors: Introduction; Constructors; Parameterized Constructors; Destructors.			
MODULE -3			6 Hrs.
Operator Overloading and Type Conversions: Introduction; Defining Operator Overloading; Overloading Unary Operators; Overloading Binary Operators; Manipulation of String Using Operators; Rules for Overloading Operators; Inheritance; Extending Classes; Introduction; Defining derived Classes; Single Inheritance; Making a Private Member Inheritable; Multilevel Inheritance; Hierarchical Inheritance; Hybrid Inheritance;			
MODULE -4			6 Hrs.
Templates: Introduction; Class Templates; Class Templates with Multiple Parameters; Function Templates; Function Templates with Multiple Parameters; Exception Handling: Introduction; Basic of Exception Handling; Exception Handling Mechanism; Throwing Mechanism; Catching Mechanism; Rethrowing an Exception; Specifying Exceptions.			
Practical Component			

- 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.

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

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

[illegible]

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. Weighted 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

[illegible]

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. Computational 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			

[illegible][illegible]

Course Title	R PROGRAMMING		
Course Code	23IS307A	(L-T-P)C	(0-0-2)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	-
S.N	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: - Profit for each month. - Profit after tax for each month (Tax Rate is 30%). - Profit margin for each month equals to profit after tax divided by revenue. - Good Months – where the profit after tax was greater than the mean for the year. - Bad Months – where the profit after tax was less than the mean for the year. - The best month – where the profit after tax was max for the year. - The worst month – where the profit after tax was min for the year. Note: - All Results need to be presented as vectors - Results for Dollar values need to be calculated with \$0.01 precision, but need to be presented in Units of \$1000 (i.e 1k) with no decimal points - Results for the profit margin ratio need to be presented in units of % with no decimal point. - It is okay for tax to be negative for any given month (deferred tax asset) - Generate CSV file for the data. Suggested Reading – Text Book 1 – Chapter 4 (Vectors, Combining Matrices)
3	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.			
		Item Code	Item Category	Item Price
		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 NewYork, 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 andwrite 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 ofcylinders [3] disp Displacement (cu.in.), [4] hp Gross horsepower [5] drat Rear axleratio,[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:

Prescribed Text Books:

SLN o	Book Title	Authors	Edition	Publisher	Year
1	Learning R: a step by step function guide to data analysis	Cotton	1st	O'reilly Media Inc	2017

Course Articulation Matrix

[illegible]

Course Title	DATA ANALYTICS WITH EXCEL		
Course Code	23IS307B	(L-T-P)C	(0-0-2) 1
Exam	3 Hrs.	Hours/Week	2 Hrs
SEE	50 Marks	Total Hours	28

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

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	To understand the mathematical calculation performed in Excel.	1,2	-
2	To apply sorting, Filtering and condition format for the various problems.	2,3,5	-

Course Contents:

Guided Laboratory Experiments

1.	In a company, 30 employee details (Name, Date of joining, Qualification and salary) are stored in Microsoft Access database and text file. Using Excel tool import the data from different sources for analysis.																																				
2.	Suppose a class of size 40 having SGPA of 8 semesters between 5 to 10. Calculate the CGPA of each student in below Grade form. <table><tr><td>O</td><td>S</td><td>A</td><td>B</td><td>C</td></tr><tr><td>100>=9</td><td>8-8.9</td><td>7-7.9</td><td>6-6.9</td><td>5-5.9</td></tr></table>	O	S	A	B	C	100>=9	8-8.9	7-7.9	6-6.9	5-5.9																										
O	S	A	B	C																																	
100>=9	8-8.9	7-7.9	6-6.9	5-5.9																																	
3.	Create 10 students name in the form of First name, Middle name and Last name. Concatenate all the names and store in one column and also find the length of each name.																																				
4.	Suppose your customer survey results from the east and west regions, month wise are <table><tr><td>MONTH</td><td>EAST</td><td>WEST</td><td>LOW(<50%)</td><td>MEDIUM(50%-80%)</td><td>HIGH(>80%)</td></tr><tr><td>15-Apr</td><td>86.40%</td><td>63.00%</td><td>50%</td><td>30%</td><td>20%</td></tr><tr><td>15-May</td><td>45.80%</td><td>58.90%</td><td>50%</td><td>30%</td><td>20%</td></tr><tr><td>15-Jun</td><td>44.10%</td><td>81.60%</td><td>50%</td><td>30%</td><td>20%</td></tr><tr><td>15-Jul</td><td>77.60%</td><td>86.10%</td><td>50%</td><td>30%</td><td>20%</td></tr><tr><td>15-Aug</td><td>80.70%</td><td>95.00%</td><td>50%</td><td>30%</td><td>20%</td></tr></table> For the above date, display customer satisfaction survey using Band Chart.	MONTH	EAST	WEST	LOW(<50%)	MEDIUM(50%-80%)	HIGH(>80%)	15-Apr	86.40%	63.00%	50%	30%	20%	15-May	45.80%	58.90%	50%	30%	20%	15-Jun	44.10%	81.60%	50%	30%	20%	15-Jul	77.60%	86.10%	50%	30%	20%	15-Aug	80.70%	95.00%	50%	30%	20%
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15-Aug	80.70%	95.00%	50%	30%	20%																																
5.	There is a loan of 5,000,000 for tenure of 30 years. You want to know the monthly payments (EMI) for varied interest rates. You also might be interested in knowing the amount of interest and Principal that is paid in the second year.																																				
6.	Suppose there is a bookstore that has 100 books in storage. The original price of the book is 250 and certain number of books was sold at that price. Later, the bookstore announced a 10% discount on that book and cleared off the stock. You might want to know how many																																				

S N	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=HZARlmviDxg 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 (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. 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 given strings Sample Output: Sample Output: Original string: Original string: Python Exercises Python Exercises Python Exercises Python Exercise Similarity between two said strings: Similarity between two said strings: 1.0 0.967741935483871 Strings: https://www.youtube.com/watch?v=ISltwlnF0eU String functions: https://www.youtube.com/watch?v=9a3CxJyTq00

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. https://www.youtube.com/watch?v=RRHQ6Fs1b8w&list=PLjVLYmrlmjGcC0B_FP3bkJJIPkV5GuZR&index=3 https://www.youtube.com/watch?v=7ABCuhWO9II&list=PLjVLYmrlmjGcC0B_FP3bkJJIPkV5GuZR&index=4
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=6 https://www.youtube.com/watch?v=PSji21jUNO0&list=PLjVLYmrlmjGcC0B_FP3bkJJIPkV5GuZR&index=7
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=PLosiE80TeTvipOqomVEeZ1HRrcEvtZB_
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, 2015. (Available under CC-BY-NC license at <http://greenteapress.com/thinkpython2/thinkpython2.pdf>)
4. Jake VanderPlas "Python Data Science Handbook" 1st Edition, O'REILLY.

Course Title	DATA STRUCTURES AND APPLICATIONS LABORATORY		
Course Code	23IS308	(L-T-P)C	(0-0-2) 1
Exam	3 Hrs.	Hours/Week	2 Hrs
SEE	50 Marks	Total Hours	28

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

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

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

Course Contents:

Guided Laboratory Experiments

1.	Design and Implement a menu driven Program in C for the following Array operations: 1. Creating an Array of N Integer Elements 2. Display of Array Elements with Suitable Headings 3. Inserting an Element (ELEM) at a given valid Position (POS) 4. Deleting an Element at a given valid Position (POS)
2.	Illustrate the concepts of malloc(), calloc(),realloc() for the dynamic allocation of memory
3.	Write a C Program to create a class called STACK to store Integers for the following operations (Array Implementation of Stack with maximum size MAX) a. Push an Element on to Stack b. Pop an Element from Stack c. Demonstrate Overflow and Underflow situations on Stack
4.	Write recursive C Programs for 1. Searching an element in a given list of integers using the Binary search method. 2. Solving the Towers of Hanoi problem.
5.	Develop a Program in C for converting an Infix Expression to Postfix Expression. Program should support for both parenthesized and free parenthesized expressions with the operators: +, -, *, /, % (Remainder), ^ (Power) and alphanumeric operands.
6.	Create a Queue, perform different operations such as Insert, Delete and Display.
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

Course Title	Social Connect & Responsibility		
Course Code	23SCR	L-T-P	(0-0-2)1
Exam	3 Hrs.	Hours/Week	2
CIE	100 Marks	Total Hours	20 hours
Course Objective: Provide a formal platform for students to communicate and connect with their surroundings and create a responsible connection with society.			
Course outcomes: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to PO's	
1	Describe societal challenges and build solutions to alleviate these complex social problems through immersion, design & technology.	3,5,6	
2	Communicate and connect with their surroundings.	7,12	
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, photo blog and documentary on evolution and practice of various craft forms.			
MODULE -3			
Organic farming and waste management: Usefulness of organic farming, wet waste management in neighboring villages, and implementation in the campus.			
MODULE -4			
Water Conservation: knowing the present practices in the surrounding villages and implementation in the campus, documentary or photo blog presenting the current practices. Food Walk City's culinary practices, food lore, and indigenous materials of the region used in cooking.			
Course Conduction			
A total of 15-20 hours engagement per semester is required for the course. Students will be divided into teams and each team will be handled by two faculty mentors . Faculty mentors will design the activities for evaluation.			
Guideline for Assessment Process:			
Continuous Internal Evaluation (CIE)			
After completion of, the social connect, the student shall prepare, with daily diary as reference, a comprehensive report in consultation with the mentor/s to indicate what he has observed and learned in the social connect period. The report should be signed by the mentor. The report shall be evaluated on the basis of the following criteria and/or other relevant criteria pertaining to the activity completed.			
• Dairy recording the details of activity conducted • Planning and scheduling the social connect • Information/Data collected during the social connect • Analysis of the information/data and report writing Considering all above points allotting the marks as mentioned below			
Excellent	80 to 100		
Good	60 to 79		
Satisfactory	40 to 59		
Unsatisfactory and fail	<=39		

Course Articulation Matrix

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

Course Title	NSS,YOGA,PE		
Course Code	23NYP1	(L-T-P)C	(0-0-2) A
Exam	-	Hours/Week	2 Hrs
SEE	-	Total Hours	28

Course Objective: Importance of Sports & Yoga in day-to-day life

• National Service Scheme (NSS) will enable the students to: Understand the community in which they work identify the needs and problems of the community and involve them in problem-solving

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	The importance of fitness/sports in day-to-day life	9,12	
2	Benefits of Yoga on fitness and health	9,12	
3	Understand the importance of his/her responsibility towards the society.	6	
4	Analyze the environmental and societal problems/issues and will be able to design solutions for the same	6	

Course Contents:

SPORTS and ATHLETICS:

Athletics Track- 110 & 400 Mtrs 110 Mtrs and 400Mtrs:

Hurdling Technique: Lead leg Technique, Trail leg Technique, Side Hurdling, Over the Hurdles Crouch start (its variations) use of Starting Block. Approach to First Hurdles, In Between Hurdles, Last Hurdles to Finishing Hurdles

Jumps- High Jump Approach Run, Take-off, Bar Clearance (Straddle), and Landing Throws- Discuss Throw: Holding the Discus, Initial Stance Primary Swing, Turn, Release and Recovery (Rotation in the circle).

YOGA:

Introduction of Yoga, Aim, and Objectives of Yoga, Prayer, Yoga, its origin, history, and development.

1)Yoga, its meaning, definitions.

2) Brief introduction of yogic practices for the common man- Yogic practices for the common man to promote positive health

3) Rules and regulations

4) Misconceptions of Yoga

5) Suryanamaskara

6) Different types of Asanas

a. Sitting- 1. Padmasana, 2. Vajrasana

b. Standing- 1. Vrikshana, 2. 2. Trikonasana

c. Prone line-1. Bhujangasana 2. Shalabh asana d. Supine line- Utthita dvipadasana, 2. Ardha halasana

NSS:

1. Organic farming, Indian Agriculture (Past, Present, and Future) Connectivity for marketing.

2. Waste management– Public, Private and Govt organization, 5 R's.

3. Setting of the information imparting club for women leading to contribution to social and economic issues.

4. Water conservation techniques – Role of different stakeholders– Implementation.

5. Preparing an actionable business proposal for enhancing the village income and approach for implementation.

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

7. Developing a Sustainable Water management system for rural areas and implementation approaches.

8. Contribution to any national-level initiative of the Government of India. Foreg. Digital India, Skill India, Swachh Bharat, Atmanirbhar Bharath, Make in India, Mudra scheme, Skill development programs, etc.
9. Spreading public awareness under rural outreach programs. (minimum 5 programs).
10. Social connections and responsibilities.
11. Plantation and adoption of plants. Know your plants.
12. Organize National integration and social harmony events /workshops /seminars. (Minimum 02 programs).
13. Govt. school Rejuvenation and helping them to achieve good infrastructure.

References:

- Dharma, P.N. Fundamentals of Track and Field, Khel Sahitya Kendra, New Delhi
- Swami Kuvulyananda : Asma (Kavalyadhama, Lonavala) • Tiwari, O P : Asana Why and How
- Ajitkumar : Yoga Pravesha (Kannada)
- Swami Satyananda Saraswati : Asana Pranayama, Mudra, Bandha (Bihar School of yoga, Munger)
- Swami Satyananda Saraswati : Surya Namaskar,(Bihar School of Yoga, Munger)
- Nagendra H R : The art and science of Pranayama
- NSS Course Manual, Published by NSS Cell, VTU Belagavi

Course Title	Bridge Course for Diploma Students BRIDGE COURSE MATHEMATICS - I (Common to all Branches of Engineering) (Audit Course)		
Course Code	23BCM301	L-T-P	(3-0-0)
Exam	3 Hrs.	Hours/Week	3
SEE	50 Marks	Total Hours	42
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.	Solve simple problems on determinants, matrix multiplication, partial differentiation, and integration.	1	-
2.	Compute the roots of transcendental equations and interpolate when the experimental data is given.	1	-
3.	Expand the given function in terms of Taylor/ Macluarin's series.	1	-
MODULE – 1			10Hrs.
Basic Formulas: Partial fractions. Matrices and determinants: matrix multiplication, evaluation of determinants, finding inverse. Differentiation-I: Review of limit and Continuity, differentiation- Basic formulas, Sum rule, product rule, quotient rule, chain rule and problems. Differentiation-II: Taylor's series, and Macluarin's series of simple functions for single variable, simple problems.			
MODULE – 2			10 Hrs.
Partial Differentiation: Definition, Illustrative examples on Partial differentiation, Total differentiation, chain rule, Differentiation of composite and implicit functions, Jacobians, illustrative examples and problems, simple problems.			
MODULE -3			10 Hrs.
Integration: Basic formulas, Illustrative examples, evaluation of definite integrals, Integration by parts, Bernoulli's rule of Integration. Integral calculus: Reduction formula for functions $\int \sin^n x$, $\int \cos^n x$ (without proof), Simple problems, Double & triple integration, simple problems with standard limits.			
MODULE -4			12 Hrs.
Numerical Methods - Numerical Solution of algebraic & transcendental equations by Bisection method, Newton Raphson method.			

Numerical Interpolation-Definition of forward, backward differences, Newton's forward and backward interpolation formulae, Lagrange's interpolation formula, central difference formulas-Bessel and Stirling formulas, illustrative examples.

Practical Component:

NIL

Note –1. Theorems and properties without proof. Applicable to all the modules.

2. Self study part is not included for Semester End Examination.

Text Books:

1. Dr. B. S. Grewal, Higher Engineering Mathematics, Khanna Publications, 40th edition (2007).
2. Erwin Kreyszig, Advanced Engineering Mathematics, Tata McGraw Hill, Publications, 8th edition (2007).

Reference Books:

1. Calculus by Thomas Finney, 9th edition, Pearson education, 2002.
2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010..

Course Articulation Matrix

[illegible]

Course Title	Mathematics for Information Science Engineering-II		
Course Code	23MAIS401	L-T-P	(3-1-2) 4
Exam	3 Hrs.	Hours/Week	6
SEE	50 Marks	Total Hours	65(40L+13T+12P)
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.	Correlate the experimental data using correlation coefficient. Predict the output corresponding to input using regression, fit a curve to the data, solve simple problems on probability and joint probability.	1	-
2.	Validate an assumption through "hypothesis testing" (that is the assumption is not simply because of chance).	1,2	-
3.	Analyze the problems connected with probability to apply suitable probability distribution and also, predict the probability in the long run for Markov chain-based problems.	1,2	-
4.	Write the R-programme for the mathematical procedures connected with probability and statistics and model real-life problems/engineering application problems and solve the same.	1,2,5	-
MODULE – 1			10 Hrs.
Statistics: Correlation, Karl Pearson coefficient of correlation and Spearman's rank correlation coefficient. Physical interpretation of numerical value of the rank correlation coefficient. Linear Regression analysis (when the experimental output depends on one input). Illustrative examples from engineering field, multiple linear regression analysis (When the experimental output depends on two inputs). Curve fitting-exponential. Self-study: Illustrative examples. Curve fitting-linear, quadratic.			
MODULE – 2			10 Hrs.
Brief introduction: Random variable Continuous Random Variables: Definition of PDF and CDF, Expectation and Variance, illustrative examples. Probability distribution: Exponential pdf, Normal/Gaussian pdf. Discussion on the choice of PDF. Illustrative examples from engineering field. Application: Current measurement problems and Digital transmission channel connected with pdf. Self-study: Uniform pdf. Detection of signal connected with pdf.			
MODULE -3			10 Hrs.
Confidence intervals & Hypothesis analysis: Introduction, Testing a hypothesis, central limit theorem-statement, Level of significance, Simple sampling of attributes, confidence intervals, Test of significance for large samples, Comparison of large samples, Student's t-distribution, Chi-square distribution. Application: Propellant burning rate, process-capacity problem. Self-study: drying time problem, Two catalyst effect on chemical reaction.			
MODULE -4			10 Hrs.

Joint Probability Distribution & Stochastic Processes: Concept of joint probability, Joint distributions of discrete random variables, Independent random variables-problems. Joint expectation, co-variance, and correlation.

Markov Chains: Introduction, stochastic matrices, fixed probability vectors and regular stochastic matrices.

Application: Application of Markov chain to determine the voting tendencies.

Self-study: Estimating the population distribution of a city due to migration.

Tutorial:

1. A report on the need of studying Correlation & Linear Regression.
2. Examples on Correlation & Linear Regression.
3. A report on the need of studying Multiple Regression.
4. Examples on Multiple Regression.
5. Examples on Continuous Random Variable.
6. Examples on Normal probability distribution & exponential probability distribution.
7. Discussion on the applications connected with Normal probability distribution.
8. Discussion on the applications connected with Exponential probability distribution.
9. Examples on Hypothesis testing such as student-t test, Chi-square.
10. Examples on Joint probability distribution.
11. Application of Joint probability distribution in engineering.
12. Examples on Markov chain.
13. Application of Markov chain in engineering.

Practical Component:

1. Examining the correlation of the experimental data.
2. Carryout linear regression and multiple regression analysis for the experimental data.
3. To predict the probability of continuous random variable in an interval (Uniform random variable, exponential variable).
4. To predict the probability of continuous random variable in an interval (Normal random variable).
5. Hypothesis testing on application problem connected with mean, variance, proportions when sample size is large.
6. Hypothesis testing on application problem connected with mean, variance, proportions when sample size is less (student's T distribution, chi square distribution)
7. To predict the probability of application connected with Markov process in long run.
8. Estimating the population distribution of a city due to migration.

Activity:

1. Negative binomial distribution: Failure of server's problems,
2. Poisson distribution: Contamination problem, flaws in wires.
3. Exponential distribution: lack of memory property.
4. Continuous random variable: Shaft conforms.
5. Continuous random variable: detection of signal, Digital transmission channel.
6. Hypothesis analysis Depression treatment.
7. Hypothesis analysis defect in printed circuit board.
8. Confidence levels: Doping the cement with lead effect on percentage of calcium.
9. Current measurement problems, Propellant burning rate, process-capacity problem, drying time problem, two catalyst effect on chemical reaction.

10. Application of Markov chain in estimating the population distribution of a city due to migration.

Note –1. Theorems and properties without proof. Applicable to all the modules.

2. Self study part is not included for Semester End Examination.

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Higher Engineering Mathematics	Dr. B. S. Grewal	44th Edition	Khanna Publications	2016.
2	Advanced Engineering Mathematics	Erwin Kreyszig	9th edition	Wiley India Pvt. Ltd	2014
3	Higher Engineering Mathematics	B V Ramana	2nd edition	Tata McGraw Hill Publications	2007

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Probability and Random Process with application to Signal Processing	Scott L. Miller, Donald G. Childers	2nd Edition	Elsevier Academic Press	2013
2	Statistics for engineers and Scientists	William Navide	3rd edition	Mc-Graw hill education, India pvt. Ltd.	2014
3	Probability, Statistics and Random Process	T.Veerarajan	3rd edition	Tata McGraw Hill Co.	2008
4	Theory and problems of probability	Seymour Lipschutz and marclarslipson	2nd edition	Schaum out line series	2008

MOOC Course:

SN	Course Name	Course offered by	Year	URL
1	Probability, Statistics and Random Process	nptel	2023	http://nptel.ac.in/courses.phd?disciplineID=111

Course Title	Microprocessor and Microcontroller		
Course Code	23IS402	(L-T-P)C	(3-0-2)4
Exam	3 Hrs.	Hours/Week	5
SEE	50 Marks	Total Hours	50 (36L+14P)
Course Objective: To get acquainted with the importance and applications of Microprocessor and Microcontroller. Course outcomes: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Describe the complete architecture of the 8086 processor and the Segmented memory management.	1	-
2	Develop the assembly language programs for the given problems.	3	-
3	Describe the architectural features and instructions of AR microcontroller	2	-
4	Interface external devices and I/O with ARM microcontroller.	3	-
MODULE – 1			09 Hrs.
The 8086/8088 Processors: Register Organization of 8086, Architecture, Signal descriptions of 8086, Physical memory organization, General bus operation, I/O Addressing capability, Special processor activities, 8086 Machine language Instruction formats, addressing modes of 8086, Instruction set of 8086/8088. GPU: Introduction to GPU, Streaming multiprocessors, cache hierarchy, graphics pipeline.			
MODULE – 2			09 Hrs.
8086/8088 Instruction Set & Assembler Directives: Assembler Directives and Operators. Instruction Set. The art of Assembly Language Programming with 8086/8088: A few machine level programs, Machine coding the programs.			
MODULE -3			09 Hrs.
Microprocessors versus Microcontrollers, ARM Embedded Systems: The RISC design philosophy, The ARM Design Philosophy, Embedded System Hardware, Embedded System Software. ARM Processor Fundamentals: Registers, Current Program Status Register, Pipeline, Exceptions, Interrupts, and the Vector Table, Core Extensions.			
MODULE -4			09 Hrs.
Introduction to the ARM Instruction Set: Data Processing Instructions, Programme Instructions, Software Interrupt Instructions, Program Status Register Instructions, Coprocessor Instructions, Loading Constants. ARM programming using Assembly language: Writing Assembly code, Profiling and cycle counting, instruction scheduling, Register Allocation, Conditional Execution, Looping Constructs.			

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Advanced Microprocessors and Peripherals	Ajoy Kumar Ray & Kishor M Bhurchandi,	3rd	McGraw Hill publication	2018

2.	ARM system developer's guide,	Andrew N Sloss, Dominic Symes and Chris Wright,	3rd	Kaufman publishers	2008
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Reference Books:

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

E Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Advanced Microprocessors and Peripherals.	Ajoy Kumar Ray & Kishor M Bhurchandi,	3rd	McGraw Hill publication	2018

MOOC Course:

Sl.No	Course Name	Course offered by	Year	URL
1	Microprocessors and Interfacing	By Prof. Shaik Rafi Ahamed IIT Guwahati	2022	https://onlinecourses.nptel.ac.in/noc22_ee09/preview

Proposed Assessment Plan (for 50 marks of CIE)

Laboratory Plan:

Tool	Remarks	Marks
Internals	Three tests conducted for 20 marks each and reduced to 10 marks	30
AAT	Laboratory Conduction	20
Total		50

Lab Program	Program Details
PART A Conduct the following 8086 Microprocessor experiments by writing program using MASM.	
1	Write a program to find factorial of a number.
2	Performing binary search on given 'n' 8 - bit and 16 - bit numbers.
3	Reversing a given string and check whether it is a palindrome or not.

Course Title	DATABASE MANAGEMENT SYSTEMS		
Course Code	23IS403	(L-T-P)C	(3-0-2) 4
Exam	3 Hrs.	Hours/Week	5
SEE	50 Marks	Total Hours	50 (36L+14P)

Course Objective: Students will acquire the concepts of database, and application of SQL for solving problem.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	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.

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.

MODULE-4

9 Hrs

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

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

Prescribed Text Books:

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

Reference Books:

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

E Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Fundamentals of Database Systems	Elmasri and Navathe	7th	Addison-Wesley	2015

MOOC Course:

Sl.No	Course Name	Course offered by	Year	URL
1	Database Management Systems	NPTEL	2022	https://nptel.ac.in/courses/106105175
2	MongoDB	Tutorialspoint	2024	https://www.tutorialspoint.com/mongodb/mongodb_overview.html

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	Database lab program execution	20
Total		50

Laboratory Plan:

Lab Program	Program Details
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 - Find all sailors with a rating above 7 - Find the names of sailors who have reserved boat number 103 - Find the names of sailors who have reserved a red boat - Find the names of sailors who have reserved a red or a green boat 3.
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) Write the following queries in SQL. No duplicates should be printed in any of the answers. - Find the names of all Juniors (level = JR) who are enrolled in a class taught by Prof. Harshith - Find the names of all classes that either meet in room R128 or have five or more Students enrolled. - Find the names of all students who are enrolled in two classes that meet at the same time. - 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) CUSTOMER(customer_name:String,customer_street: String,customer_city:String) 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.
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Course Articulation Matrix:

Course Outcomes	Program Outcomes [POs]													
COs	O1	O2	O3	O4	O5	O6	O7	O8	O9	O10	O11	O12	SO1	SO2
CO1	3													
CO2			3											2
CO3		3												
CO4	3													

Course Title	DESIGN AND ANALYSIS OF ALGORITHMS		
Course Code	23IS404	(L-T-P)C	(3-0-0)3
Exam	3hrs	Hours/Week	3
SEE	50 Marks	Total Hours	40

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

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

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

MODULE 1	10 Hrs.
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Introduction: Notion of Algorithm, Fundamentals of algorithmic problem solving. **Fundamentals of the Analysis of Algorithm Efficiency:** Analysis framework, Asymptotic notations and Basic efficiency classes, Mathematical analysis of Recursive and Non-recursive algorithms, Examples. **Brute Force:** Selection Sort and Bubble Sort, Sequential Search and String Matching, Exhaustive search.

MODULE 2	10 Hrs.
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Divide-and-Conquer: Binary Search, Merge Sort, Quick Sort, Binary tree traversals and related properties, Multiplication of large integers, Strassen's Matrix multiplication. **Decrease-and-Conquer:** Insertion Sort, Depth First and Breadth First Search, Topological sorting, Algorithms for generating combinatorial objects.

MODULE 3	10 Hrs.
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Transform-and-Conquer: Pre-sorting, Balanced Search Trees, Heaps and Heap Sort, Problem reduction. **Space and Time Trade-off:** Sorting by counting, Input enhancement in string Matching (only Horspool), Hashing. **Dynamic Programming:** Computing a Binomial coefficient, Warshall's Algorithm, Floyd's algorithms, The Knapsack problem.

MODULE -4	10 Hrs.
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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.

Prescribed Text Books:

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

Reference Books:

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

E Books:

SN	Book Title	Authors	Edition	Publisher	Year
1	Introduction to the Design and Analysis of Algorithms	Anany Levitin	3rd Edition	Pearson Education	2017.

MOOC Course:

Sl.No	Course Name	Course offered by	Year	URL
1	1. Design and Analysis of Algorithms	nptel	2022	https://nptel.ac.in/courses/106/106/106106131/

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Three tests conducted for 20 marks each and reduced to 10 marks	30
AAT	Demonstration activity: On different algorithm technique with real world examples.	20
Total		50

Course Articulation Matrix

[illegible]

Course Title	C# AND .NET TECHNOLOGIES		
Course Code	23IS405A	(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	

Prescribed Text Books:

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

Reference Books:

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

MOOC Course:

Sl.No	Course Name	Course offered by	Year	URL
1	C#	coursera	2020	https://www.coursera.org/learn/intro-to-dotnet-core

Course Articulation Matrix

[illegible]

Course Title	Internet of things		
Course Code	23IS405B	(L-T-P)C	(2-0-2)3
Exam	3 Hrs.	Hours/Week	4
SEE	50 Marks	Total Hours	40(28+12P)
Course Objective: Students will be able to develop IOT applications. Course Outcomes: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Understand the fundamentals and applications of IoT, its Architecture, Design Principles and Standards	1	-
2.	Apply programming skills to design IoT applications	3	-
3.	Appraise the role of IoT protocols for efficient network communication.	2	2
4.	Design and Implement applications of IoT and make presentation in team	5, 10	2
MODULE-1			7 Hrs
Introduction to Internet of Things: Definition and characteristics of IoT, Physical design of IoT, Things in IoT, IoT Protocols, Logical Design, IoT functional blocks, IoT communication Models, IoT communication API's, IoT enabling Technologies Wireless sensor networks, Cloud Computing, Big Data Analytics, Communication protocols, embedded systems. IoT levels and deployment template Domain specific IoTs, - IoT levels, Introduction, Home Automation; Cities; Environment; Energy; Retail; Logistics; Agriculture; Industry; Health & Lifestyle.			
MODULE-2			7 Hrs
IoT and M2M IoT System management with NETCONF-YANG Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT- Software defined networking, network function virtualization Need for IoT Systems management; SNMP; Network Operator Requirements; NETCONF; YANG; IoT Systems management with NETCONFYANF; NETOPE IoT platform Design Methodology - IoT Design Methodology; Introduction; Case Study on IoT System for Weather Monitoring,			
MODULE-3			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, AmazonEC2, 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 Madiseti	1st	Universities Press	2015

Reference Books:

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

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 Madiseti	1st	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	Lab Conduction	20
Total		50

Laboratory Plan:

Lab Program	Program Details
1	Study the fundamental of IOT software and components.
2	Familiarization with Ardunio / raspberry Pi and perform necessary software.
3	To interface LED / Buzzer with Ardunio / raspberry Pi and write a program to turn on LED for one seconds after every two seconds.
4	To interface push button Digital sensor(IR/LDR)with Ardunio / raspberry Pi and write a program to turn on LED when push button is pressed or at sensor detection.
5	To interface DHT level sensor with Ardunio / raspberry Pi and write a program to print temperature and humidity readings.
6	To interface motor using relay with Ardunio / raspberry Pi and write a program to turn on motor when push button is pressed.
7	To interface Bluetooth with Ardunio / raspberry Pi and write a program to send sensor data to smart phone using Bluetooth.
8	write a program on Ardunio / raspberry Pi to upload temperature and humidity data to thinkspeak cloud.

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	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3													
CO2			2											
CO3		2												3
CO4					3					3				3

Course Title	OPTIMIZATION TECHNIQUES		
Course Code	23IS405C	L-T-P-C	(2-0-2)3
Exam Hrs.	3	Hours / Week	4
SEE	50 Marks	Total Hours	40
Course Objective: Solve optimization problems using various methods			
Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Develop mathematical model for a given problem.	1	-
2.	Apply techniques of Operations Research.	2	-
3.	Solve prediction and estimation problems.	1, 2	-
4.	Expose to the significance of various scientific tools.	5	-
Course Contents:			
MODULE – 1			10 Hrs
Introduction : Introduction: The origin, nature and impact of OR; Overview of the Operations Research Modeling Approach: Defining the Problem and Gathering Data; Formulating a Mathematical Model; Deriving Solutions from the Model; Testing the Model; Preparing to Apply the Model; Implementation Linear Programming – 1 : Prototype example; The Linear Programming (LP) Model, Assumptions of LP, Additional Examples			
MODULE – 2			10 Hrs
Simplex Method - 1 : The Essence of the Simplex Method; Setting up the Simplex Method; The Algebra of the Simplex Method; The Simplex Method in Tabular Form; Tie Breaking in the Simplex Method Simplex Method – 2 : Adapting to other Model Forms; Post Optimality Analysis, Computer implementation.			
MODULE – 3			10 Hrs
Revised Simplex Methods : Foundations of the Simplex Method, The revised simplex method, A Fundamental Insight Duality Theory : The Essence of Duality Theory; Economic Interpretation of Duality. Primal-Dual Relationships , Adapting to other primal forms, The role of duality in sensitive analysis; The essence of sensitivity analysis; Applying sensitivity analysis, The dual simplex method ; Parametric linear programming; The upper bound technique.			
MODULE – 4			10 Hrs
Transportation Model :Definition of the Transportation Model, Nontraditional Transportation Models, The Transportation Algorithm. Assignment Model and Network Models : The Assignment Model, CPM and PERT			

Course Title	PROBABILTYY, STASTISTICS AND QUEING		
Course Code	23IS405D	L-T-P	(3-0-0)3
Exam	3 Hrs.	Hours/Week	3 Hrs
SEE	50 Marks	Total Hours	40
Course Objective: To study the basics of statistics, measure central tendency and dispersion. Course outcomes: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Understand the basics of probability, sample space, events, statistics and apply them to real life problems	1	-
2.	Distinguish probability density and distribution functions for single and multiple random variables.	1	-
3.	Use the probability, moment generating functions and characteristic functions.	1	-
4.	Formulate, analyze and validate models applicable to practical problems.	2	-
MODULE – 1			10 Hrs.
Probability Theory: Definition of probability: classical, empirical and axiomatic approach of probability, Addition theorem of probability, Multiplication theorem of probability, Bayes theorem of inverse probability, Properties of probabilities with proofs, Examples.			
MODULE – 2			10 Hrs.
Random Variable and Mathematical Expectation: Definition of random variables, Probability distributions, Probability mass function, Probability density function, Mathematical expectation, Join and marginal probability distributions, Properties of expectation and variance with proofs, Examples.			
MODULE -3			10 Hrs.
Correlation: Introduction, Types of correlation, Correlation and causation, Methods of studying correlation, Karl Pearson's correlation coefficient, Spearmans rank correlation, Coefficient, Properties of Karl Pearson's correlation coefficient, Properties of Spearmans rank correlation coefficient, Probable errors, Examples.			
MODULE -4			10 Hrs.
Linear Regression Analysis: Introduction, Linear and non-linear regression, Lines of regression, Derivation of regression lines of y on x and x on y, Angle between the regression lines, Coefficients of regression, Theorems on regression coefficient, Properties of regression coefficient, Examples.			
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

[illegible]

Course Title	Green IT and Sustainability		
Course Code	23IS406A	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	-

MODULE – 1

5 Hrs.

Green IT: An Overview Green IT fundamentals - Environmental Impacts of IT - Green IT standards - Applying IT for enhancing environmental sustainability

MODULE – 2

5 Hrs.

Green Devices And Hardware Life cycle of a device or hardware - Reuse, Recycle and dispose. Green software - Energy saving software techniques, Green information systems, evaluating software impact to platform power.

MODULE -3

5 Hrs.

Managing Green IT Implementation of Green IT, Information Assurance and communication - Green Enterprise transformation roadmap -Green compliance.

MODULE -4

5 Hrs.

Law, Standards and Protocols Regulatory environment and IT manufacturers, Non regulatory government initiatives, Green building standards, Green data centers.

Text Books:

1. Bhuvan Unhelkar, —"Green IT Strategies and Applications-Using Environmental Intelligence", CRC Press, June 2014

Reference Books:

1. Woody Leonhard, Katherine Murray, —Green Home computing for dummies, August 2012.
2. San Murugesan, G.R. Gangadharan "Harnessing Green IT Principles and Practices", Wiley Publication, ISBN:9788126539680.

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		2				2	2							
CO4		2				2	2							

Course Title	UI/UX LABORATORY		
Course Code	23IS406B	(L-T-P)C	(0-0-2)1
Exam Hrs.	3	Hours / Week	2
SEE	50 Marks	Total Hours	28
Course Objective: To gain a solid understanding of fundamental UI/UX principles, including visual design, user-centered design, usability, and user experience. Course Outcomes (COs): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply design principles and guidelines to create visually appealing and user-friendly interfaces for websites and mobile applications.	3	-
2.	Develop wire frames and interactive prototypes using design tools to visualize and communicate interface concepts and user flows.	3,5	-
Course Contents:			
1	Designing a Login Form: Design a user-friendly login form for a mobile app. Consider the layout, input fields, button design, and error handling to create an intuitive and visually appealing login experience.		
2	Creating a Navigation Menu: Design a navigation menu for a website that includes dropdown menus and a responsive design. Ensure the menu is easy to navigate and visually consistent across different screen sizes.		
3	Redesigning a Landing Page: Redesign a landing page for a product or service. Improve the visual hierarchy, use compelling imagery, and optimize the layout to encourage user engagement and conversions.		
4	Creating a Contact Form: Design a contact form for a website that captures essential user information. Consider input validation, error messages, and a confirmation message to enhance the user experience.		
5	Designing a Product Card: Create a visually appealing product card for an e-commerce website. Include product images, title, price, and call-to-action buttons to entice users to learn more and make a purchase.		
6	Improving Form Usability: Evaluate an existing form on a website for usability issues and propose improvements. Focus on optimizing the form's layout, labeling, and input validation to enhance user comprehension and completion rates.		
7	Enhancing Mobile App Onboarding: Design an onboarding experience for a mobile app. Create a series of screens that introduce users to the app's features and guide them through the setup process in a clear and engaging manner.		
8	Redesigning a Checkout Process: Redesign the checkout process for an e-commerce website. Simplify the steps, provide clear instructions, and optimize the layout and form inputs to streamline the purchasing experience.		

Course Title	INTRODUCTION TO WEB TECHNOLOGY		
Course Code	23IS406C	L-T-P	(0-0-1)1
Exam	3 Hrs.	Hours/Week	2
SEE	50 Marks	Total Hours	26

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

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

#	Course Outcomes	Mapping to PO	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

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, 8 th 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

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

[illegible][illegible]

Course Title	TECHNICAL WRITING USING LATEX		
Course Code	23IS406D	L-T-P	(0-0-1)1
Exam	3 Hrs	Hours/Week	2 Hrs
SEE	50 marks	Total Hours	28 Hrs
Course Objective: To introduce the basic syntax and semantics of the LaTeX scripting language			
Course outcomes: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Identify different types of technical documents for a given requirement.		-
2.	Create well-written short technical documents and typeset it in LaTeX	1	-
3.	Create a simple report for a given technical topic, and typeset it in LaTeX	1	-
4.	Create a sample research paper in a technical topic, and typset it in LaTeX templates	2	-
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. TobiasOetiker,“The Not So Short Introduction to LATEX” 2e https://cslab.pepperdine.edu/warford/cosc320/lshort.pdf [retrieved 18 Oct. 22]			
Course Articulation Matrix			

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

Course Title	Biology for Engineers		
Course Code	23BEIS407	(L-T-P)C	(0-0-2)1
Exam	3 Hrs.	Hours/Week	2
SEE	50 Marks	Total Hours	28
Course Objective: Realization of relation between Natural Engineering and man-made Engineering. Course outcomes: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	To familiarize engineering students with basic biological concepts	1	-
2	To involve students in an interdisciplinary vision of biology and engineering	2	-
3	To gain an appreciation for how biological systems can be designed and engineered to substitute natural system	2	-
4	To develop biological models using AI tools	3	-
MODULE – 1			6 Hrs.
Introduction to Human Anatomy: Overview of human anatomy, Structural organization of the human body- cardiovascular system, endocrine system, digestive system, respiratory system, excretory system, lymphatic system, nervous system, muscular system and skeletal system.			
MODULE – 2			8 Hrs.
Bioinspired Engineering based on human physiology: Circulatory system (artificial heart, pacemaker,stents), Nervous system (Artificial neural network).			
MODULE -3			8 Hrs.
Bioinspired Algorithms and Applications: Genetic algorithm, Gene expression modelling. Parallel Genetic Programming: Methodology, History, and Application to Real-Life Problems. Dynamic Updating DNA Computing Algorithms. Beehive: New Ideas for Developing Routing Algorithms Inspired by Honey Bee Behaviour.			
MODULE -4			6 Hrs.
Artificial Intelligence and Biology: Applications of AI in medical imaging, neural engineering, systems biology, microbiome and data mining.			

Prescribed Text Books:

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

E Books:

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

Proposed Assessment Plan (for 50 marks of CIE):

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

MOOC Course:

Sl.No	Course Name	Course offered by	Year	URL
1	Biology for Engineers	IIT Madras	2022	https://onlinecourses.nptel.ac.in/noc19_g e31/preview

[illegible]

Course Title	UNIVERSAL HUMAN VALUES		
Course Code	23UHV	L-T-P	(0-0-2)1
CIE	50 marks	Hours/Week	2 Hrs
SEE	50 marks	Total Hours	28 Hrs

Course Objective: The course aims at the development of the value education by the right understanding through the process of self-exploration (about themselves), family, society and nature/existence. Strengthening of self-reflection by development of commitment and courage to act are presented as the prime focus throughout the course towards qualitative transformation in the life of the student.

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

#	Course Outcomes	Mapping to POs
1.	Start exploring themselves, get comfortable with each other and with the teacher and they start appreciating the need and relevance for the course. Also they are able to note that the natural acceptance (intention) is always for living in harmony.	6, 7, 8, 9,12
2.	Differentiate between the characteristics and activities of different orders and study the mutual fulfillment among them and need to take appropriate steps to ensure right participation (in terms of nurturing, protection and right utilization) in the nature.	6, 7, 8, 9, 12
3.	Present sustainable solutions to the problems in society and nature. They are also able to see that these solutions are practicable and draw roadmaps to achieve them.	6, 7, 8, 9,12

Course Contents

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 fulfillment among the four orders of nature recyclability and self-regulation in nature. Include practice sessions to discuss human being as cause of imbalance in nature (film “Home” can be used), pollution, depletion of resources and role of technology etc	
MODULE-4	6 Hrs
Implications of the Holistic Understanding – a Look at Professional Ethics: Natural Acceptance of Human Values, D e f i n i t e n e s s 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:EkParichaya, ANagaraj, 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-J C Kumarappa 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]												PSO 1	PSO 2
	PO1	PO2	PO3	PO4	PO5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO 12		
COs														
CO1						2	1	3	2			1		
CO2						2	1	3	2			1		
CO3						2	1	3	2			1		

Evaluation :**Continuous Internal Evaluation (CIE)**

Two CIEs will be conducted for 20 marks each.

For the activity component students should form a team of 3 to 4 members each. A group activity should be assigned to each team based on the modules covered in the course. Students should show the progress in this activity as a preliminary phase for SEE.

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

Semester End Examination

SEE will be conducted for 50 marks in practical mode based on the assigned activity which may be a presentation/ prototype development/any other activity.

Course Title	DESIGN AND ANALYSIS OF ALGORITHMS LABARATORY		
Course Code	23IS408	L-T-P-C	(0-0-2) 1
Exam	3 Hrs.	Hours/Week	2 Hrs
SEE	50 Marks	Total Hours	28

Course Objective: To design and implement various algorithms in C/C++ programming using suitable development tools to address different computational challenges.

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

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

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

Course Contents:

Guided Laboratory Experiments

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.

Course Title	NSS, YOGA,PE		
Course Code	23NYP2	L-T-P-C	(0-0-2) A
Exam	-----	Hours/Week	2Hrs
SEE	---	Total Hours	28

Course Objective: Understand the Meaning and Importance of the Fit India Movement, the Definition of fitness, Benefits of fitness, Types of fitness, and Fitness tips.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	The importance of fitness/sports in day-to-day life	3	1
2	Benefits of Yoga on fitness and health	5	1
3	Understand the importance of his/her responsibility towards the society.	2	1
4.	Analyze the environmental and societal problems/issues and will be able to design solutions for the same	3	1

Course Contents:

Guided Laboratory Experiments

SPORTS and ATHLETICS: Athletics Track- 110 & 400 Mtrs 110 Mtrs and 400Mtrs: Hurdling Technique: Lead leg Technique, Trail leg Technique, Side Hurdling, Over the Hurdles Crouch start (its variations) use of Starting Block. Approach to First Hurdles, In Between Hurdles, Last Hurdles to Finishing Hurdles Jumps- High Jump Approach Run, Take-off, Bar Clearance (Straddle), and Landing Throws- Discuss Throw: Holding the Discus, Initial Stance Primary Swing, Turn, Release and Recovery (Rotation in the circle).

YOGA: Introduction of Yoga, Aim, and Objectives of Yoga, Prayer, Yoga, its origin, history, and development. 1) Yoga, its meaning, definitions. 2) Brief introduction of yogic practices for the common man- Yogic practices for the common man to promote positive health 3) Rules and regulations 4) Misconceptions of Yoga 5) Suryanamaskara 6) Different types of Asanas a. Sitting- 1. Padmasana, 2. Vajrasana b. Standing- 1. Vrikshana, 2. 2. Trikonasana c. Prone line-1. Bhujangasana 2. Shalabha asana d. Supine line- Utthita dvipadasana, 2. Ardha halasana

NSS: 1. Organic farming, Indian Agriculture (Past, Present, and Future) Connectivity for marketing. 2. Waste management- Public, Private and Govt organization, 5 R's. 3. Setting of the information imparting club for women leading to contribution to social and economic issues. 4. Water conservation techniques - Role of different stakeholders- Implementation. @#18102023 5. Preparing an actionable business proposal for enhancing the village income and approach for implementation. 6. Helping local schools to achieve good results and enhance their enrolment in Higher/ Technical/ vocational education. 7. Developing a Sustainable Water management system for rural areas and implementation

approaches. 8. Contribution to any national-level initiative of the Government of India. Foreg. Digital India, Skill India, Swachh Bharat, Atmanirbhar Bharath, Make in India, Mudra scheme, Skill development programs, etc. 9. Spreading public awareness under rural outreach programs. (minimum 5 programs). 10. Social connections and responsibilities. 11. Plantation and adoption of plants. Know your plants. 12. Organize National integration and social harmony events /workshops /seminars. (Minimum 02 programs). 13. Govt. school Rejuvenation and helping them to achieve good infrastructure.



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

Course Title	Computer Networks																						
Course Code	23IS501	(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 gain the basic knowledge of data communication and computer networks. 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>Explain the Ethernet Standard and Networking devices, Connecting devices and different protocols at the network, transport and application layers.</td><td>1</td><td></td></tr> <tr> <td>2.</td><td>Apply suitable subnetting and IP addressing for a given Requirement. Switching techniques as per need.</td><td>1</td><td></td></tr> <tr> <td>3.</td><td>Analyze different protocols at MAC sub-layer, Network and Transport Layers</td><td>2,5</td><td></td></tr> <tr> <td>4.</td><td>Design networks applying Internetworking concepts and appropriate IP addressing for a given problem</td><td>3, 4,5</td><td></td></tr> </table>				#	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. Switching techniques as per need.	1		3.	Analyze different protocols at MAC sub-layer, Network and Transport Layers	2,5		4.	Design networks applying Internetworking concepts and appropriate IP addressing for a given problem	3, 4,5	
#	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. Switching techniques as per need.	1																					
3.	Analyze different protocols at MAC sub-layer, Network and Transport Layers	2,5																					
4.	Design networks applying Internetworking concepts and appropriate IP addressing for a given problem	3, 4,5																					
MODULE-1			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 L limits, Performance. Digital Transmission: Digital-to-Digital Conversion - Line Coding, Line Coding Schemes. Transmission Media: Introduction, Guided Media, Unguided Media: Wireless. Transmission Media																							
MODULE-2			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																							



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

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:

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

MOOC Course:

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



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

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:

Sl.No	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.



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

Course Title	Theoretical Foundations of Computation		
Course Code	23IS502	(L-T-P)C	(2-2-0) 3
Exam	3 Hrs	Hours/Week	4
SEE	50 Marks	Total Hours	40

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:

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



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

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:

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

E-Book:

1. https://onlinecourses.nptel.ac.in/noc25_cs70/preview?utm_source=chatgpt.com
2. https://onlinecourses.nptel.ac.in/noc21_cs19/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	Details of activities to be conducted 1) Demonstration using JFLAP tool – 5 marks 2) Problem solving test – 10 marks 3) Concept/problem presentation – 5 marks	20
	Total	50



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

Course Title	SOFTWARE ENGINEERING		
Course Code	23IS503	(L-T-P)C	(3-0-2) 4
Exam	3 Hrs.	Hours/Week	5
SEE	50 Marks	Total Hours	50(36L+14P)
Course Objective: Use software engineering principles for application development. Course outcomes: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Analyze a system for identifying the software requirements	2	2
2	Differentiate process models to judge which process model has to be adopted for the given scenarios.	3	2
3	Apply different approaches of verifying and validating a software product and analyze the agile methodology.	1,4,5	2
4	Illustrate the role of project planning and quality management in software development.	3,7,8,9,10	2
MODULE-1			09 Hrs.
Introduction: Professional Software Development, Software Engineering Ethics. Case studies Software Processes: Software Processes models, Process activities, coping with change, The Rational Unified Process. Agile Software Development: Agile Methods, Plan-driven and Agile Development, Extreme programming. Agile Project Management. Scaling Agile Methods. Case Studies- A patient information system for mental health care, A wilderness weather station			
MODULE -2			09 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.			
MODULE -3			09 Hrs.
Design and Implementation: Object-oriented design using the UML, Design patterns, Implementation issues, Open source development. Software Testing: Development testing, Test-driven development, Release testing, User testing. Software Evolution: Evolution processes, Program evolution dynamics. Software maintenance, Legacy system management. Designing UML diagrams			
MODULE -4			09 Hrs.
Software Project Management: Software Project Management Complexities, Responsibilities of software project Manager, Project Planning, Metrics for project size estimation, Project estimation techniques, Empirical estimation techniques, Scheduling, Organization and Team Structures, Staffing, Risk Management. COCOMO, ISO9000, SEI Capability Maturity Model, Six Sigma.			



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

Prescribed Text Books:

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

Reference Books:

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

E Books:

1. <https://dpvipracollege.in/wp-content/uploads/2023/01/Ian-Sommerville-Software-Engineering-9th-Edition.pdf>

MOOC Course:

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

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
Practical	Laboratory CIE conduction	20
Total		50



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

Laboratory Plan:

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

Course Articulation Matrix:

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



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

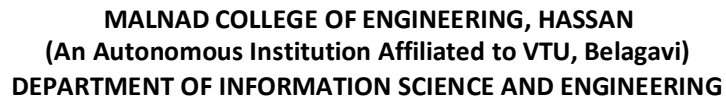
Course Title	Data Visualization Lab		
Course Code	23IS504	(L-T-P)C	(0-0-2) 1
Exam	2 Hrs.	Hours/Week	2
SEE	50 Marks	Total Hours	14

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.



Proposed Assessment Plan (for 50 marks of CIE):

MOOC Course:

Course Articulation Matrix

[illegible]



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

Course Title	Entrepreneurship and Management		
Course Code	23IS505	(L-T-P)C	(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	Examine 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, Making Planning Effective–Decision Making–Meaning, Types of Decisions, Steps in Decision Making, Common Difficulties in Decision – Making.			
MODULE-2			10 Hrs.
Organization and Staffing: Meaning and Process of Organizing - Principles of Organizing - Types of Organization - Departmentalization - Committees. Centralization Vs Decentralization of Authority and Responsibility, Nature and Importance of Staffing - Process of Selection & Recruitment (in brief). Directing Controlling: Requirements of Effective Direction, Motivation Theories, Communication–Importance, Purpose- Leadership Styles, Meaning and Steps in Controlling, Need for Control, Essentials of Effective Control System.			
MODULE-3			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			



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

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 of 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:

1. <https://www.scribd.com/document/438914396/principles-of-management-p-c-tripathi-p-n-reddy-pdf-By-EasyEngineering-net-pdf>

MOOC Course:

1. https://onlinecourses.swayam2.ac.in/cec_23_mg11/preview



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

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
COs														
CO1	3	3									3			
CO2		2									2			
CO3		2									2			
CO4						2								



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

Course Title	Computer Vision and Image Processing		
Course Code	23IS551	(L-T-P)C	(3-0-0) 3
Exam	3 Hrs.	Hours/Week	3
SEE	50 Marks	Total Hours	40

Course Objective: To understand the fundamentals of computer vision and image processing.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Apply suitable techniques to process and analyse images.	1	-
2.	Analyse appropriate operations for a given scenario.	2	-
3.	Compare the different image restoration and segmentation techniques.	3,5	-
4.	Implement various segmentation, compression and morphological algorithms.	3,5,9,10	-

MODULE-1

10 Hrs.

Introduction: Image representation, Image digitization, Digital image properties, Color images. **Image pre-processing:** Pixel brightness transformations, Geometric transformations, local pre-processing. **Segmentation:** Thresholding, Edge- based segmentation, Region based segmentation, Matching.

MODULE-2

10 Hrs.

Image understanding: Image understanding control strategies, SIFT, RANSAC, Point distribution models, Active appearance models, Pattern recognition methods in image understanding, Boosted cascade of classifiers, Image understanding using random forests , Scene labelling and constraint propagation, Semantic image segmentation and understanding, Hidden Markov models, Gaussian mixture models and expectation maximization, Basics of projective geometry, A single perspective camera, Scene reconstruction from multiple views.

MODULE-3

10 Hrs.

Image data compression and motion analysis: Image data properties, Discrete image transforms in image data compression, Predictive compression methods, Vector quantization, Hierarchical and progressive compression methods, Comparison of compression methods, JPEG and MPEG image compression, Statistical Texture description, Syntactic texture description methods, Hybrid texture description methods, Differential motion analysis methods, Optical Flow, Analysis based on correspondence of interest points, Detection of specific motion patterns, video tracking, motion models to aid tracking.

MODULE-4

10 Hrs

Shape representation and morphology: Region identification, Contour- based shape representation and description, Region based shape representation and description, Shape classes, Morphology concepts and principles, Binary dilation and erosion, Gray- scale dilation and erosion, Skeletons and object marking, Granulometry, Morphology segmentation and watersheds.



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

Prescribed Text Books:

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

Reference Books:

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

Ebooks:

1. <https://szeliski.org/Book>

MOOC/Online Course:

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

Proposed Assessment Plan (for 50 marks of CIE):

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



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

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		2									
CO4			3		2				2	2				



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

Course Title	Robotic Process Automation		
Course Code	23IS552	(L-T-P)C	(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.			



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

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	AlokMani Tripathi,	-	Packtpub	March 2018.

Reference Books:

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

E Books:

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

MOOC/Online Course:

1. <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



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

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	3										
CO4			3		3				3					3



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

Course Title	FULLSTACK DEVELOPMENT		
Course Code	23IS553	(L-T-P)C	(2-2-0) 3
Exam	3 Hrs.	Hours/Week	4
SEE	50 Marks	Total Hours	40
Course Objective: The primary objective of this course is to equip students with comprehensive skills in full stack web development using the Django framework. Students will learn the Model-View-Template (MVT) architecture, design models and forms, and utilize Django's template system and generic views. The course also aims to teach students to generate various content types and manage user authentication, enabling them to create dynamic and scalable web applications. Course outcomes: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Understand the working of MVT-based full stack web development using Django and Visual Studio Code.	1,5,11	-
2.	Design Django models and forms for the rapid development of dynamic web pages.	3,5,11	1
3.	Analyze the role of template inheritance and generic views in building scalable full stack applications.	1,2,5,11	2
4.	Apply Django libraries to render non-HTML content such as CSV and PDF documents	1,3,5,11	2
MODULE-1			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.			



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

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/Online Course:

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

EBooks:

1. <https://books.google.com.jm/books?id=h2tR8p-4a9QC&printsec=copyright#v=onepage&q&f=false>



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

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: As part of the course, students must design and implement a mini project using Django. This activity is aimed at reinforcing practical knowledge and end-to-end application development skills. - Students will develop a full-stack web application using Django as the backend framework and appropriate frontend technologies (HTML, CSS, Bootstrap, JavaScript, etc.). - The project should demonstrate integration of models, views, templates, forms, and database operations. - Each student/team must: - Identify a problem statement - Design the database schema and architecture - Develop and test the application - Present a live demonstration - Submit a detailed project report (including system design, code snippets, screenshots, challenges, and future scope) - The mini project will carry weightage in internal assessment and is a mandatory component of the course.	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				2						2			
CO2			3		2						2		3	
CO3	2	2			2						1			2
CO4	3		2		3						1			2



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

Course Title	SUPPLY CHAIN ANALYTICS																						
Course Code	23IS554	(L-T-P)C	(3-0-0) 3																				
Exam	3 Hrs.	Hours/Week	3																				
SEE	50 Marks	Total Hours	40																				
Course Objective: Apply the principles of Supply Chain Analytics for solving real time problems. 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 various importance of Supply chain Analytics process in the flows involving material, money, information and ownership</td><td>1,2,7,11</td><td>1</td></tr> <tr> <td>2.</td><td>Apply various Decision Domains in Supply Chain analytics for effective decision making.</td><td>1,2,3</td><td>1</td></tr> <tr> <td>3.</td><td>Develop effective Network Planning and Design of Logistics Network using Heuristics/optimization.</td><td>1,2,3,5</td><td>2</td></tr> <tr> <td>4.</td><td>Analyze case studies to assess the impact of data-driven decision-making in supply chain operations and strategy.</td><td>1,2,3</td><td>1</td></tr> </table>				#	Course Outcomes	Mapping to PO's	Mapping to PSO's	1.	Describe various importance of Supply chain Analytics process in the flows involving material, money, information and ownership	1,2,7,11	1	2.	Apply various Decision Domains in Supply Chain analytics for effective decision making.	1,2,3	1	3.	Develop effective Network Planning and Design of Logistics Network using Heuristics/optimization.	1,2,3,5	2	4.	Analyze case studies to assess the impact of data-driven decision-making in supply chain operations and strategy.	1,2,3	1
#	Course Outcomes	Mapping to PO's	Mapping to PSO's																				
1.	Describe various importance of Supply chain Analytics process in the flows involving material, money, information and ownership	1,2,7,11	1																				
2.	Apply various Decision Domains in Supply Chain analytics for effective decision making.	1,2,3	1																				
3.	Develop effective Network Planning and Design of Logistics Network using Heuristics/optimization.	1,2,3,5	2																				
4.	Analyze case studies to assess the impact of data-driven decision-making in supply chain operations and strategy.	1,2,3	1																				
MODULE-1			10 Hrs.																				
Context of today's supply chains (SC) analytics, Understanding and defining the supply chain analytics (SCA) Revisions of Basic Lessons of Supply Chain Management, Why is Analytics Important in a supply chain?, Relating Operations Management with Supply chain concepts with SC Analytics, The importance of supply chain analytics in the flows involving material, money, information and ownership.																							
MODULE-2			10 Hrs.																				
Supply chain analytics, Key issues in supply chain analytics, What involves in supply chain analytics, Concept of Descriptive Analytics in a Supply Chain, Discussion on a Few Supply Chains Analytics applications in India (students participation is expected), Decision Domains in supply chain analytics.																							
MODULE-3			10 Hrs.																				
Foundation of Business Analytics (BA), E2: Introduction to Modeling, Approaches for Optimization and Simulation, Modeling software, Supply Chain (SC), Decisions that requires mathematical or interpretative modeling Understanding of Data and its role in Analytics, Analytics of a Transportation problem in a Supply Chain, Managerial implication of results of analytics, A case study of supply chain analytics..																							
MODULE-4			10 Hrs																				
Foundation of prescriptive analytics in network planning in a supply chain, Network Planning in a Supply Chain, Importance of Network Planning, Design of Logistics Network using Heuristics/optimization (Exercise 3.4 Levi (2008)), Concept of 3PL/4PL in a Supply Chain, Case Study: GATI, Foundation of Modeling Coordination Decisions in Supply Chain Management, Foundation of performance management in supply chain management, it enablement of supply chains, role of ICT in supply chains																							



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

Prescribed Text Books:

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

Reference Books:

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

E-Books:

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

MOOC/Online Course:

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

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals :	Three tests conducted for 20 marks each and reduced to 10 marks	30
Activity : Simulate a Supply Chain with Any Logic or SCM Games	• Use a simulation tool (Any Logic or online SCM simulators) • Assign roles (supplier, manufacturer, retailer) • Analyze how forecasting errors and delays affect the supply chain Tools: Any Logic, MIT Beer Game (online), SCM Globe, Forio simulations	20
Total		50

[illegible]



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

Course Title	RESEARCH METHODOLOGY & INTELLECTUAL PROPERTY RIGHTS		
Course Code	23RIP	(L-T-P)C	(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	2,3,4,11,12	-
2.	Describe the fundamentals of patent laws and the patent drafting Procedure.	4, 11,12	-
3.	Elucidate the copyright laws and subject matters of copyright	4, 11,12	-

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: The Way Forward, Introduction to Technical Reading Conceptualizing Research, Critical and Creative Reading.

MODULE-2

10 Hrs.

Attributions and Citations: Giving Credit Wherever Due, Citations: Functions and Attributes, Impact of Title and Keywords on Citations, Knowledge Flow through Citation, Citing Datasets, Styles for Citations, Acknowledgments and Attributions. **Technical Writing and Publishing :** Free Writing and Mining for Ideas, Attributes and Reasons of Technical Writing, Patent or Technical Paper?—The Choice, Writing, Journal Paper: Structure and Approach: Title, Abstract, and Introduction, Methods, Results, and Discussions, Table, Figures, Acknowledgments, and Closures.

MODULE-3

10 Hrs.

Introduction To Intellectual Property: Role of IP in the Economic and Cultural Development of the Society, IP Governance, IP as a Global Indicator of Innovation, Origin of IP, Major Amendments in IP Laws and Acts in India. **Patents:** Conditions for Obtaining a Patent Protection, To Patent or Not to Patent an Invention. Rights Associated with Patents. Enforcement of Patent Rights. Inventions Eligible for Patenting. Non-Patentable Matters. Patent Infringements. **Process of Patenting:** Prior Art Search. Choice of Application to be Filed. Patent Application Forms. Jurisdiction of Filing Patent Application. Publication. Pre-grant Opposition. Examination. Grant of a Patent. Validity of Patent Protection. Post-grant Opposition. Do I Need First to File a Patent in India. Patent Related Forms. Fee Structure. Types of Patent Applications.



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

MODULE-4	10 Hrs
Copyrights and Related Rights: Classes of Copyrights. Criteria for Copyright. Ownership of Copyright. Copyrights of the Author. Copyright Infringements. Copyright Infringement is a Criminal Offence. Copyright Infringement is a Cognizable Offence. Copyrights and Internet. Non-Copyright Work. Copyright Registration. Judicial Powers of the Registrar of Copyrights. Fee Structure. Copyright Symbol. Validity of Copyright. Copyright Profile of India. Copyright and the word 'Publish'. Transfer of Copyrights to a Publisher. Copyrights and the Word 'Adaptation'. Copyrights and the Word 'IndianWork'. Joint Authorship. Copyright Society. Copyright Board. Copyright Enforcement Advisory Council (CEAC). Trademarks: Eligibility Criteria. Who Can Apply for a Trademark? Acts and Laws. Designation of Trademark 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:

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



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

MOOC/Oline Course:

1. 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

Course Outcomes	Program Outcomes [POs]													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	Po12	PSO1	PSO2
CO1		3	3	3							3	3		
CO2				3							3	3		
CO3				3							3	3		



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

Course Title	Environmental Studies		
Course Code	23EVS	(L-T-P)C	(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 ecological, political, economical, societal and aesthetic factors.	6, 8, 9	
MODULE-1			4 Hrs.
Environment: Definition, about the Earth, Earth's Structure I.e. Atmosphere and its parts, Hydrosphere, Lithosphere and Biosphere, Ecosystem, Balanced ecosystem, Effects of human activities on environment Agriculture Housing Industry Mining and Transportation.			
MODULE-2			8 Hrs.
Natural Resources: Water resources, Availability and Quality, Water borne diseases, Water induced diseases, Fluoride problem in drinking water. Mineral Resources - Forest Resources - Material Cycles - Carbon, Nitrogen and Sulphur Cycles.			
MODULE-3			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



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

Reference Books:

Sl.No	Book Title	Authors	Publisher	Year
1	Environmental Studies	Benny Joseph	Tata McGraw Hill	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:

1. <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					



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

Course Title	Mini Project		
Course Code	23IS506	(L-T-P)C	(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)



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

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	
CO5								3					3	



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

Course Title	National Service Scheme (NSS)		
Course Code	23NYP3	(L-T-P) C	(0-0-2)
Exam	-	Hours/Week	2
SEE	-	Total Hours	24

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

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

MODULE - 1

8 Hrs.

Developing Sustainable Water management system for rural areas and implementation approaches.
 Contribution to any national level initiative of Government of India.
 For eg. Digital India, Skill India, Swachh Bharat, Atmanirbhar Bharath, Make in India, Mudra scheme, Skill development programs etc.

MODULE - 2

8 Hrs.

Spreading public awareness under rural outreach programs.(minimum 5 programs).

MODULE - 3

8 Hrs.

Social connect and responsibilities.

Suggested Learning Resources:

Books :

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



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

Course Title	Physical Education (PE)		
Course Code	23NYP3	(L-T-P) C	(0-0-2)
Exam	-	Hours/Week	2
SEE	-	Total Hours	24
Course Outcomes: At the end of the course, the student will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
12.	Understand the fundamental concepts and skills of Physical Education, Health, Nutrition and Fitness.	9, 10, 12	-
13.	Familiarization of health-related Exercises, Sports for overall growth and development	9, 12	-
14.	Create a foundation for the professionals in Physical Education and Sports	12	-
15.	Participate in the competition at regional/state / national / international levels.	9, 10, 12	-
16.	Create consciousness among the students on Health, Fitness and Wellness in developing and maintaining a healthy lifestyle.	9, 10, 12	-
MODULE - 1			4 Hrs.
Orientation - Fitness, Food & Nutrition			
MODULE - 2			4 Hrs.
General Fitness & Components of Fitness - Agility – Shuttle Run, Flexibility – Sit and Reach, Cardiovascular Endurance – Harvard step Test			
MODULE - 3			16 Hrs.
Specific games (Any one to be selected by the student)			
1. Badminton (Fore hand low/high service, back hand service, smash, drop)			
2. Basketball (Dribbling, passing, shooting etc.)			
3. Athletics (Field events – Throws)			



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

Course Title	Yoga		
Course Code	23NYP3	(L-T-P) C	(0-0-2)
Exam	-	Hours/Week	2
SEE	-	Total Hours	24

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

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

MODULE - 1

8 Hrs.

Ashtanga Yoga

Asana , Pranayama , Pratyahara

MODULE - 2

8 Hrs.

Different types of Asanas

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

MODULE - 3

8 Hrs.

Pranayama

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



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

Course Title	Cryptography, Network Security and Cyber Law		
Course Code	23IS601	(L-T-P) C	(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:

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

MODULE-1

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.



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

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	3rd	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

E-Books and online course materials:

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

MOOC Course / Online Courses and Video Lectures:

- 2) <https://nptel.ac.in/courses/106/105/106105031>

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.



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

Course Articulation Matrix

Course Outcomes	Program Outcomes [POs]													
	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						



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

Course Title	Artificial intelligence and Machine learning		
Course Code	23IS602	L-T-P	(3-0-2) 4
Exam	3 Hrs.	Hours/Week	5
SEE	50 Marks	Total Hours	(36L+14P) 50

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:

#	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

9 Hrs.

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. **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.



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

MODULE-4	9 Hrs
Supervised Learning: Introduction, example, classification model, classification learning steps, and Common algorithms –KNN, decision tree and 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, Back propagation 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	2nd	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	2nd	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	Tata McGraw-Hill	2019

E-Books and online course materials:

1. <http://repo.darmajaya.ac.id/5272/1/Artificial%20Intelligence-20Modern%20Approach%20%283rd%20Edition%29%20%28%20PDFDrive%20%29.pdf>

MOOC Course / Online Courses and Video Lectures:

1. <https://www.udacity.com/course/intro-to-artificial-intelligence--cs271>
2. <https://www.edx.org/course/artificial-intelligence-uc-berkeleyx-cs188-1x>
3. <https://nptel.ac.in/courses/106106139/>



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

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 Tensor Flow to predict customer Churn based on bank customer data.



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

Course Title	Cloud Computing		
Course Code	23IS603	(L-T-P) C	(3-0-2) 4
Exam	3 Hrs.	Hours/Week	4
SEE	50 Marks	Total Hours	(36L+14P) 50

Course Objective: Students will be able to understand cloud infrastructure, virtualization, storage, networking, and resource provisioning.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Comprehend the fundamental concepts of cloud computing, including service and deployment models.	2	-
2.	Describe the architecture and working of various cloud platforms and technologies.	2	-
3.	Identify different cloud storage options and resource provisioning techniques.	3,5	2
4.	Apply principles of best practice in cloud application design and Management.	3,5,8	2

MODULE – 1

9 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

9 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 datacentre, Thomson's routers. Cloud computing technology: hardware and infrastructure clients, Security, network, services.

MODULE -3

9 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

9 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 Book:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Cloud Computing: A practical approach	Anthony T. Velte, Toby J. Velte, Robert Elsenpeter	3rd	McGraw Hill publication	2010



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

Reference Books:

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

E-Books and online course materials:

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

MOOC Course / Online Course and Video Lecture:

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

Proposed Assessment Plan (for 50marks of CIE):

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

Laboratory Plan:

Sl. No	Program Details
1.	Use Google App Engine launcher to launch the web applications.
2.	Find a procedure to transfer the files from one virtual machine to another virtual machine.
3.	Install Google App Engine. Create a hello world app and other simple web applications using python/java.
4.	Install a C compiler in the virtual machine created using virtual box and execute Simple Programs such as file storage, file sharing.
5.	Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
6.	Find a procedure to launch virtual machine using try stack. (Online Open stack Demo Version)
7.	Install Hadoop single node cluster and run simple applications like word count.



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

Course Articulation Matrix:

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



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

Course Title	Main Project Phase 1		
Course Code	23IS604	(L-T-P) C	(0-0-4)2
Exam	3Hrs	Hours/Week	4
SEE	50 Marks	Total Hours	40

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	3,5	2
3.	Make oral presentation and documentation of the work carried out	9,10,11,12	-

During VI semester, Candidates in consultation with the guides shall carry out literature survey to finalize the topic of the project. Students are expected to present the project synopsis, system analysis, Requirements Specification and should publish a technical paper on Literature Survey.

- **Project Phase 1 – Team Formation , Topic Selection & Guide allotment**
- **Project Phase 2 – Extensive Literature Survey , Problem Definition**
- **Project Phase 3 – 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 Project 3 will be continued & implemented during eighth semester

Performance Indicators	Low	Medium	High
Literature Survey and Problem Definition (15 Marks)	Literature Survey not pertaining to the title of the project (1-4)	Incomplete literature survey and improper problem definition (5-9)	Extensive literature survey with clear state of the art problem definition(10-15)
Design (10 Marks)	Has no coherent strategies for problem Solving (1-3)	Has some strategies for problem –solving, but does not apply them consistently (4-6)	Formulates strategies for solving problems (7-10)
Presentation/ Communication (5 Marks)	Disorganized and Ineffective presentation (1-2)	Organized, but ineffective presentation (3)	Effective organized presentation (4-5)
Report Preparation (5 Marks)	Disorganized and contents not sufficient (1-2)	Organized but not good content wise (3)	Effectively organized and well framed contents (4-5)



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

Paper Publication (10Marks)	Paper submitted & awaiting results (1-3)	National conference International Conference (4-6)	Journal (7-10)
Punctuality(Project Dairy Maintenance) (5 marks)	Not meeting the guide regularly (1-2)	Meeting regularly but doesn't document details of every session (3)	Up to date dairy maintenance (4-5)

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												
CO2			3		3									2
CO3									3	3	3	3		



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

Course Title	Storage Area Networks		
Course Code	23IS661	(L-T-P) C	(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.	Understand the fundamentals of data storage technologies and the architecture of Storage Area Networks (SANs).	1	-
2.	Describe different types of storage systems such as DAS, NAS, and SAN, and compare their features and use cases.	1	-
3.	Analyze various SAN components including host bus adapters, switches, storage arrays, and protocols like iSCSI and Fibre Channel.	2	1
4.	Demonstrate the configuration and management of SAN environments using tools and techniques commonly used in industry.	3,5	1
Module - 1			10 Hrs
Storage System: Introduction to evolution of storage architecture, key data centre Elements, virtualization, and cloud computing. Key data centre elements – Host (or compute), connectivity, storage, and application in both classic and virtual Environments. RAID implementations, techniques, and levels along with the Impact of RAID on application performance. Components of intelligent storage systems and virtual storage provisioning and intelligent storage system Implementations.			
Module - 2			10 Hrs
Storage Networking Technologies and Virtualization Fibre Channel SAN components, connectivity options, and topologies including access protection mechanism „zoning”, FC protocol stack, addressing and operations, SAN-based virtualization and VSAN technology, iSCSI and FCIP(Fibre Channel over IP) protocols for storage access over IP network, Converged protocol FCoE and its components, Network Attached Storage (NAS) - components, protocol and operations, File level storage virtualization, Object based storage and unified storage platform.			
Module - 3			10 Hrs
Backup, Archive, and Replication: This unit focuses on information availability and business continuity solutions in both virtualized and non-virtualized environments. Business continuity terminologies, planning and solutions, Clustering and multipathing architecture to avoid single points of failure, Backup and recovery - methods, targets and topologies, Data deduplication and backup in virtualized .			



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

environment, Fixed content and data archive, Local replication in classic and virtual environments, Remote replication in classic and virtual environments, Three-site remote replication and continuous data protection.

Module - 4

10 Hrs

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

Prescribed Text Books:

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

Reference Books:

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

E-Books and online course materials:

1. https://www.google.co.in/books/edition/Storage_Area_Networks_For_Dummies/clRghD4X2uMC?hl=en&gbpv=1&pg=PA3&printsec=frontcover

MOOC Course / Online Course and Video Lecture:

1. https://www.udemy.com/topic/storage-area-network/?srsltid=AfmBOopCfCjPjwigXqVKmk4fNoChQe6YVuQ_fBqyZ370NQJk4P_8Veqc



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

Course Title	Big Data Technologies		
Course Code	23IS662	(L-T-P)C	(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.	3,5	1
4.	Design Map reduce solution or Hbase query for a given Problem.	2	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, And 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.			



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

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	John Wiley & Sons, Inc	2019

Reference Books:

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

E-Books and online course materials:

1. https://public.dhe.ibm.com/software/de/pdf/Hadoop_for_dummies.pdf

MOOC Course / Online Course and Video Lecture:

1. <https://nptel.ac.in/courses/106104189>



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

Course Title	Automated Software Testing																						
Course Code	23IS663	(L-T-P) C	(3-0-0) 3																				
Exam	3 Hrs.	Hours/Week	3																				
SEE	50 Marks	Total Hours	40																				
Course Objective: This course enables students to identify the requirements and develop the appropriate functional testing strategies for a given problem. 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 the concepts of software testing to assess the most appropriate testing method.</td><td>1,3</td><td>-</td></tr> <tr> <td>2.</td><td>Analyze the Testing tool for various applications.</td><td>3,5</td><td>1</td></tr> <tr> <td>3.</td><td>Design test-cases and automate testing using testing tool for a real-time application.</td><td>3</td><td>1</td></tr> <tr> <td>4.</td><td>Evaluate the effectiveness of automated testing in improving software quality and reducing testing effort.</td><td>3,4,5</td><td>-</td></tr> </table>				#	Course Outcomes	Mapping to PO's	Mapping to PSO's	1.	Apply the concepts of software testing to assess the most appropriate testing method.	1,3	-	2.	Analyze the Testing tool for various applications.	3,5	1	3.	Design test-cases and automate testing using testing tool for a real-time application.	3	1	4.	Evaluate the effectiveness of automated testing in improving software quality and reducing testing effort.	3,4,5	-
#	Course Outcomes	Mapping to PO's	Mapping to PSO's																				
1.	Apply the concepts of software testing to assess the most appropriate testing method.	1,3	-																				
2.	Analyze the Testing tool for various applications.	3,5	1																				
3.	Design test-cases and automate testing using testing tool for a real-time application.	3	1																				
4.	Evaluate the effectiveness of automated testing in improving software quality and reducing testing effort.	3,4,5	-																				
MODULE-1			10 Hrs.																				
Introduction to Software Testing, Types of Testing, SDLC and STLC in Software Testing, different types of Software Testing Techniques. What is Automation Testing? When we Switch to Automation Testing? Why Automation testing? Advantages & Disadvantages of Automation Testing Tools.																							
MODULE-2			10 Hrs.																				
What is Selenium? Advantages of Selenium Selenium Architecture, Basic Selenium Program, Locators path, its Types and cases, Web Element, Functions, check points, Handling Multiple Elements, Handling Synchronization, Implicit Explicit Custom wait, Blind wait, Handling Dropdown (static and dynamic) Handling Keyboard and Mouse Actions, Taking Screenshot, Performing Scroll down Action, Handling Popups (web-based and Window-based), Handling Frames, Handling New Windows/New Tabs Encapsulation in Selenium.																							
MODULE-3			10 Hrs.																				
Analyze the selenium tool and its usage in various application. Consider a Bank application and study its system specifications and report the various bugs. Derive different test cases, execute these test cases and discuss the test results. Design Test Case for Inventory Management system.																							
MODULE-4			10 Hrs.																				
Automation Framework: Stages and Types of Frameworks, POM (Page Object Model), Handling Excel, Pytest, Assertion, Grouping, GitHub, Jenkins, Hybrid Framework, Designing, Framework, Hybrid Framework Architecture, Framework implementation, Framework execution.																							



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

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Software Testing: A Craftsman's Approach.	Paul C. Jorgensen, Byron De Vries	5th	Auerbach	2022

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Foundations of Software Testing	Aditya P Mathur	2nd	Pearson Education	2013
2	The Craft of Software Testing: Subsystems Testing Including Object-Based and Object-Oriented Testing	Brian Marrick.	2nd	Pearson Education	2007

E-Books and online course materials:

1. <https://books.google.co.in/books?id=UhtSBQAAQBAJ&printsec=copyright#v=onepage&q&f=false>

MOOC Course / Online Course and Video Lecture:

1. <https://nptel.ac.in/courses/106/105/106105150>
2. https://onlinecourses.nptel.ac.in/noc19_cs71/preview
3. <https://www.javatpoint.com/selenium-tutorial>

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals :	Three tests conducted for 20 marks each and reduced to 10 marks	30
Activity : PowerPoint presentation on case studies	1.Relevance of topic(4 marks) : How relevant and appropriate the topic is in relation to the case studies 2.Presentation(12 marks) Quality of the PowerPoint presentation including clarity, design, and delivery 3.Report (4 marks) : Quality and comprehensiveness of the accompanying report	20
Total		50



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

Course Title	Blockchain Technology		
Course Code	23IS664	(L-T-P)C	(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:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Understand the types, benefits and limitations of blockchain and bitcoin.	1	1
2	Explore the blockchain decentralization, cryptography concepts and smart contracts.	1,5	1,2
3	Comprehend the blockchain applications outside of currencies.	1,6	1,2
4	Analyze real-world blockchain use cases and collaboratively design a blockchain solution.	8,9,11	2

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.

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

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Mastering Blockchain – Distributed ledgers, Decentralization and smart contracts explained	Imran Bashir	3 rd	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.,	2 nd	Princeton University Press	2016



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

Reference Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	Blockchain Basics: Anon- 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 and online course materials:

1. <https://unglueit-files.s3.amazonaws.com/ebf/05db7df4f31840f0a873d6ea14dcc28d.pdf>

MOOC Course / Online Course and Video Lecture:

1. https://onlinecourses.nptel.ac.in/noc22_cs44/preview
2. https://onlinecourses.swayam2.ac.in/aic21_ge01/preview

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Three tests conducted for 20marks each and reduced to 10 marks	30
AAT	Presentation on course related topic-10Marks, Quiz- 10 Marks	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												2	
CO2	3				3								2	2
CO3	3					3							2	2
CO4				3				3			3			3



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

Course Title	Responsible Artificial Intelligence		
Course Code	23OEIS61	L-T-P	(3-0-0) 3
Exam	3 Hrs.	Hours/Week	3
SEE	50 Marks	Total Hours	36L

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

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	To be able to state aspects of responsible AI such as fairness, accountability, bias, privacy etc.	2,3	-
2.	To be able to assess the fairness and ethics of AI modules	3	1
3.	To be able to enforce fairness in models and remove bias in data.	3	1
4.	To be able to preserve the privacy of individuals while learning from them.	3,5	1

MODULE-1	10 Hrs.
Artificial Intelligence Fundamentals , Introduction to responsible AI. (3 hours), Need for ethics in AI. AI for Society and Humanity, Fairness and Bias (9 hours): Sources of Biases, Exploratory data analysis, limitation of a dataset, Preprocessing, in processing and post processing to remove bias, Group fairness and Individual fairness, Counterfactual fairness	
MODULE-2	10 Hrs.
Interpretability and explain ability: - Interpretability through simplification and visualization, Intrinsic interpretable methods, Post Hoc interpretability, Explain ability through causality, Model agnostic Interpretation.	
MODULE-3	10 Hrs.
Ethics and Accountability : Auditing AI models, fairness assessment, Principles for ethical practices, Privacy preservation , Attack models, Privacy-preserving Learning	
MODULE-4	10 Hrs.
Privacy preservation: Differential privacy, Federated learning, Case study: Recommendation systems, medical diagnosis, Hiring/ Education, Computer Vision, Natural Language Processing.	

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Responsible Artificial Intelligence: How to Develop and Use AI in a Responsible Way	Virginia Dignum	2nd	University of Cambridge	2019
2	Interpretable Machine Learning	Christoph Molnar	1st		2019



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

Reference Books:

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

E-Books and online course materials:

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

MOOC Course / Online Course and Video Lecture:

1. https://swayam.gov.in/nd1_noc19_cs52/preview
2. <https://www.coursera.org/learn/machine-learning/>
3. <https://nptel.ac.in/courses/106106139/>

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Three tests conducted for 20 marks each and reduced to 10 marks	30
Activity	Demonstration	20
Total		50



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

Course Title	Introduction to Machine learning		
Course Code	23OEIS62	(L-T-P) C	(3-0-0) 3
Exam	3 Hrs.	Hours/Week	3
SEE	50 Marks	Total Hours	40L

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

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Describe and Apply preprocessing, Modeling, Evaluation and concept learning for the given problem.	2,3	-
2.	Depict and Apply supervised and unsupervised machine learning Algorithms for solving the given problem.	3	1
3.	Illustrate and utilize the Neural networks, Bayesian learning and other forms learning for the given problem.	3	1
4.	Conduct experiments for demonstrating machine learning algorithms and data visualization methods.	3,5	1

MODULE-1

10 Hrs.

Introduction to Machine learning: Human learning and its types, Machine learning and its types, Applications, tools and issues in machine learning, Activities in machine learning, Types of data, Exploring structure of data, Data quality and Pre-processing.

Modelling and Evaluation: Introduction, Selecting a model, training a model, model representation and Interpretability, Evaluating performance of a model.

MODULE-2

10 Hrs.

Learning Problems and Concept Learning: Well Posed learning problems, Designing a Learning systems, Concept Learning Tasks, Search, Find-S, Version Spaces and Candidate Elimination Algorithm

Supervised Learning: Introduction, example, classification model, classification learning steps, Common algorithms –KNN, decision tree.

MODULE-3

10 Hrs.

Supervised Learning: Random forest model, SVM, Regression-Simple linear regression, Multiple linear regressions, **Unsupervised Learning:** Supervised Vs Unsupervised, Application, clustering, Finding pattern using Association rule.

MODULE-4

10 Hrs.

Basics of Neural Networks: Exploring the artificial neuron, Types of activation function, Early implementations of ANN, Architectures of NN, Learning process in ANN, Back propagation algorithm.

Bayesian learning: Introduction, Bayes theorem, Bayes theorem and concept learning, **Other types of Learning** – Representation learning, Active Learning, Instance based Learning, Ensemble learning.



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

Prescribed Text Books:

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

Reference Books:

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

E-Books and online course materials:

1. http://14.139.161.31/OddSem-0822-1122/Hands-On_Machine_Learning_with_Scikit-Learn-Keras-and-TensorFlow-2nd-Edition-Aurelien-Geron.pdf

MOOC Course / Online Course and Video Lecture:

4. https://swayam.gov.in/nd1_noc19_cs52/preview
5. <https://www.coursera.org/learn/machine-learning/>
6. <https://nptel.ac.in/courses/106106139/>



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

Course Title	Information and Network Security		
Course Code	23OEIS63	(L-T-P) C	(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.	Utilize secure communication protocols to safeguard data during transmission.	1,3,5	2
2.	Examine network security challenges and identify potential risks and vulnerabilities.	1,3,4,8	2
3.	Apply various cryptographic techniques (symmetric, asymmetric encryption, hashing, and digital signatures) to ensure data security.	1,2,3	2
4.	Analyze network security architectures and protocols (such as SSL/TLS, IP sec, and VPNs) and evaluate their effectiveness.	1,3,4,8	2

MODULE-1

10 Hrs.

Introduction to Information Security: Components of information security, Balancing information security and Access, the Security systems Development Life Cycle. Legal, Ethical and professional issues in Information Security: Law and Ethics in Information Security, Ethics and Information Security Planning for Security: Information Security Planning and Governance, Information Security Policy, Standards and Practices Risk Management: Introduction, An Overview of Risk Management, Risk Identification, Risk Assessment, Risk Control, Quantitative Versus Qualitative Risk Management.

MODULE-2

10 Hrs.

Vulnerability Analysis Vulnerability Analysis, Penetration Testing, Layering of tests, Vulnerability Classification, Frameworks, The RISOS Study, Protection Analysis Model, Aslam's Model, Comparison and Analysis, Standards, Common Vulnerabilities and Exposures (CVE), Common Weaknesses and Exposures (CWE), Gupta and Gligor's Theory of Penetration Analysis Tool.

MODULE-3

10 Hrs.

Transport-Level Security: Web Security Considerations Transport Layer Security, HTTPS, Secure Shell (SSH) Wireless Network Security: Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN Overview, IEEE 802.11i Wireless LAN Security IP Security: IP Security Overview, IP Security Policy, Encapsulating Security Payload

MODULE-4

10 Hrs.

Malicious Software: Types of Malicious Software (Malware), Advanced Persistent Threat, Propagation-Infected Content-Viruses, Propagation: Vulnerability Exploit, Social Engineering, Payload: System Corruption, Payload: Attack Agent, Information Theft, Stealthing, Countermeasures, Distributed Denial of Service Attacks



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

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Principles of Information Security	Michael E. Whitman, Herbert J. Mattord	6th	Cengage Learning	2021
2	Network Security Essentials: Applications and Standards	Williams Stallings	6th	Pearson 2	2021
3	Computer Security Arts and Science	Matt Bishop	7th	Addison Wesley	2023

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Cryptography: Theory and Practice	Stinson. D.	8th	Chapman & Hall/CRC	2021
2	A Guide to Computer Network Security	Joseph Migga Kizza	7th	Springer International Edition	2022

E-Books and online course materials:

1. https://almuhammadi.com/sultan/crypto_books/Stinson.3ed.pdf

MOOC Course / Online Course and Video Lecture:

1. <http://nptel.ac.in/courses/106105031/>

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		2		2									2
CO2	3		3	2				2						2
CO3	2	2	3											2
CO4	2		3	3				2						3



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

Course Title	PROMPT ENGINEERING																						
Course Code	23OEIS64	(L-T-P)C	(3-0-0) 3																				
Exam	3hrs	Hours/Week	3																				
SEE	50 Marks	Total Hours	40																				
Course Objective: The course provides students to enable engineering students to design and optimize effective prompts for AI systems to generate accurate, reliable, and task-specific outputs for technical problem-solving and engineering applications. 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 importance and benefits of prompt engineering</td><td>1,2</td><td>-</td></tr> <tr> <td>2.</td><td>Apply the techniques involved and monitor the prompt for Generative AI</td><td>1,2,3,4</td><td>1</td></tr> <tr> <td>3.</td><td>Compute the functions and feedback for ChatGPT prompt</td><td>1,2,3,4</td><td>1</td></tr> <tr> <td>4.</td><td>Identify the framework to find out the Quality prompt</td><td>1,2,3,4</td><td>1</td></tr> </table>				#	Course Outcomes	Mapping to PO's	Mapping to PSO's	1.	Understand the importance and benefits of prompt engineering	1,2	-	2.	Apply the techniques involved and monitor the prompt for Generative AI	1,2,3,4	1	3.	Compute the functions and feedback for ChatGPT prompt	1,2,3,4	1	4.	Identify the framework to find out the Quality prompt	1,2,3,4	1
#	Course Outcomes	Mapping to PO's	Mapping to PSO's																				
1.	Understand the importance and benefits of prompt engineering	1,2	-																				
2.	Apply the techniques involved and monitor the prompt for Generative AI	1,2,3,4	1																				
3.	Compute the functions and feedback for ChatGPT prompt	1,2,3,4	1																				
4.	Identify the framework to find out the Quality prompt	1,2,3,4	1																				
MODULE-1			10 Hrs.																				
Introduction to Prompt Engineering: Prompts- Types of Prompts – works of prompt engineering – Evaluating and validating prompts - Role of prompts in AI models – Importance of effective prompts – Techniques in Prompt engineering - Ethical considerations in prompt engineering– Benefits in prompt engineering.																							
MODULE-2			10 Hrs.																				
Prompt Engineering–Generative AI : Generative language models- NLP and ML foundations, common NLP task , Optimizing prompt-based models, Tuning and optimization techniques , Pre-training and transfer learning – Designing effective prompts – prompt generation strategies – Monitoring prompt effectiveness.																							
MODULE-3			10 Hrs.																				
ChatGPT: Reinforcement Learning from Human Feedback- The Process of Building a Model- Moving from Instruct GPT to ChatGPT- Instruct GPT- ChatGPT- The Changing API-Chat Completion API- Moving Away from Chat-Moving Beyond Chat to Functions-Prompt Engineering as Play Writing..																							
MODULE-4			10 Hrs																				
A Framework for Effective AI Communication: The CLEAR Framework - Concise and Logical Prompt Crafting - Explicit Prompt Crafting - Adaptive Prompt Crafting- Reflective Prompt Crafting - The Relationship Between Prompts And Outputs - Quality Prompts - A Systematic Approach.																							



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

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Prompt Engineering for Generative AI.	James Phoenix, Mike Taylor.	-	O'Reilly Media	2024 ISBN: 9781098153434

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	The Art of Prompt Engineering with Chatgpt	Nathan Hunter	-	Independently Published	2023.
2	What Is ChatGPT Doing...and Why Does It Work?	Stephen Wolfram	-	Wolfram Media Inc	2023.

E-Books and online course materials:

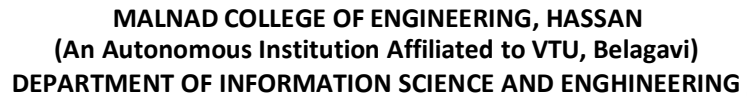
1. https://studylib.net/doc/27621472/phoenix-j.-prompt-engineering-for-generative-ai.-future-p...#google_vignette

MOOC Course /Online Courses and Video Lectures:

1. <https://www.coursera.org/courses?query=prompt%20engineering>
2. <https://www.mygatelearning.com/>

Proposed Assessment Plan (for 50marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	1) Video demonstration of latest trends in Generative -AI .-10 Marks 2) Demonstration of sample projects done using ChatGPT-5 Marks 3) Contents related activities(Activity-based discussions)- 5 Marks	20
	TOTAL	50

[illegible]



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

Course Title	Analytical Ability and Soft Skills		
Course Code	23ASK	(L-T-P) C	(0-1-0) 1
Exam	1 Hr.	Hours/Week	2
SEE	50 Marks	Total Hours	30
Course Objective: Students will be able to select appropriate data mining techniques to extract useful pattern. Course outcomes: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Apply methods to solve numerical and reasoning problems	2,3	-
2	Lead a team in corporate offices	8,9	-
3	Communicate effectively in professional ambience	10	-
MODULE – 1			40 Hrs.
Hard Skills: Speed/Distance, Probability, Permutations/Combinations, Profit/Loss, Simple Interest/Compound Interest, Number theories, Number/Letter series, Coding/Decoding, Blood relations, Directions, Clock, Calendar. Logical reasoning problems			
MODULE – 2			15 Hrs.
Soft Skills: Basic grammar, Spotting errors, Sentence formation, Email writing, Public speaking, Client communication, Leadership, Managerial skills, Stress management, Presentation Skills			
MODULE -3			15 Hrs.
Technical Skills: Review of C programming, Simple coding, Syntax rules, MCQs on C language.			
MODULE -4			14 Hrs.
Activities: GD, JAM, Mock Interview, Pick and speak, Presentation			

Course articulation matrix:

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



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

Course Title	National Service Scheme (NSS)		
Course Code	23NYP4	(L-T-P) C	(0-0-2)
Exam	-	Hours/Week	2
SEE	-	Total Hours	24

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

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

MODULE - 1	8 Hrs.
Plantation and adoption of plants. Know your plants.	
MODULE - 2	8 Hrs.
Organize National integration and social harmony events /workshops /seminars. (Minimum 02 programs).	
MODULE - 3	8 Hrs.
Govt. school Rejuvenation and helping them to achieve good infrastructure.	

Suggested Learning Resources:

Books :

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



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

Course Title	Physical Education (PE)		
Course Code	23NYP4	(L-T-P) C	(0-0-2)
Exam	-	Hours/Week	2
SEE	-	Total Hours	24
Course Outcomes: At the end of the course, the student will be able to:			
	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Understand the fundamental concepts and skills of Physical Education, Health, Nutrition and Fitness.	9, 10, 12	-
2	Familiarization of health-related Exercises, Sports for overall growth and development	9, 12	-
3	Create a foundation for the professionals in Physical Education and Sports	12	-
4	Participate in the competition at regional/state / national / international levels.	9, 10, 12	-
5	Create consciousness among the students on Health, Fitness and Wellness in developing and maintaining a healthy lifestyle.	9, 10, 12	-
MODULE - 1			4 Hrs.
Orientation - Postural deformities, Stress management			
MODULE - 2			16 Hrs.
Specific games (Any one to be selected by the student)			
1. Throw ball			
2. Table Tennis			
3. Athletics (Field Events- Jumps) – Any event as per availability of Ground.			
MODULE - 3			4 Hrs.
Aerobics			



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

Course Title	Yoga		
Course Code	23NYP4	(L-T-P) C	(0-0-2)
Exam	-	Hours/Week	2
SEE	-	Total Hours	24

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

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

MODULE - 1			8 Hrs.
Ashtanga Yoga 1. Dharana 2. Dhyana (Meditation) 3. Samadhi			
MODULE - 2			8 Hrs.
Different types of Asanas a. Sitting 1. Bakasana 2. Hanumanasana 3. Ekapada Rajakapotasana 4. Yogarnudra in Vajrasana b. Standing 1. Vatayanasana 2. Garudasana c. Balancing 1. Veerabhadrasana 2. Sheershasana			
MODULE - 3			8 Hrs.
Pranayama 1. Bhastrika 2. Bhramari			



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

Course Title	Deep Learning																						
Course Code	23IS701	(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: <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>Understand the foundational concepts of machine learning and the motivations for deep learning.</td><td>1,4,2,11</td><td>-</td></tr> <tr> <td>2</td><td>Apply neural network architectures and training algorithms to build and train deep feedforward models.</td><td>1,3,5</td><td>1,2</td></tr> <tr> <td>3</td><td>Analyze and implement regularization techniques to improve model generalization and robustness.</td><td>2,4,5</td><td>-</td></tr> <tr> <td>4</td><td>Design and evaluate deep learning models for visual and sequential data using CNNs and RNNs.</td><td>1,3,5,11</td><td>1,2</td></tr> </tbody> </table>					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
	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																				
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																				
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																				
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																				
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	4 th	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
1	Introduction to Artificial Neural Networks	Gunjan Goswami, S.K. Kataria & Sons	4th	PHI Learning	2012
2	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	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
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



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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



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

Course Title	Data Science using R		
Course Code	23IS702	(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			



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

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	7th	Tata McGraw- Hil	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.



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

Course Title	MAIN PROJECT WORK PHASE - 2		
Course Code	23IS703	(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.

Criteria	High	Medium	Low
1.Methodology & Design Approach(5M)	Well-planned methodology with a strong theoretical foundation and practical implementation; clear design principles applied. (4-5)	Good methodology with a sound approach; design is mostly logical and structured.(2-3)	Poor or missing methodology; weak design approach with significant gaps(1)
2.Implementation & Prototype Development(10M)	Fully functional prototype/system developed with high-quality implementation and testing. (8-10)	Functional prototype with minor flaws , Basic prototype with limited functionality; or areas of improvement.(5-7)	Incomplete or non-functional prototype; lacks implementation effort.(1-4)
3.Results & Analysis(10M)	Clear, well-organized results with thorough analysis; strong correlation with project objectives. (8-10)	Good results with reasonable analysis but minor gaps in explanation or Basic results with limited analysis.(5-7)	Poor or missing analysis; results are unclear or unstructured. (1-4)



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

Criteria	High	Medium	Low
4. Presentation & Defense(5m)	Excellent presentation with strong technical knowledge; confidently answers questions.(4-5)	Good presentation with clear understanding but some minor issues. (2-3)	Weak presentation with unclear delivery and poor defense of concepts.(1)
5.Report Preparation(10m)	Effectively organized and well framed contents or using latex editor(8-10)	Organized but not good content wise (5-7)	Disorganized and contents not sufficient(1-4)
6.Paper Publication (10Marks)	Journal/Conference (8-10)	National conference International Conference(5-7)	Paper submitted & awaiting results (1-4)

Course Articulation Matrix

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO12	PSO 1	PSO 2
CO1			3		3								2	2
CO2									3	3	3	3		2
CO3						3	3	3						
CO4									3					2



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

Course Title	Virtual Reality and Augmented Reality		
Course Code	23IS771	(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			



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

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=0AAAAAp_hJCZXFxnZBPcmZGqPaESOd6I8kZ&gclid=CjwKCAjw6s7CBhACEiwAuHQcko1piaCfNIMFQIw_a0JCr-UEK3s2i471qqLGjBQRzjKLQGUqmijobthoCeH0QAvD_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 – 5Marks	20
Total		50



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

Course Title	Parallel Programming		
Course Code	23IS772	(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.
Introduction to parallel programming, Parallel hardware and parallel software –Classifications of parallel computers, SIMD systems, MIMD systems, Interconnection networks, Cache coherence, Shared- memory vs. distributed-memory, Coordinating the processes/threads, Shared-memory, Distributed-memory GPU programming, Programming hybrid systems.			
MODULE-2			10 Hrs.
Input and output - MIMD systems, GPUs, Performance –Speedup and efficiency in MIMD systems, Amdahl's law, Scalability in MIMD systems, Taking timings of MIMD programs, GPU performance. Distributed memory programming with MPI – MPI functions, The trapezoidal rule in MPI, Dealing with I/O, Collective communication, MPI-derived data types.			
MODULE-3			10 Hrs.
Distributed memory programming with MPI (Continue..) Performance evaluation of MPI programs, A parallel sorting algorithm. Shared-memory programming with OpenMP – openmp programs and directives, The trapezoidal rule, Scope of variables, The reduction clause, loop carried dependency, scheduling, producers and consumers, Caches, cache coherence and false sharing in openmp, tasking, thread safety.			
MODULE-4			10 Hrs.
GPU programming with CUDA - GPUs and GPGPU, GPU architectures, Heterogeneous computing, Threads, blocks, and grids Nvidia compute capabilities and device architectures, Vector addition, Returning results from CUDA kernels, CUDA trapezoidal rule I, CUDA trapezoidal rule II: improving performance, CUDA trapezoidal rule III: blocks with more than one warp.			



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

Prescribed Text Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1.	An Introduction to parallel programming	Peter S Pacheco, Matthew Malensek –Morgan Kauffman	Second Edition	Morgan Kaufmann	2011
2.	Parallel Programming in C with MPI and OpenMp	Michael J Quinn	–	McGrawHill	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: Demonstration, Presentation, Report on a course- related topic – 20 Marks Each student will present a topic related to parallel computing paradigms, tools (such as OpenMP, MPI) real-world applications, demonstrating conceptual clarity and relevance.	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	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	DevOps: Bridging Development and Operations		
Course Code	23IS773	(L-T-P) C	(3-0-0) 3
Exam	3	Hours/Week	3
SEE	50 Marks	Total Hours	40

Course Objective: Introduce DevOps culture, CI/CD, Infrastructure as Code, containerization, and Kubernetes using industry practices.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	DevOps culture and practices	1,2,3,4	-
2.	Implement CI/CD pipelines.	1,2,3,4,9	-
3.	Apply Infrastructure as Code and configuration management and Build and deploy containerized applications.	1,2,3,4,9	-
4.	Deploy and manage applications using Kubernetes	1,2,3,4,9	-

MODULE - 1

10Hr

Introduction to Devops: What Is Devops ,History of Devops, Devops definition ,DevOps Main Objectives ,DevOps and Software Development Life Cycle ,Waterfall Model ,Agile Model ,Continuous Integration & Deployment ,Jenkins ,Containers and Virtual Development ,Docker ,Vagrant ,Configuration Management Tools ,Ansible Cloud Computing :What is Cloud, IAAS(Infrastructure as a Service) ,SAAS(Software as a Service) ,PAAS(Platform as a Service) ,Private, Public and Hybrid Cloud ,Public Cloud Amazon Web Services , Microsoft Azure ,Google Cloud Services

MODULE - 2

10 Hr

Terraform: Introduction to terraform, terraform architecture and its components, terraform life cycle, terraform modules, terraform using aws examples. **Ansible:** Introduction to Ansible, Infrastructure Management, YAML Scripts , Host Inventory ,Hosts and Groups , Host Variables ,Group Variables ,Playbooks ,Variables ,Conditionals ,Loops ,Blocks ,Handlers ,Templates ,Modules ,Core Modules ,Ansible Roles

MODULE - 3

10 Hr

Docker: What is Docker Image, Docker Installation, Working with Docker Containers, What is Container,Docker Engine,Creating Containers with an Image,Working with Images Docker Command Line Interface ,Docker Compose Version Control-GIT: GITFeatures, 3-TreeArchitecture, GIT-Clone /Commit/Push, GIT Hub Management, GIT Rebase &Merge ,GIT Stash, Reset, Checkout ,GIT Clone, Fetch ,Pull.

MODULE - 4

10 Hr

Continuous Integration-Jenkins: Introduction to Jenkins, Configure Jenkins, Jenkins Management, Scheduling build Job, pollscmMaven Build Scripts , Support for the GIT. version control System ,Different types of Jenkins Jobs, Jenkins Build Pipe Line ,Parent and Child Builds ,Sequential Builds ,Jenkins Master &Slave Node Configuration, Jenkins Workspace Management ,Securing Jenkins ,Authentication ,Authorization, Confidentiality ,Creating Users ,Jenkins Plugins ,Installing Jenkins Plugins , SCM plug in ,Build and test. **Kubernetes:** Introduction to kubernetes, components and architecture of kubernetes



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DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Learning Devops, , c	Mikael krief,	-	packt publishers	2019

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Ansible from beginner to pro	Michael heap	first	Apress	2016
2	Jenkins the definitive guide	John ferguson smart	creative commons edition	O'Reilly Media	2011

Online Courses and Video Lectures:

1. [http://www.edureka.co>devops>training](http://www.edureka.co/devops/training)
2. <http://www.papaerlive.in>

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: Students will implement DevOps practices by performing version control, continuous integration and deployment, containerization, infrastructure automation, and system monitoring using tools such as Git, Jenkins, Docker, and Grafana to demonstrate automation, collaboration, and efficient software deployment.	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	2	1	1										
CO2	2	3	2	2	3				1					
CO3	2	3	2	2	3									
CO4	2	3	2	2	3				1					



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

Course Title	Generative Artificial Intelligence		
Course Code	23IS774	(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

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

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

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

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-



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

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 (3January 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>

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



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

Course Articulation Matrix

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

Course Title	Fundamentals of Database Management System		
Course Code	23OEIS71	(L-T-P)C	(3-0-0) 3
Exam	50	Hours/Week	3
SEE	50	Tota Hours	40
Course Objective: Acquire the knowledge, and implement relational databases. 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			



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

Prescribed Text Books:

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

Reference Books:

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

Mooc Courses:

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

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 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

Course Articulation Matrix

Course Outcomes	Program Outcomes													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO12	PSO1	PSO2
CO1	3	1									1			
CO2	2	2	2											
CO3	3		3	1	2						2			
CO4	2	2		1		2					2			

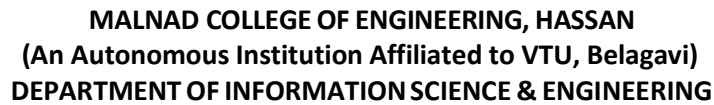


MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING

Course Title	Introduction To Big Data		
Course Code	23OEIS72	(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:			
#	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..			

Prescribed Text Books:

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

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

Course Title	Fundamentals of Block Chain		
Course Code	23OEIS73	(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
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING

Course Title	Introduction to Data Science		
Course Code	23OEIS74	(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			



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

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



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

Course Title	Internship (Research / Industry) (14-16 Weeks)		
Course Code	23INT	(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.		
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		



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

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.
Parameters for Assessment	Diary Report presentation skill Recommendation Letter from the guide



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

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		



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

Course Title	Professional Elective (Online Course)
Course Code	23SW01

Course Title	Openl Elective (Online Course)
Course Code	23SW02

Mapping of marks from NPTEL courses

For computing the marks scored by a students in NPTEL course, both CIE and SEE component will be given 50-50 weightage. 50% marks will be considered from online assignment marks as CIE marks and 50% marks will be considered from proctored exam conducted by NPTEL as SEE marks.

Type of assessment	Weightage given to NPTEL courses
Continuous Internal Evaluation(CIE)	50% marks from online assignments
Semester End Examination(SEE)	50% marks from proctored exam

The CIE and SEE marks are computed as follows:

CIE marks= Online assignment marks scored by student*2

SEE marks= (Proctored exam marks scored by student/75)*50