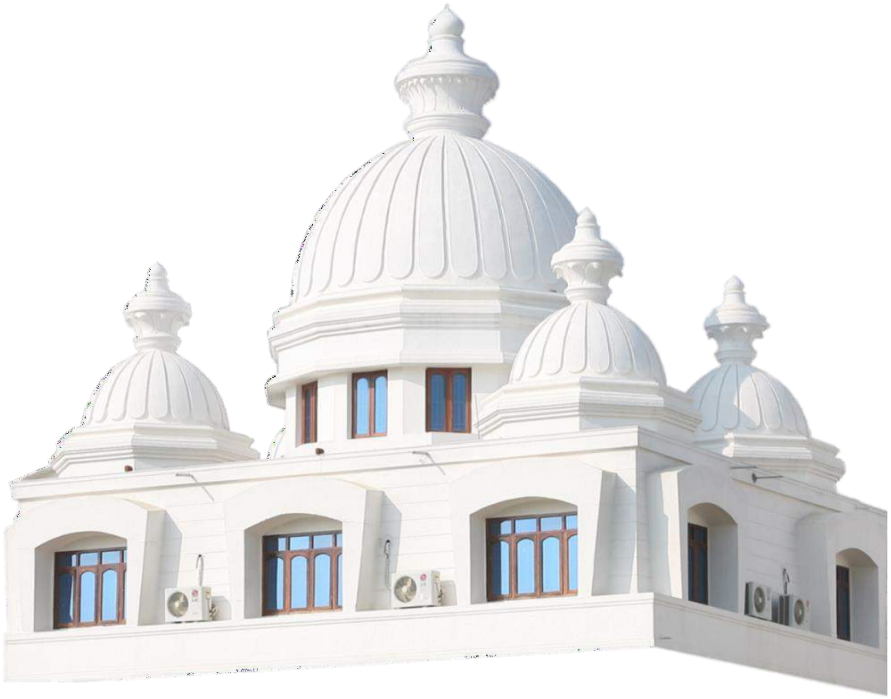
B.Tech. Artificial Intelligence & Data Science

CURRICULUM & SYLLABI
I to IV Semester

Regulation – 2023



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B.TECH - ARTIFICIAL INTELLIGENCE AND DATA SCIENCE
REGULATION – 2023 / V2
CHOICE BASED CREDIT SYSTEM
I TO VIII SEMESTERS CURRICULUM

I – SEMESTER									
Code No.	**Course**	**Category**	**Periods /Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
Theory Course(s)									
23MA102	Matrices and Calculus	BS	3	1	0	4	40	60	100
23CS101	Computer Hardware and Networking	ES	3	0	0	3	40	60	100
23CS102	Problem Solving using Python Programming	ES	3	0	0	3	40	60	100
23LET07	Tamilar Marabu/ Heritage of Tamils (□□□□□□ □□□□)	HSS	1	0	0	1	100	0	100
Theory with Practical Course(s)									
23LEE01	Language Electives – I Communicative English	HSS	2	0	2	3	50	50	100
23PH102	Physics for Computing Sciences	BS	3	0	2	4	50	50	100
Practical Course(s)									
23CS103	Problem Solving using Python Programming Laboratory	ES	0	0	4	2	60	40	100
Mandatory Course - I									
23MC001	Mandatory Course – I Induction Programme	MC	2 Weeks			**0**	**100**	**-**	**100**
TOTAL			**15**	**1**	**8**	**20**	**480**	**320**	**800**

Language Electives – I									
Code No.	**Course**	**Category**	**Periods / Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
23LEE01	Communicative English	HSS	2	0	2	3	50	50	100
23LEE02	Advanced Communicative English	HSS	2	0	2	3	50	50	100

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II - SEMESTER									
Code No.	**Course**	**Category**	**Periods /Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
Theory Course(s)									
23MA202	Mathematical Foundations For Engineering	BS	3	1	0	4	40	60	100
23CS201	Programming in C and Data Structures	PC	3	0	0	3	40	60	100
23AI201	Operating Systems	PC	3	0	0	3	40	60	100
23LET08	Tamils & Technology (த□□□ரும் தொழில்நுட்பமும்)	HSS	1	0	0	1	100	0	100
Theory with Practical Course(s)									
23LEE02	Language Electives – II Advanced Communicative English	HSS	2	0	2	3	50	50	100
23CH201	Chemistry for Computing Sciences	BS	3	0	2	4	50	50	100
23ME101	Engineering Graphics	ES	1	0	4	3	50	50	100
Practical Course(s)									
23CS202	Programming in C and Data StructuresLaboratory	PC	0	0	4	2	60	40	100
Mandatory Course									
23MC003	Mandatory Course – II Interpersonal Skills	MC	0	0	2	0	100	0	100
TOTAL			**18**	**1**	**12**	**23**	**530**	**370**	**900**

*Language Electives									
Code No.	**Course**	**Category**	**Periods /Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
23LEE02	Advanced Communicative English	HSS	2	0	2	3	50	50	100
23LEH03	Hindi	HSS	2	0	2	3	50	50	100
23LEF04	French	HSS	2	0	2	3	50	50	100
23LEG05	German	HSS	2	0	2	3	50	50	100
23LEJ06	Japanese	HSS	2	0	2	3	50	50	100

III – SEMESTER									
Code No.	**Course**	**Category**	**Periods /Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
Theory Course(s)									
23AI301	Artificial Intelligence	PC	3	0	0	3	40	60	100
23CB301	Design and Analysis of Algorithms	PC	3	0	0	3	40	60	100
23CS401	Database Management Systems	PC	3	0	0	3	40	60	100
23UH001	Universal Human Values	HSS	3	0	0	3	40	60	100
Theory with Practical Course(s)									
23MA302	Probability and Statistics	BS	3	0	2	4	50	50	100
23AI302	DataMining and Modeling	PC	3	0	2	4	50	50	100
Practical Course(s)									
23CS403	Database Management Systems Laboratory	PC	0	0	2	1	60	40	100
23AI303	Prolog Programming Laboratory	PC	0	0	2	1	60	40	100
Mandatory Course									
23MC002	Mandatory Course – III Environmental Sciences	MC	2	0	0	0	100	0	100
TOTAL			**20**	**0**	**8**	**22**	**480**	**420**	**900**

IV – SEMESTER									
Code No.	**Course**	**Category**	**Periods / Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
Theory Course(s)									
23AI401	Data Science	PC	3	0	0	3	40	60	100
23AI402	Theory of Computation	PC	3	0	0	3	40	60	100
23AI403	JAVA Programming	PC	3	0	0	3	40	60	100
Theory with Practical Course(s)									
23MA401	Numerical Methods	BS	3	0	2	4	50	50	100
23EC309	Digital Logics and Microprocessor	ES	3	0	2	4	50	50	100
Practical Course(s)									
23AI404	JAVA Programming Laboratory	PC	0	0	2	1	60	40	100
23AI405	Data Science Laboratory	PC	0	0	2	1	60	40	100
23MC005	Mandatory Course – IV Yoga and Values for Holistic Development	MC	0	0	2	0	100	0	100
TOTAL			**15**	**0**	**10**	**19**	**440**	**360**	**800**

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V – SEMESTER									
Code No.	**Course**	**Category**	**Periods /Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
Theory Course(s)									
23AI501	Data Analytics	PC	3	0	0	3	40	60	100
23AI502	Machine Learning Techniques	PC	3	0	0	3	40	60	100
23IT401	Data Communication and Computer Networks	ES	3	0	0	3	40	60	100
23AIEXX	Professional Elective – I	PE	3	0	0	3	40	60	100
23YYOXX	Open Elective – I	OE	3	0	0	3	40	60	100
Theory with Practical Course(s)									
23AI503	Object Oriented System Design	PC	3	0	2	4	50	50	100
Practical Course(s)									
23AI504	Machine Learning Laboratory	PC	0	0	2	1	60	40	100
23AI506	Data Analytics Laboratory	PC	0	0	2	1	60	40	100
23IT406	Data Communication and Computer Networks Laboratory	ES	0	0	2	1	60	40	100
23MCXXX	Mandatory Course – V Indian Constitution	MC	0	0	2	0	100	0	100
TOTAL			**18**	**0**	**10**	**22**	**530**	**470**	**1000**

VI – SEMESTER									
Code No.	**Course**	**Category**	**Periods /Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
Theory Course(s)									
23AI601	Professional Ethics and Human Values	HSS	3	0	0	3	40	60	100
23AIEXX	Professional Elective - II	PE	3	0	0	3	40	60	100
23YYOXX	Open Elective - II	OE	3	0	0	3	40	60	100
Theory with Practical Course(s)									
23AI602	Data Exploration and Visualization	PC	3	0	2	4	50	50	100
23IT502	Internet Of Things	PC	3	0	2	4	50	50	100
23IT702	Cloud Computing and Virtualization	PC	3	0	2	4	50	50	100
Practical Course(s)									
23AI605	Design Thinking and Mini project	EEC	0	0	2	2	60	40	100
23AI606	Internship	EEC	2 Weeks			1	100	-	100
TOTAL			**15**	**0**	**8**	**24**	**430**	**370**	**800**

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VII – SEMESTER									
Code No.	**Course**	**Category**	**Periods /Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
Theory Course(s)									
23AI701	Deep Learning	PC	3	0	0	3	40	60	100
23CB703	Software Quality Assurance and Testing	PC	3	0	0	3	40	60	100
23AIEXX	Professional Elective - III	PE	3	0	0	3	40	60	100
23AIEXX	Professional Elective - IV	PE	3	0	0	3	40	60	100
23YYOXX	Open Elective - III	OE	3	0	0	3	40	60	100
Theory with Practical Course(s)									
23IT603	Cryptography and Digital Security	PC	3	0	2	4	50	50	100
Practical Course									
23AI704	Design Project	EEC	0	0	2	2	60	40	100
TOTAL			**18**	**0**	**4**	**21**	**310**	**390**	**700**

VIII – SEMESTER									
Code No.	**Course**	**Category**	**Periods /Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
Theory Course(s)									
23AIEXX	Professional Elective - V	PE	3	0	0	3	40	60	100
23AIEXX	Professional Elective - VI	PE	3	0	0	3	40	60	100
Practical Course(s)									
23AI801	Major project	EEC	0	0	16	8	60	40	100
TOTAL			**6**	**0**	**16**	**14**	**140**	**160**	**300**

MANDATORY COURSES (MC)									
Code No.	**Course**	**Category**	**Periods / Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
23MC001	Induction Programme	MC	2 Weeks			0	100	0	100
23MC002	Environmental Sciences	MC	2	0	0	0	100	0	100
23MC003	Interpersonal Skills	MC	2	0	0	0	100	0	100
23MC004	Indian Constitution	MC	0	0	2	0	100	0	100
23MC005	Yoga and Values for Holistic Development	MC	0	0	2	0	100	0	100
23MC006	Soft Skills	MC	0	0	2	0	100	0	100

Professional Electives (PE)									
Stream I: Computer Automation									
Code No.	**Course**	**Category**	**Periods /Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
23AIE01	Intelligent Information Retrieval	PE	3	0	0	3	40	60	100
23AIE02	Advanced Artificial Intelligence Systems	PE	3	0	0	3	40	60	100
23AIE03	Neural Networks	PE	3	0	0	3	40	60	100
23AIE04	Robotic Process Automation	PE	3	0	0	3	40	60	100
23AIE05	Natural Language Processing	PE	3	0	0	3	40	60	100
23AIE06	Augmented Reality & Virtual Reality	PE	3	0	0	3	40	60	100
23AIE07	Pattern Recognition	PE	3	0	0	3	40	60	100
23AIE08	Statistical Decision Making	PE	3	0	0	3	40	60	100
23AIE09	Computer Vision	PE	3	0	0	3	40	60	100
23AIE10	Geometric Modeling	PE	3	0	0	3	40	60	100
23AIE11	Digital Marketing	PE	3	0	0	3	40	60	100
23AIE12	Multimedia and Animation	PE	3	0	0	3	40	60	100

Stream II: Cyber Security and Forensics									
Code No.	**Course**	**Category**	**Periods /Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
23AIE21	Cyber Law and Ethics	PE	3	0	0	3	40	60	100
23AIE22	Cyber Forensics	PE	3	0	0	3	40	60	100
23AIE23	Ethical Hacking Fundamentals	PE	3	0	0	3	40	60	100
23AIE24	Secure Cloud Computing	PE	3	0	0	3	40	60	100
23AIE25	Information Security	PE	3	0	0	3	40	60	100
23AIE26	Quantum Cryptography	PE	3	0	0	3	40	60	100
23AIE27	Blockchain and Cryptocurrency Technologies	PE	3	0	0	3	40	60	100
23AIE28	Cyber Crime and Computer Ethics	PE	3	0	0	3	40	60	100
23AIE29	Mobile Application Security	PE	3	0	0	3	40	60	100
23AIE30	Intrusion Detection and Prevention	PE	3	0	0	3	40	60	100
23AIE31	Ethics and AI	PE	3	0	0	3	40	60	100
23AIE32	Social Network Security	PE	3	0	0	3	40	60	100

Stream III: Internet of Things									
Code No.	**Course**	**Category**	**Periods /Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
23AIE41	Principles of Sensors and Signal Conditioning	PE	3	0	0	3	40	60	100
23AIE42	Data Acquisition	PE	3	0	0	3	40	60	100
23AIE43	Wireless sensor Networks	PE	3	0	0	3	40	60	100
23AIE44	EDGE Computing Technologies	PE	3	0	0	3	40	60	100
23AIE45	Mobile Computing	PE	3	0	0	3	40	60	100
23AIE46	Wearable Computing	PE	3	0	0	3	40	60	100
23AIE47	IoT Programming	PE	3	0	0	3	40	60	100
23AIE48	IoT Security and Trust	PE	3	0	0	3	40	60	100
23AIE49	IoT Applications and Web development	PE	3	0	0	3	40	60	100
23AIE50	Industrial IoT	PE	3	0	0	3	40	60	100
23AIE51	IoT Communication Technologies	PE	3	0	0	3	40	60	100
23AIE52	Design of Smart Cities	PE	3	0	0	3	40	60	100

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Open Electives (OE)									
Code No.	**Course**	**Category**	**Periods/Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
23AIO01	Game Programming	OE	3	0	0	3	40	60	100
23AIO02	CISCO- Routing and Switching	OE	3	0	0	3	40	60	100
23AIO03	Foundations of Artificial Intelligence	OE	3	0	0	3	40	60	100
23AIO04	Content Based Image and Video Retrieval	OE	3	0	0	3	40	60	100
23AIO05	Mobile Computing	OE	3	0	0	3	40	60	100
23AIO06	Human Computer Interaction	OE	3	0	0	3	40	60	100
23AIO07	Database management System and Administration	OE	3	0	0	3	40	60	100
23AIO08	Advanced Java Programming	OE	3	0	0	3	40	60	100
23AIO09	Soft Computing	OE	3	0	0	3	40	60	100
23AIO10	Concepts in Data Science	OE	3	0	0	3	40	60	100
23AIO11	Fundamentals of Data Science and Analytics	OE	3	0	0	3	40	60	100
23AIO12	Web Technology	OE	3	0	0	3	40	60	100

ONE CREDIT COURSES									
Code No.	**Course**	**Category**	**Periods /Week**			**C**	**Maximum Marks**		
			L	**T**	**P**		**CA**	**FE**	**Total**
23AIA01	Hadoop - Map Reduce	EEC	0	0	2	1	40	60	100
23AIA02	Maya Tool	EEC	0	0	2	1	40	60	100
23AIA03	Tensor Flow	EEC	0	0	2	1	40	60	100
23AIA04	CMS Web Development	EEC	0	0	2	1	40	60	100
23AIA05	Eclipse	EEC	0	0	2	1	40	60	100
23AIA06	ORANGE Tool	EEC	0	0	2	1	40	60	100
23AIA07	WEKA Tool	EEC	0	0	2	1	40	60	100
23AIA08	Mango DB	EEC	0	0	2	1	40	60	100
23AIA09	Raspberry-Pi	EEC	0	0	2	1	40	60	100
23AIA10	Rapid miner	EEC	0	0	2	1	40	60	100
23AIA11	Embedded Systems in Python	EEC	0	0	2	1	40	60	100
23AIA12	Linux Shell Programming	EEC	0	0	2	1	40	60	100
23AIA13	Full Stack Development	EEC	0	0	2	1	40	60	100
23AIA14	Search Engine Optimization	EEC	0	0	2	1	40	60	100

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CREDIT SUMMARY

S. No	Category	CREDITS PER SEMESTER								Total Credit (AICTE)	Credits in %
		I	II	III	IV	V	VI	VII	VIII		
1	HSS	4	4	3			3			14 (10-14)	8.49%
2	BS	8	8	4	4					24 (22-28)	14.56%
3	ES	8	3		4	4				19 (24)	11.51%
4	PC		8	15	11	12	12	10		68 (48)	41.21%
2	PE					3	3	6	6	18 (18)	10.90%
6	OE					3	3	3		9	5.46%
7	EEC						3	2	8	13 (12-16)	7.87%
8	MC	0	0	0	0					0	0%
Total		20	23	22	19	22	24	21	14	165	100.00%

HSS - Humanities and Social Sciences

BS - Basic Sciences

ES - Engineering Sciences

PC - Professional Core

PE - Professional Electives

OE – Open Electives

EEC - Employability Enhancement Courses

MC - Mandatory Courses (Non-Credit Courses)

CA - Continuous Assessment

FE - Final Examination

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SEMESTER 1

23PH102	PHYSICS FOR COMPUTING SCIENCES (Common to AI&DS, CSE, CSBS and IT courses)	L	T	P	C
		3	0	2	4
Nature of Course	Basic Sciences				
Pre requisites	Nil				

Course Objectives

The course is intended to

1. Impart knowledge in production of laser and their applications in engineering and medical field
2. Know the types of fibre optics and their applications in advanced communication systems.
3. Relate the concept of ultrasonics in the field of engineering and medical
4. Distinguish the types of semiconductors and its applications.
5. Learn the optoelectronic devices like solar cell, LED etc.

Course Outcomes

On successful completion of the course the students will be able to

CO.No	Course Outcome	Bloom's Level
CO 1	Compare the types of lasers for various industrial applications.	Apply
CO 2	Discuss the importance of different fibre optic communication systems.	Understand
CO 3	Describe the production and applications of ultrasonics.	Understand
CO 4	Explain the various properties of semiconductor and its types.	Understand
CO 5	Demonstrate the construction and working of the optoelectronic devices	Apply

Course Contents

Module – I LASER PHYSICS 9

Lasers: Introduction - characteristics of laser - population of energy levels - Einstein's A and B coefficients – Types of lasers – CO_2 and semiconductor lasers (homojunction and heterojunction) - Industrial Applications – Laser heat treatment (cutting, welding and drilling) – Holography.

Module – II FIBER OPTICS 9

Fiber Optics: Introduction – principle and propagation of light in optical fiber - Numerical aperture and Acceptance angle - Types of optical fiber (Material, refractive index & mode) - Double crucible technique – splicing, loss in optical fibre – optical fiber communication system - applications - fiber optic sensors – temperature and displacement sensors - fiber optic endoscope.

Module – III ULTRASONICS 9

Introduction – Production – magnetostriction effect – magnetostriction generator - piezoelectric effect – piezoelectric generator – detection of ultrasonic waves properties – Cavitations – velocity measurement – acoustic grating – Industrial applications – SONAR – Non destructive testing – Sonograms.

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Module – IV SEMICONDUCTOR PHYSICS 9

Introduction – properties – types - Intrinsic Semiconductors – direct and indirect band gap semiconductors — carrier concentration of intrinsic semiconductors- extrinsic semiconductors - N-type - P-type semiconductors (Qualitative) — Hall effect – theory – experimental and its applications.

Module – V OPTO ELECTRONIC DEVICES 9

Classification of optical materials – carriers generation and recombination processes – photo current in a P- N diode: principle and working – solar cell and photo detectors: principle and working – LED: principle and working – Organic LED. principle and working, advantages over LED.

Total : 45 Periods

Laboratory Component

S.No.	Name of the Experiment	CO Mapping	RBT
1	Determination of wavelength of the given Laser beam.	CO 1	Apply
2	Particle size determination of the given particles using laser.	CO 1	Apply
3	Determination of acceptance angle using optical fiber.	CO 2	Apply
4	Determination of velocity of sound and compressibility of liquid - Ultrasonic interferometer.	CO 3	Apply
5	Determination of band gap of a semiconductor	CO 4	Apply
6	Determination of V-I characteristics of solar cell.	CO 5	Apply

Total: 30 Periods

Text Books

1. R Murugeshan&KiruthigaSivaprasath, "Modern Physics",S.Chandand company. Ltd., New Delhi, 18th edition, 2019.
2. M.N. Avadhanulu&Kshirsagar PG. "A Text book of Engineering Physics", S.Chand and Company. Ltd., New Delhi, 11th edition, 2019.
3. Dr. P.K. Diwan, "Applied Physics for Engineers", Wiley India PVT Ltd,1st edition, 2014.

Reference Books

1. Halliday, D, Resnick, R and Walker, J, "Principles of Physics",Wiley, 11th edition,2020.
2. Ghatak A K and Thyagarajan K, "Introduction to Fiber Optics", Cambridge University Press, 2017
3. Serway, R.A. & Jewett, J.W, "Physics for Scientists and Engineers", Cengage Learning, 9th edition, 2019.

Additional References

1. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7694722/
2. https://nptel.ac.in/courses/115/107/115107095/
3. https://www.coursera.org/lecture/fe-exam/stresses-in-beams-strains-in-pure-and-nonuniform-bending-6afMRx
4. https://nptel.ac.in/courses/115/105/115105099/#
5. https://www.youtube.com/watch?v=uv0LxMoalEQ

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Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	3	2	1								1			
CO 2	3	2	1								1			
CO 3	3	2	1								1			
CO 4	3	2	1								1			
CO 5	3	1	1								1			
	3-High				2-Medium				1-Low					

Summative Assessment						
Bloom's Level	Continuous Assessment					Final Examination (Theory) [50]
	Theory				Practicals	
	IAE-I [5]	IAE-II [10]	IAE-III [10]	Attendance [5]	Rubric based CIA [20]	
Remember	12	12	12			30
Understand	34	38	28		40	60
Apply	4	-	10		60	10
Analyze	-	-	-		-	-
Evaluate	-	-	-		-	-
Create	-	-	-		-	-

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Passed in Academic Council Meeting 27.04.23

23MA102	MATRICES AND CALCULUS (Common to all B.E/B.Tech Programmes)	L	T	P	C
		3	1	0	4
Nature of Course	Basic Sciences				
Pre requisites	Nil				

Course Objectives

The course is intended to

1. Introduce the concept of orthogonal transformation to convert the square matrix into diagonal form.
2. Acquaint the student with mathematical tools needed in evaluating derivatives and differentiation of one variable.
3. Familiarize the functions of two variables, Taylor series and Jacobian techniques
4. Impart knowledge of double integral techniques in evaluating volume of the solid.
5. Learn the Green's theorem Stoke's theorem and the Divergence theorem to compute integrals

Course Outcomes

On successful completion of the course the students will be able to

CO. No	Course Outcome	Bloom's Level
CO 1	Apply the concept of orthogonal reduction for diagonalization of the given matrix	Apply
CO 2	Execute the rules of differentiation to differentiate the functions.	Apply
CO 3	Demonstrate the maxima and minima for a given function with two variables	Apply
CO 4	Apply integration to compute area and volume using multiple integrals	Apply
CO 5	Interpret the Green's theorem, Stokes' theorem and Divergence theorem to evaluate integrals.	Apply

Course Contents

Module – I MATRICES 9+3

Eigen values and Eigenvectors of a real matrix – Characteristic Equation- Properties - Cayley Hamilton Theorem - Orthogonal transformation of a symmetric matrix to diagonal form – Reduction of quadratic form to canonical form by orthogonal transformation – Nature of Quadratic Forms.

Module – II DIFFERENTIAL CALCULUS 9+3

Functions of single Variable -Limits and Continuity - Derivatives - Differentiation rules(sum, product, quotient, chain rule) – Implicit differentiation-Logarithmic differentiation-Maxima and Minima of function of one variable –Taylors series.

Module – III FUNCTIONS OF TWO VARIABLES 9+3

Limits and Continuity –Partial differentiation–Homogeneous functions and Euler's theorem– Jacobians –Partial differentiation of implicit functions–Taylor's series– Maxima and minima – Lagrange s method of multipliers.

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Module – IV **MULTIPLE INTEGRALS** 9+3

Double integrals – Change of order of integrations- Double integrals in polar coordinates – Areaenclosed by plane curves – Triple integrals – Volume of solids.

Module – V **VECTOR CALCULUS** 9+3

Gradient and directional derivative — Divergence and curl — Green's, Gauss divergence and Stoke's theorems — Verification andapplicationinevaluatingline, surfaceandvolumeintegrals (cube, rectangular parallelepiped)

Total : 60 Periods

Text Books

1. B.K.Pal and K.Das , "Engineering Mathematics", Volume-1, 10th Edition, U.N.Dhur and Sons private limited,2020
2. Grewal B.S, "Higher Engineering Mathematics", Khanna Publishers, Delhi, 44th Edition. 2019

Reference Books

1. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company. 1st Edition, 2018
2. N.P.Bali, Manish Goyal, "A text book of Engineering Mathematics Semester II", Laxmi Publications, 6th Edition 2015.
3. Veerarajan T," Engineering Mathematics for Semester I and II", Tata McGraw Hill. 3rd Edition 2017.

Additional References

1. NPTEL-https://nptel.ac.in/courses/111105035
2. NPTEL-https://nptel.ac.in/courses/111104144
3. NPTEL- https://nptel.ac.in/courses/111105122

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	3	2	2										1	
CO 2	3	3	2										1	
CO 3	3	1	1										1	
CO 4	3	2	1										1	
CO 5	3	2	2										1	
	3-High				2-Medium				1-Low					

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Passed in Board of Studies Meeting 17.03.23 *Passed in Academic Council Meeting 27.04.23*

Formative Assessment			
Blooms Taxonomy	**Assessment Component**	**Marks**	**Total marks**
Remember	Quiz	5	15
Understand	Tutorial class / Assignment	5	
Apply			
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examinations (IAE)**			**Final Examinations (FE)**
	IAE – I (5)	**IAE – II (10)**	**IAE – III (10)**	**60**
Remember	10	10	10	20
Understand	30	30	30	60
Apply	10	10	10	20
Analyse				
Evaluate				
Create				

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23LEE01	COMMUNICATIVE ENGLISH Common to all B.E./B.Tech Programmes	L	T	P	C
		2	0	2	3
Nature of Course	Humanities and Sciences				
Pre requisites	Nil				

Course Objectives

The course is intended to

1. Improve lexical, grammatical and semantic competence.
2. Enhance communicative skills in real life situations.
3. Augment thinking in all forms of communication.
4. Equip with oral and written communication skills.
5. Gain employability skills.

Course Outcomes

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO1.	Use effectively the lexical, grammatical and semantic knowledge	Understand
CO2.	Communicate with clarity using intentional vocabulary in English	Apply
CO3.	Articulate perfectly and express their opinions confidently	Apply
CO4.	Accomplish listening and reading skills for life long learning	Apply
CO5.	Comprehend, interpret and present data	Understand

Course Contents:

MODULE I BASIC GRAMMAR AND USAGE 9

Grammar: Parts of Speech – Verb (Primary & Modal Auxiliary) – Prefixes and Suffixes **Listening:** Listening Skills: Importance and Types of Listening – Barriers of Listening - Listening to short monologues **Speaking:** Introducing oneself – Role play **Reading:** Types of Reading – Intensive reading – Extensive Reading – Reading Comprehension **Writing:** Permission letter (Industrial Visit) – Informal letter – Dialogue writing

MODULE II APPLICATIONS OF LANGUAGE SKILLS 9

Grammar: Tenses (Present, Past and Future) – Different Forms of a word – Types of Questions **Listening:** Listening strategies – Listening to Announcements **Speaking:** Likes and dislikes- Movie Reviews – **Reading:** Skimming - Scanning - Reading Newspaper and Articles **Writing:** Inviting Dignitaries – Accepting Invitation – Declining Invitation.

MODULE III CONVERSATIONAL SKILLS 9

Grammar: If conditionals – Numerical Adjectives **Listening:** - Listening to Telephone calls and taking notes – Listening Lectures **Speaking:** Technical Presentation – Group Discussion **Reading:** Reading Magazines - Cloze Test **Writing:** Calling for Quotation – Complaint Letter – Process Description

MODULE IV GRAMMATICAL ACCURACY COMPETENCE 9

Grammar: Subject verb agreement – Discourse markers - One word substitution **Listening:** Listening and gap filling – Listening and Match the answers **Speaking:** Narrating Story - Asking and giving directions **Reading:** Rearranging Jumbled sentence - Note making **Writing:** Instructions – Hints Developing – Report Writing (Fire and Accident Report)

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MODULE V TECHNICAL WRITING SKILLS **Grammar:** Homophones and Homonyms - Abbreviation and Acronyms **Listening:** Listening announcements – Listening and Summing up **Speaking:** Impromptu speech – Presentation at a business meeting **Reading:** Reading and summarizing articles **Writing:** Paragraph Writing – Checklist – Story writing.

Total: 45 Periods

Laboratory Components

S.No.	List of Exercises	CO Mapping	RBT
1	Self Introduction	1	Understand
2	Movie Review	2	Apply
3	Group Discussion	3	Apply
4	Asking and Giving Directions	4	Apply
5	Impromptu Speech	5	Apply
6	Listening to short monologues	1	Understand
7	Listening to Announcement	2	Understand
8	Listening Telephone calls	3	Understand
9	Listening and Gap Filling	4	Apply
10	Listening and Match the answers	4	Apply

Text Books

1. Rizvi, Ashraf.M, "Effective Technical Communication",Tata McGraw Hill Publishing company Limited,New Delhi, 2nd Edition, 2018.
2. Hewings. M, "Advanced English Grammar", 3rd Edition, Cambridge University Press, Chennai, 9th Edition, 2019.
3. Board of Editors, "Using English – A Course book for Undergraduate Engineers and Technologists", Orient Black Swan Private Limited, Hyderabad, 3rd Edition, 2019.

Reference Books:

1. Raman M & Sangeetha Sharma, "Technical Communication", Oxford University Press,USA,13thEdition,2018.
2. Norman Whitby, Business Benchmark – "Pre-Intermediate to Intermediate, Students Book", Cambridge University Press, 1st Edition, 2006.
3. Dhanavel S. P., "English and Soft Skills", 1stEdition, Orient Black Swan Private Limited, Hyderabad, 1st Edition, 2010.

Web References:

1. https://www.englishclub.com/grammar/
2. https://learnenglish.britishcouncil.org
3. https://www.indiabix.com/verbal-ability/questions-and-answers/
4. https://www.elllo.org
5. https://englishforeveryone.org/Topics/Reading-Comprehension.html

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Mapping of Course Outcomes (CO) with Programming Outcomes (PO) Programme Specific Outcomes (PSO)															
COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1										3	1	2	2		
CO2										3	1	2	2		
CO3										3	1	2	2		
CO4										3	1	2	2		
CO5										3	1	2	2		
	3	High			2	Medium				1	Low				

Summative assessment						
Bloom's Level	Continuous Assessment					Final Examination (Theory) [50 marks]
	Theory Marks				Practical	
	IAE-I [5]	IAE-II [10]	IAE -III [10]	Attendance [5]	Rubric based CIA [20 Marks]	
Remember	-	-	-		-	-
Understand	40	40	40		40	40
Apply	60	60	60		60	60
Analyse	-	-	-		-	-
Evaluate	-	-	-		-	-
Create	-	-	-		-	-

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Passed in Board of Studies Meeting on 17.03.23

Passed in Academic Council Meeting on 27.04.23

23LET07 **தமிழர் மரபு** LTPC 1 0 0 1

அலகு I **மொழி மற்றும் இலக்கியம்:** 3

இந்திய மொழிக் குடும்பங்கள் – திராவிட மொழிகள் – தமிழ் ஒரு செம்மொழி – தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை – சங்க இலக்கியத்தில் பகிர்தல் அறம் – திருக்குறளில் மேலாண்மைக் கருத்துக்கள் – தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் - பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் – சிற்றிலக்கியங்கள் – தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி – தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

அலகு II **மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை – சிற்பக் கலை:** 3

நடுகல் முதல் நவீன சிற்பங்கள் வரை – ஐம்பொன் சிலைகள்– பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் – தேர் செய்யும் கலை – சுடுமண் சிற்பங்கள் – நாட்டுப்புறத் தெய்வங்கள் – குமரிமுனையில் திருவள்ளுவர் சிலை – இசைக் கருவிகள் – மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் – தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

அலகு III **நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்:** 3

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

அலகு IV **தமிழர்களின் திணைக் கோட்பாடுகள்:** 3

தமிழகத்தின் தாலரங்களும், விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் – தமிழர்கள் போற்றிய அறக்கோட்பாடு – சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் – சங்ககால நகரங்களும் துறை முகங்களும் – சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.

அலகு V **இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு:** 3

இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு – இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் – சுயமரியாதை இயக்கம் – இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு – கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.

TOTAL : 15 PERIODS

TEXT BOOKS

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)

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REFERENCE BOOKS

1. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
2. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (In print)
3. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
4. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
5. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)

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23LET07 **HERITAGE OF TAMILS** L T P C
1 0 0 1

UNIT I LANGUAGE AND LITERATURE 3

Language Families in India - Dravidian Languages – Tamil as aClassical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.

UNIT II HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE 3

Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.

UNIT III FOLK AND MARTIAL ARTS 3

Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leatherpuppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

UNIT IV THINAI CONCEPT OF TAMILS 3

Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.

UNIT V CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE 3

Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books

TOTAL : 15 PERIODS

TEXT BOOKS

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)

REFERENCE BOOKS

1. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
2. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
3. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
4. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
5. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)

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23CS101	COMPUTER HARDWARE AND NETWORKING (Common to CSBS and AIDS	L	T	P	C
		3	0	0	3
Nature of Course	Engineering Sciences				
Prerequisites	Nil				

Course Objectives

The course is intended to

1. Rewrite the knowledge of mother board components and memory storage devices.
2. Gain knowledge of I/O devices and interfaces.
3. Learn the Maintenance and Trouble Shooting of Desktop.
4. Predict a clear understanding about network devices.
5. Explore the knowledge on network model and various network protocols.

Course Outcomes

On successful completion of the course the students will be able to

CO.No	Course Outcome	Bloom's Level
CO1	Recognize the concepts of motherboard components and memory storage devices	Remember
CO2	Interpret I/O Devices and Interfaces	Understand
CO3	Investigate the experimental maintenance of Desktop and Laptop computers.	Apply
CO4	Summarize computer viruses and troubleshooting mechanism.	Apply
CO5	Examine the properties of various network devices.	Analyse

Course Contents

Module – I	MOTHERBOARD COMPONENTS AND MEMORY STORAGE DEVICES	9
Introduction: Hardware, Software and Firmware. Mother board, IO and Memory expansion slots, SMPS, Drives, front panel and rear panel connectors. Processors: multi core Processor Architecture, Evolution of processors – Pentium, dual core, core i3, i5, i7 (Concepts only) - Bus Standards: PCI, AGP, and PCMCIA Primary Memory: Introduction-Main Memory, Cache memory. HDD Partition - Formatting.		
Module – II	**I/O DEVICES AND INTERFACE**	**9**
Keyboard: Signals–operations; wireless Keyboard.Mouse: types, connectors, operations-troubleshooting. Printers: Introduction–Types- Dot Matrix, Inkjet Laser - Operations-Troubleshooting. I/O Ports: Serial, Parallel, USB, Game Port and HDMI. Displays: Principles of LED, LCD Displays.SMPS: Operation and block diagram of ATX Power supply.		
Module – III	**MAINTENANCE OF DESKTOP AND LAPTOP**	**9**

Passed in Board of Studies Meeting 29.03.2023

Approved in Academic Council Meeting 27.04.2023

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Bios-setup: Standard CMOS setup, Power management, advanced chipset features, PC Bios communication – upgrading BIOS, Flash BIOS -setup. POST: Definition – IPL hardware – POST Test sequence – beep codes. Laptop: Types of laptop –block diagram – working principles– configuring laptops.		
Module – IV	TROUBLE SHOOTING AND COMPUTER VIRUSES	9
Diagnostic Software and Viruses: Computer Viruses – Precautions –Anti- virus Software – identifying the signature of viruses – Firewalls and latest diagnostic softwares. Installation and Troubleshooting: Formatting, Partitioning and Installation of OS – Trouble Shooting Hardware problems.		
Module – V	COMPUTER NETWORK DEVICES	9
Data Communication: Components of a data communication. Data flow: simplex – half duplex- full duplex; Topologies: Star, Bus, Ring, Mesh, Hybrid – Advantages and Disadvantages of each topology. Networks: Definition -Types of Networks: LAN – MAN – WAN – CAN – HAN – Internet –Intranet –Extranet, Client-Server, Peer To Peer Networks. Network devices: Features and concepts of Switches – Routers (Wired and Wireless) – Gateways.		
		Total : 45 Periods

Text Books

1. B.Govindrajalu,"IBM PC and CLONES Hardware Maintenance and Troubleshooting", TataMcGrawhill Publications, 3rd Edition 2019.
2. Behrouz A.Forouzan, "Data Communication and networking", Tata Mc-Graw Hill Publication, New Delhi, 3rd Edition 2018.

Reference Books

1. D.Balasubramanian," Computer Installation and Servicing", Tata McGraw Hill Publication, 2nd Edition, 2020.
2. Micheal, Stephen J Bigelow," Trouble shooting, Maintaining and Repairing PCs, Tata MCGraw Hill Publication, 2nd Edition 2019.
3. AchyutGodbole," Computer Networks", Tata Mc-Graw Hill Publication-New Delhi, 3rd Edition 2018.
4. Kaveh Pahlavan and Prashant Krishnamurty, "Principles of Wireless Networks A Unified Approach", Pearson Education, 2nd Edition 2018.

Passed in Board of Studies Meeting 29.03.2023

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Approved in Academic Council Meeting 27.04.2023

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)															
COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	2	2	2		1							2	3	1	
CO 2	2	2	2		1							2	3	1	
CO 3	2	2	2		1							2	3	1	
CO 4	3	2	3		1							2	3	1	
CO 5	3	2	3		1							2	3	1	
	3	High				2	Medium					1	Low		

Formative Assessment			
Blooms Taxonomy	Assessment Component	Marks	Total marks
Remember	Quiz	5	15
Understand Apply	Tutorial class / Assignment	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	Internal Assessment Examinations (IAE)			Final Examinations (FE)
	IAE – I (5)	IAE – II (10)	IAE – III (10)	60
Remember	10	10	10	30
Understand	10	10	10	30
Apply	20	20	20	20
Analyse	10	10	10	20
Evaluate				
Create				

Passed in Board of Studies Meeting 29.03.2023

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Approved in Academic Council Meeting 27.04.2023

23CS102	PROBLEM SOLVING USING PYTHON PROGRAMMING (Common to AIDS / CSBS / IT)	L	T	P	C
		3	0	0	3
Nature of Course	Engineering Sciences				
Prerequisites	Mathematical and Logical Knowledge				

Course Objectives

The course is intended

1. Learn the basics of algorithmic problem solving.
2. Discuss the basics of simple python programs.
3. Build python programs with conditionals and loops.
4. Make use of python functions and call them.
5. Utilize the Python data structures — lists, tuples, dictionaries and files.

Course Outcomes

On successful completion of the course the students will be able to

CO.No	Course Outcome	Bloom's Level
CO 1	Recall algorithmic solutions to simple computational problems and read, write, execute by simple python programs	Remember
CO 2	Classify and Read, Write, Execute by hand simple python programs.	Understand
CO 3	Examine simple Python programs using conditionals and loops for solving problems	Apply
CO 4	Show the python string functions and lists	Apply
CO 5	Practice the compound data using python Tuples, Dictionaries, Files and Packages.	Apply

Course Contents

Module – I	Basics of Computers & Problem solving	9
Computer Basics – Components-Computer organization - Computer Software- Types of software - Software Development steps -Need for logical analysis and thinking- Algorithms – Flowchart - Number system.		
Module – II	**Introduction of Python Programming**	**9**
Introduction-Python IDLE Installation-Python Interpreter-Interactive and script mode -Values and types, variables, operators, expressions, statements, precedence of operators, Multiple assignments, comments, Input and Output Statements.		
Module – III	**Control statements and Functions**	**9**

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Approved in Academic Council Meeting 27.04.2023

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Conditional (if), alternative (if-else), chained conditional (if-elif-else)-Iteration-while, for, break,continue, pass – Functions - Introduction, inbuilt functions, user defined functions, passing parameters, return values, recursion, Illustrative Programs: Students Mark Statement.		
Module – IV	**Strings, Lists**	**9**
Strings-String slices, immutability, string methods and operations -Lists-creating lists, list operations, list methods, mutability, aliasing, cloning lists, list and strings, list and functions-list processing-list comprehension, Sorting: Merge Sort, Insertion Sort. Illustrative Programs: Reverse String, Adding Elements to a List, Adding List to a List.		
Module – V	**Tuples, Dictionaries, Files and Packages**	**9**
Tuples- Tuple assignment, lists and tuples, Tuple as return value- Dictionaries-operations and methods, Files and Exception-Text files, reading and writing files, Exception handling, Modules and Packages.		
		Total : 45 Periods

Text Books

1. Reema Thareja, "Problem Solving and Programming with Python", Oxford University Press, 1st Edition 2021.
2. Dr. R. Nageswara Rao, "Core Python Programming", Dream tech Press, 1st Edition 2019.

Reference Books

1. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2nd Edition 2021.
2. Ashok Namdev Kamthane, Amit Ashok Kamthane, "Programming and Problem Solving with Python", Mc-Graw Hill Education, 1st Edition 2020.
3. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem Solving Focus", Wiley India Edition, 2nd Edition 2019.
4. Timothy A. Budd," Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 1st Edition 2015.

Additional References

1. **Python Research Association of India** - https://www.araiindia.com/services/technology-and-products
2. **NPTEL** - https://nptel.ac.in/courses/107/106/107106088/
3. **MOOC Courses** - https://www.mooc-list.com/tags/automotive-engineering

Passed in Board of Studies Meeting 29.03.2023

Approved in Academic Council Meeting 27.04.2023

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Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)															
COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	1	2	1		1							2	1	3	
CO 2	2	2	2		1							2	1	2	
CO 3	3	2	2		1							2	1	2	
CO 4	3	3	3		1							2	1	2	
CO 5	2	2	2		1							2	3	1	
	3	High				2	Medium					1	Low		

Formative Assessment			
Blooms Taxonomy	Assessment Component	Marks	Total marks
Remember	Quiz	5	15
Understand	Tutorial class / Assignment	5	
Apply			
	Attendance	5	

Summative Assessment				
Bloom's Category	Internal Assessment Examinations (IAE)			Final Examinations (FE)
	IAE – I (5)	IAE – II (10)	IAE – III (10)	60
Remember	10	10	10	10
Understand	20	20	20	30
Apply	30	30	30	60
Analyse				
Evaluate				
Create				

Passed in Board of Studies Meeting 29.03.2023

Approved in Academic Council Meeting 27.04.2023

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23CS103	PROBLEM SOLVING USING PYTHON PROGRAMMING LABORATORY (Common to CSE/IT/CSBS and AI&DS)	L	T	P	C
		0	0	4	2
Nature of Course	Engineering Sciences				
Pre requisites	Nil				

Course Objectives

The course is intended to

1. Learn the problem solving approaches.
2. Interpret the basic programming constructs in Python.
3. Practice various computing strategies for Python-based solutions to real world.
4. Make use of python data structures – lists, tuples, and dictionaries.
5. Relate input/output with files in Python.

Course Outcomes

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO1	Recall algorithmic solutions to simple computational problems	Remember
CO2	Implement programs in Python using conditionals and loops for solving problems.	Understand
CO3	Build functions to decompose a Python program.	Apply
CO4	Solve compound data using Python data structures.	Apply
CO5	Utilize Python packages in developing software applications.	Apply

Laboratory Components

S.No	List of Exercises	CO Mapping	RBT
1	Write a algorithm & draw flowchart for simple computational problems.	CO1	Apply
2	Write a program to perform different arithmetic operations on numbers in python.	CO1	Apply
3	Write a python program to implement the various control structures.	CO2	Apply
4	Write a python program for computational problems using recursive function.	CO2	Apply
5	Demonstrate use of list for data validation.	CO3	Apply
6	Develop a python program to explore string functions.	CO3	Apply
7	Implement linear search and binary search.	CO4	Apply
8	Develop a python program to implement sorting methods.	CO4	Apply
9	Develop python programs to perform operations ondictionaries.	CO5	Apply
10	Write a python program to read and write into a file.	CO5	Apply
11	Create a game activity using Pygame like bouncing ball, car race etc.	CO5	Create

Passed in Board of Studies Meeting

Approved in Academic Council Meeting

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Mapping of Course Outcomes (CO) with Programme Outcomes (PO) Programme Specific Outcomes (PSO)															
Cos	Pos												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	1	1	1	3						1	2	2	2	
2	3	1	1	1	3						1	2	2	3	
3	3	1	1	1	3						1	2	2	2	
4	3	2	1	2	3						1	2	2	2	
5	3	2	1	1	3						1	2	2	3	
	3	High				2	Medium					1	Low		

Assessment based on Continuous and Final Examination			
Bloom's Level	Continuous Assessment (60 marks) (Attendance – 5 marks)		Final Examination [40 marks]
	Rubric based Continuous Assessment [25 marks]	Model Examination [30 marks]	
Remember			
Understand	10	10	10
Apply	30	30	30
Analyze	60	60	60
Evaluate			
Create			

Passed in Board of Studies Meeting

Approved in Academic Council Meeting

CHAIRMAN-BOARD OF STUDIES

23MC001	INDUCTION PROGRAMME	L	T	P	C
		2	0	0	0
Nature of Course	Mandatory, Non Credit				
Pre requisites	Completion of Schooling at Higher Secondary Level				

Course Objectives

The course is intended to

1. To nurture the character and behavior as a student.
2. To have broad understanding of society andrelationships.
3. To impart interpersonal and softskills.
4. To inspire the students in the field ofengineering.
5. To provide exposure toindustries.

Course Outcomes

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO 1	Perform curricular and co-curricular activities excellently.	Knowledge
CO 2	Do the skill based training with excellence.	Understand
CO 3	Work as team for the given task	Apply
CO 4	Gain character and behaviour	Knowledge
CO 5	Demonstrate the acquired skills effectively	Apply

Course Contents

PHYSICAL ACTIVITY

Yoga, Sports

CREATIVE ARTS (students can select any one of their choice)

Painting, sculpture, pottery, music, craft making and so on

UNIVERSAL HUMAN VALUES

Enhancing soft skills

LITERARY AND PROFICIENCY MODULES

Reading, Writing, Speaking- Debate, Role play etc., Communication and computer skills

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LECTURES BY EMINENT PEOPLE

Guest lecture by subject experts

VISIT TO LOCAL CITIES

Meditation centers / Industry

FAMILARIZATION TO DEPARTMENT / BRANCH INNOVATION

Lectures by Departments Head and senior faculty members

Total Hours: 45

Mapping of COs with POs and PSOs

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)															
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1						2	1	2				3	2		
CO2						2	1	2				3	2		
CO3						2	1	2				3	2		
CO4						2	1	2				3	2		
CO5						2	1	2				3	2		
	3	High				2	Medium					1	Low		

Bloom's Level	**Continuous Assessment (Non-Credit, Mandatory)**				
	Test -I [20]	**Test -II [20]**	**Test - III [20]**	**Assignment/ Activity [20]**	**Attendance [20]**
Remember	10	10	10		
Understand	20	20	20	10	
Apply	20	20	20	10	
Analyse					
Evaluate					
Create					

CHAIRMAN - BOARD OF STUDIES

Passed in Board of Studies Meeting 17.03.23 *Passed in Academic Council Meeting27.04.23*

SEMESTER 2

23CH201	CHEMISTRY FOR COMPUTING SCIENCES (Common for IT, CSE, CSBS and AIDS)	L	T	P	C
		3	0	2	4
Nature of Course	Basic Sciences				
Pre requisites	Fundamentals of Chemistry				

Course Objectives

The course is intended to

1. Impart knowledge and understanding about the constituents present in water and the need for purification of water.
2. Provide knowledge about the basic principles, preparatory methods and applications of nanomaterials.
3. Develop the understanding and applications of basic concepts of electrochemistry
4. Understand the fundamentals of batteries.
5. Conversant with the basics of polymers and engineering plastics.

Course Outcomes

On successful completion of the course the students will be able to

CO.No	Course Outcome	Bloom's Level
CO 1	Develop innovative and eco-friendly method for water purification to meet the growing industrial demand.	Understand
CO 2	Discuss the basic principles, synthesis and applications of nanomaterials.	Understand
CO 3	Use the principles of electrochemical cells, EMF, electroplating and electrolysis.	Understand
CO 4	Discuss the basic principles and mechanism of working of batteries and fuel cells.	Apply
CO 5	Classify engineering plastics and some important industrial polymers.	Understand

Course Contents

Module – I	WATER ANALYSIS AND WATER TREATMENT	9
Water analysis: Sources of water, hard water and soft water, Hardness of water-problems, Water treatment: Definition, Conditioning methods: Internal conditioning (Phosphate, Calgon) and external conditioning (Demineralization), Desalination, Reverse osmosis (RO), Municipal water treatment.		
Module – II	**NANOCHEMISTRY**	**9**
Basics: Distinction between molecules, nanomaterials and bulk materials, Size-dependent properties, Types of nanomaterials: Definition, properties, and uses of nanoparticle, nanocluster, nanorod, nanowire and nanotube. Synthesis: sol-gel, laser ablation. Applications of nanomaterials in medicine, agriculture, energy, electronics, information technology and catalysis.		
Module – III	**ELECTROCHEMISTRY**	**9**
Electrode potential, Nernst equation and problems, Reference electrodes, Standard hydrogen electrode, Calomel electrode, Ion selective electrode-glass electrode, Electrochemical series, Electrochemical cell, Galvanic cell-Daniel cell.		

Module – IV	ENERGY STORAGE DEVICES	9
Batteries: Definition, characteristics and classification, Primary battery: Alkaline battery, Secondary battery: lead acid battery, and lithium-ion battery, Fuel cells: construction and working of H_2-O_2 fuel cell.		
Module – V	**POLYMERIC MATERIALS**	**9**
Engineering plastics: Thermosetting and Thermoplastics, Polymers: polyethylene (PE), polyvinylchloride, nylon-6:6, Fabrication: Injection molding, Composites: definition, types, polymer matrix composites, Biodegradable polymers		
		Total : 45 Periods

Laboratory Components

S.No	List of Experiments	CO Mapping	RBT
1	Determination of hardness of water by using EDTA method.	CO1	Apply
2	Determination of chloride content in water sample.	CO1	Apply
3	Conductometric titration of strong acid versus strong base.	CO2	Apply
4	Determination of strength of HCl by pH metry.	CO2	Apply
5	Estimation of copper in brass by EDTA method.	CO3	Apply
6	Determination of rate of corrosion by weight loss method	CO3	Apply
7	Estimation of strength of iron by potentiometric titration	CO3	Apply
8	Determination of strength of acids in a mixture of acids using conductivity meter	CO3	Apply

Text Books

1. O.G.Palanna, "Engineering Chemistry" Tata McGraw-Hill Pub.Co.Ltd, New Delhi.2020.
2. P. C. Jain and Monica Jain, "Engineering Chemistry", 17th Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2018.
3. M.Manjuladevi and G.Pradheesh, Chemistry Labortory Manual, Gem Publishers, 2017
4. S. S. Dara, "A Text Book of Engineering Chemistry", S. Chand Publishing, 12th Edition, 2018.

Reference Books

1. Engineering Chemistry by Shikha Agarwal, Cambridge University Press, Delhi 2021.
2. R. Sivakumar and N. Sivakumar, "Engineering Chemistry" Tata McGraw-Hill Pub.Co.Ltd. New Delhi. 2019.
3. Dr.Sivanesan and Nandagopal, "Engineering Chemistry-I" V. K. Pub. Pvt. Ltd. 2019.
4. P.C.Jain and Monicka Jain, "Engineering Chemistry", Dhanapat Rai Publising Company Pvt. Ltd. 2017.
5. Text book of Polymers science by Gowarikar and Vishwanathan, New Age International Publishers, New Delhi, 2nd Edition, 2015.

Web References:

1. https://nptel.ac.in/downloads/122101001
2. https://nptel.ac.in/courses/103103033/module9/lecture1.pdf
3. https://nptel.ac.in/courses/102103044/3
4. https://www.youtube.com/watch?v=jFQeDef6bug

Passed in Board of Studies Meeting on 28.12.2023 *Passed in Academic Council Meeting on 11.01.2024*

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Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)														
COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	3	2									1			
CO 2	3	2									1			
CO 3	3	2									1			
CO 4	3	2									1			
CO 5	3	2									1			
	3-High				2-Medium				1-Low					

Summative Assessment						
Bloom's Level	Continuous Assessment (IAE)					Final Examination (FE) [50marks]
	Theory Marks				Practical	
	IAE-I [5]	IAE-II [10]	IAE-III [10]	Attendance [5]	Rubric based CIA [20 Marks]	
Remember	20	20	10		30	30
Understand	30	30	15		30	60
Apply			25		40	10
Analyse						
Evaluate						
Create						

23MA202	MATHEMATICAL FOUNDATIONS FOR ENGINEERING (Common to all B.E. / B.Tech Programme)	L	T	P	C
		3	1	0	4
Nature of Course	Basic Sciences				
Pre requisites	Fundamentals of Basic Mathematics				

Course Objectives

The course is intended to

1. Understand the curvature and calculate the radius of curvature, centre, evolutes, involutes.
2. Acquire the mathematical skills required to solve ordinary differential equations.
3. Familiarizethe concepts of Laplace transform and its inverse.
4. Gain knowledge of analytic approach to analyse the conformal mapping.
5. Obtainthe knowledge of evaluating contour integrals using residue theorem.

Course Outcomes

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO1	Identify the circle of curvature, evolutes and involutes of the curves.	Apply
CO2	Demonstrate various techniques to solve ordinary differential equations.	Apply
CO3	Select Laplace transform to standard functions and solve initial value problems / differential equations .	Apply
CO4	Find an analytic function ,when its real or imaginary part is known	Apply
CO5	Classify the Singularities and its corresponding Residues for the given function	Apply

Course Contents:

Module – I	APPLICATION OF DIFFERENTIAL CALCULUS	12
Curvature – Curvature in Cartesian co-ordinates - Centre and Radius of curvature- Circle of curvature- Evolutes and Involutes.		
Module – II	**ORDINARY DIFFERENTIAL EQUATION**	**12**
Higher order linear differential equations with constant coefficients – Method of variation of parameters – non-Homogenous equation - Euler and Legendre Equations.		
Module – III	**LAPLACE TRANSFORMS**	**12**
Laplace transform –Transform of elementary functions –Properties –Transforms of derivatives and integrals -Transform of periodic functions. Inverse Laplace transform –Statement and applications of Convolution theorem - Method of solving second order ordinary differential equations with constant coefficients by using Laplace transform technique.		

Module – IV	ANALYTIC FUNCTIONS	12
Analytic functions – Necessary and sufficient conditions for analyticity in Cartesian and polar coordinates – Properties – Harmonic conjugates – Construction of analytic function – Conformal mapping : w = a+z, az, 1/z – Bilinear transformation.		
Module – V	**COMPLEX INTEGRATION**	**12**
Line integral - Cauchy's integral theorem –Cauchy's integral formula – Taylor's and Laurent's series — Singularities — Residues — Residue theorem — Application of residue theorem for evaluation of real integrals.		
		Total: 60 Periods

Text Books:

1. Grewal B.S, "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2019.
2. Kreyszig, "Advanced Engineering Mathematics", John Wiley and Sons (Asia) Limited, 10th Edition, 2016.

Reference Books:

1. Bali.N.P and ManishGoyal N.P, "A text book of Engineering Mathematics", Laxmi Publications, 6th Edition, 2015.
2. Ramana B.V, "Higher Engineering Mathematics",Tata McGraw Hill Publishing Company, 1st Edition, 2018.
3. Veerarajan T," Engineering Mathematics for Semester I and II", Tata McGraw Hill, 3rd Edition 2017.

Additional References:

1. https://onlinecourses.nptel.ac.in/noc24_ma12/preview
2. https://onlinecourses.swayam2.ac.in/cec24_ma10/preview
3. https://onlinecourses.nptel.ac.in/noc24_ma37/preview

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

	Pos												PSOs		
COs	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3												
CO2	3	3	2												
CO3	3	2	2												
CO4	3	3	3												
CO5	3	3	3												
	3	High				2	Medium					1	Low		

Formative assessment			
Bloom's Level	**Assessment Component**	**Marks**	**Total marks**
Remember	Online Quiz	5	15
Understand	Tutorial Class /Assignment	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	Internal Assessment Exam			Final Examination (60)
	IAE I (5)	IAE II (10)	IAE III (10)	
Remember	10	10	10	20
Understand	10	10	10	20
Apply	30	30	30	60
Analyze				
Evaluate				
Create				

23LEE02	ADVANCED COMMUNICATIVE ENGLISH (Common to all B.E. / B.Tech Programme)	L	T	P	C
		2	0	2	3
Nature of Course	Humanities and Sciences				
Pre requisites	Communicative English				

Course Objectives

The course is intended to

1. Hone professional communication skills, including email etiquette and formal presentation.
2. Develop advanced vocabulary and collocation for official communication.
3. Communicate effectively and actively in social interactions.
4. Improve writing skills such as project and report writing for various purposes.
5. Foster collaborative communication abilities through group discussion in diverse contexts.

Course Outcomes

On successful completion of the course the students will be able to

CO.No	Course Outcome	Bloom's Level
CO 1	Communicate professionally in various contexts.	Understand
CO 2	Make use of common English phrases and vocabulary.	Understand
CO 3	Integrate basic English communication skills at a personal and a professional level in day-to- day interaction.	Apply
CO 4	Implement listening, reading and writing skills in real - life situations	Apply
CO 5	Decipher collaborative communication skills through diversified contexts.	Understand

Course Contents

Module – I	**TECHNICAL VOCABULARY AND USAGE**	**9**
Grammar: Technical Vocabulary (Synonyms and antonyms) - Articles - Reported Speech - **Listening**: Listening to video lectures (TED / INK Talks) **Speaking**: Describing pictures, places – Speaking practice to improve pronunciation **Reading**: Critical reading from the given text **Writing**: Job Application with Resume - E mail writing.		
Module – II	**EFFECTIVE OFFICIAL COMMUNICATION**	**9**
Grammar: Collocation – Question tags – Prepositions **Listening:** Listening to telephonic conversation **Speaking:** Role plays – Telephonic Etiquette and telephonic phrases **Reading:** Company profile - Advertisement (job / product) **Writing:** – Preparing Memo – Prepare Circular, Agenda and Minutes – Placing Order – Prepare Advertisement.		
Module – III	**TECHNICAL LANGUAGE SKILLS FOR CONVERSATION**	**9**
Grammar: Degrees of Comparison – Conjunctions **Listening:** Sports commentaries – Animated short stories **Speaking:** Asking for and giving directions – Describing simple process **Reading:** Reading and understand technical vocabulary **Writing:** Letter to the Editor – Review of Favourite Movie / Book – Recommendations.		

Module – IV	LANGUAGE FOR BUSINESS CORRESPONDENCE	9
Grammar: Idioms and Phrases – Single line definitions Phrasal verbs **Listening:** Listening to informal communication **Speaking:** Narrating personal experience **Reading:** Speed reading – reading passage within the time limit **Writing:** Project writing – Report writing (Accident and Survey) – Preparing welcome address and vote of thanks.		
Module – V	**VERBAL ABILITY FOR WRITING**	**9**
Grammar: Verbal Analogy – Cause and effect expressions **Listening:** Listening to Iconic Speeches - debate and reviewing the performance **Speaking:** Group communication skills – Discussing social issues and current affairs **Reading:** Short story – critical reading **Writing:** Itinerary –Interpretation of charts (Flow chart and Pie chart) - Essay Writing and Paragraph.		
		Total : 45 Periods

Laboratory Components:

S.No	List of Experiments	CO Mapping	RBT
1	Describing Picture / Place	1	Understand
2	Listening	1	Understand
3	Role Play	2	Understand
4	Prepare Circular, Agenda & Minutes	2	Understand
5	Asking and Giving Directions	3	Apply
6	Narrate a Favourite Movie / Book	3	Apply
7	Welcome Address	4	Apply
8	Vote of Thanks	4	Apply
9	Discussing Social Issues	5	Understand
10	Interpretation of Charts	5	Understand
		Total	**15 Periods**

Text Books

1. Rizvi, Ashraf.M, "Effective Technical Communication", Tata McGraw Hill Publishing Company Limited, New Delhi, 8th Edition, 2020.
2. Hewings. M, "Advanced English Grammar", 3rd Edition, Cambridge University Press, Chennai, 9th Edition, 2019.
3. Board of Editors, "Using English – A Course book for Undergraduate Engineers and Technologists", Orient Black Swan Private Limited, Hyderabad, 3rd Edition, 2019.

Reference Books

1. Dr. Krishnakumar TP, "Rudiments of Communication Skills", Buddha Publication, 1st Edition, 2023.
2. Raman M & Sangeetha Sharma, "Technical Communication", Oxford University Press, USA, 13th Edition, 2018.
3. Dhanavel S. P., "English and Soft Skills", 1st Edition, Orient Black Swan Private Limited, Hyderabad, 2010.

Web References:

1. https://nptel.ac.in/courses/111104031
2. https://nptel.ac.in/courses/111106139
3. https://nptel.ac.in/courses/111105134

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)														
COs	Pos												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1									1	3	1		2	
CO 2									1	3	1		2	
CO 3									1	3	1		2	
CO 4									1	3	1		2	
CO 5									1	3	1		2	
	3-High				2-Medium				1-Low					

Summative assessment						
Bloom's Level	Continuous Assessment (IAE)					Final Examination (FE) [50marks]
	Theory Marks				Practical	
	IAE-I [5]	IAE-II [10]	IAE-III [10]	Attendance [5]	Rubric based CIA [20 Marks]	
Remember	25				4	10
Understand	25	25	25		8	20
Apply		25	25		8	20
Analyse						
Evaluate						
Create						

23LEJ06	JAPANESE	L	T	P	C
		2	0	2	3
Nature of Course	HSS				
Pre requisites	Nil				

Course Objectives

The course is intended to

1. Read & Write Hiragana and Katakana (Japanese Alphabets) letters.
2. Use words and phrases of greeting in Japanese, identify names of objects and do a self-introduction using short and simple sentences.
3. Demonstrate the use of time-related words, verb conjunctions and make light conversation asking for directions and answering questions.
4. Express their likes and dislikes, hobbies, describe the locations of different things and demonstrate counting in Japanese.
5. Demonstrate the minimum day to day conversation and describe their ability and experiences.

Course Outcomes

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO1.	Read & Write Hiragana and Katakana (Japanese Alphabets) letters	Understand
CO2.	Identify names of objects and do self-introduction using short and simple sentences	Apply
CO3.	Demonstrate the use of time-related words	Apply
CO4.	Articulate their likes and dislikes, hobbies and describe the locations of different things	Apply
CO5.	Express day to day conversation and describe their ability to share their experiences	Understand

Course Contents

Module – I		9
INTRODUCTION- はじめまして – ALPHABET - Hiragana - NUMBERS- すうじ- Classroom Words- きょうしつのことば – LISTENING		
Module – II		**9**
ALPHABET-Katakana - BASIC SENTENCE- じぶんのなまえ - COUNTRY NAMES- くにのなまえ- SAYING AGE- なんさいですか - LISTENING		
Module – III		**9**
SAYING MONTH- なにつき - SAYING BIRTHDAY- たんじょうび - KAZOKU- かぞく - KNOWINGTHINGS- あ/こ/そ – LISTENING		

Module – IV		**9**
PRONOUNS - ADJECTIVES - SAYING TIME, SHOPPING – LISTENING		
Module – V		**9**
SELF INTRODUCTION - MY TOWN - Watashino machi - GO, COME, RETURN - BASIC VERBS – TRANSPORT – LISTENING		
		Total : 45 Periods

Text Books

1. Minna no Nihongo – Elementary Japanese 1
2. Minna no Nihongo- Translation & Grammar Notes 1
3. Gateway to Japan Japanese Language school e-handouts / e-course materials.

Summative Assessment						
Bloom's Level	**Continuous Assessment**					**Final Examination (Theory) [50 marks]**
	Theory Marks				**Practical**	
	IAE-I [5]	**IAE-II [10]**	**IAE - III [10]**	**Attendance [5]**	**Rubric based CIA [20 Marks]**	
Remember	50				4	10
Understand		20	20		8	20
Apply		30	30		8	20
Analyse						
Evaluate						
Create						

23LET08	தமிழரும் தொழில்நுட்பமும் TAMILS AND TECHNOLOGY (Common to all B.E. / B.Tech Programme)	L	T	P	C
		1	0	0	1

Nature of Course	Humanities and Sciences
Pre requisites	Tamil

Course Objectives

The course is intended to

1. Introduce students to the great technology of ancient Tamil society.
2. Realize the contribution of various technologies for the development of governing area.
3. Highlighting the different manufacturing technology to make the coins, jewels, stones, art etc.
4. Know the role of agriculture, water management system and food processing.
5. Learn about the Scientific Tamil and Tamil computing of the past and how it has evolved over the generations.

Course Outcomes

On successful completion of the course the students will be able to

CO. No	Course Outcome	Bloom's Level
CO 1	Remember the life style and technology of the Sangam people.	Remember
CO 2	Get an updated knowledge of ancient designing and construction of House, Temple, hero stones etc.	Understand
CO 3	Learnt the speciality of manufacturing technology types and usages.	Understand
CO 4	Gain the knowledge on production of agricultural products based on the ancient technologies.	Understand
CO 5	Understand the evaluation of Tamil language through the digital system.	Understand

Course Contents (in Tamil)

அலகு - I	நெசவு மற்றும் பானைத் தொழில்நுட்பம்	2
சங்க காலத்தில் நெசவுத் தொழில் – பானைத் தொழில் நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் – பாண்டங்களில் கீறல் குறியீடுகள்.		
அலகு - II	வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்	2
சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப்பொருட்களில் வடிவமைப்பு - சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் – சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் – மாமல்லபுரச் சிற்பங்களும், கோவில்களும் – சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் – நாயக்கர் காலக் கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் – செட்டிநாட்டு கட்டிடக் கலை – பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ - சாரோசெனிக் கட்டிடக் கலை.		

அலகு - III	உற்பத்தித் தொழில் நுட்பம்	2
கப்பல் கட்டும் கலை – உலோகவியல் – இரும்புத் தொழிற்சாலை – இரும்பை உருக்குதல், எஃகு – வரலாற்றுச் சின்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் -நாணயங்கள் அச்சடித்தல் – மணி உருவாக்கும் தொழிற்சாலைகள் – கல்மணிகள், கண்ணாடி மணிகள் – சுடுமண் மணிகள் – சங்கு மணிகள் – எலும்புத்துண்டுகள் – தொல்லியல் சான்றுகள் – சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.		
அலகு - IV	வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்	2
அணை, ஏரி, குளங்கள், மதகு – சோழர்காலக் குமுழிகள் முக்கியத்துவம் – கால்நடை பராமரிப்பு – கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் – வேளாண்மை மற்றும் வேளாண்மை சார்ந்த செயல்பாடுகள் – கடல்சார் அறிவு – மீன்வளம் – முத்து மற்றும் முத்துக்குளித்தல் – பெருங்கடல் குறித்த பண்டைய அறிவு – அறிவுசார்.		
அலகு - V	அறிவியல் தமிழ் மற்றும் கணினித்தமிழ்	2
அறிவியல் தமிழின் வளர்ச்சி – கணினித்தமிழ் வளர்ச்சி – தமிழ் நூல்களை மின் பதிப்பு செய்தல் – தமிழ் மென்பொருட்கள் உருவாக்கம் – தமிழ் இணையக் கல்விக் கழகம் - தமிழ் மின் நூலகம் – இணையத்தில் தமிழ் அகராதிகள் – சொற்குவைத் திட்டம்.		
		Total : 10 Periods

Course Contents (in English)

Module – I	WEAVING AND CERAMIC TECHNOLOGY	2
Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.		
Module – II	DESIGN AND CONSTRUCTION TECHNOLOGY	2
Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.		
Module – III	MANUFACTURING TECHNOLOGY	2
Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and gold Coins as source of history - Minting of Coins – Beads making-industries Stone beads –Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram.		
Module – IV	AGRICULTURE AND IRRIGATION TECHNOLOGY	2
Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea – Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.		
Module – V	SCIENTIFIC TAMIL & TAMIL COMPUTING	2

Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.
Total : 10 Periods

பார்வை நூல்கள் (TEXT-CUM-REFERENCE BOOKS)

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித்தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நகரிகம் (தொல்லியல் துறைவெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

23CS201	PROGRAMMING IN C AND DATA STRUCTURES (Common to AIDS / CSBS / IT)	L	T	P	C
		3	0	0	3
Nature of Course	Engineering Sciences				
Pre requisites	Problem Solving Using Python Programming				

Course Objectives

The course is intended

1. Learn the C Programs using basic programming constructs.
2. Acquire Knowledge in C programs using arrays, strings, pointers, structures and functions.
3. Explore the applications of linear and non-linear data structures
4. Represent data using graph data structure
5. Learn the basic sorting and searching algorithms

Course Outcomes

On successful completion of the course the students will be able to

CO.No	Course Outcome	Bloom's Level
CO1.	Summarize the knowledge on C programming constructs.	Understand
CO2.	Interprets the concept of arrays, strings, pointers, structures, and functions their usage in C.	Understand
CO3.	Implement linear data structure operations using C	Apply
CO4.	Suggest appropriate linear / non-linear data structure for any given data set	Apply
CO5.	Appropriately choose the searching and sorting algorithm for an application	Apply

Course Contents

Module – I	Basics of C Programming	9
Introduction to programming paradigms- Structure of C program- C programming: Data Types – Storage classes - Constants – Enumeration Constants – Keywords- Operators: Precedence and Associativity- Decision making statements- - Control Statements- String operations: length, compare, concatenate, copy.		
Module – II	Advanced Features	9

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Introduction to Arrays: Declaration, Initialization – One dimensional array –Two dimensional Arrays - Structure - Nested structures- Pointers –Pointer operators – Pointer arithmetic- Introduction to functions: Parameter passing: Pass by value, Pass by reference- Types of file processing: Sequential access, Random access – Sequential access file.		
Module – III	**Linear Data Structures**	**9**
Abstract Data Types (ADTs) – List ADT – Array-Based Implementation – Linked List – Doubly- Linked Lists – Circular Linked List – Stack ADT – Implementation of Stack – Applications – Queue ADT – Priority Queues – Queue Implementation – Applications.		
Module – IV	**Non-Linear Data Structures**	**9**
Trees – Binary Trees – Tree Traversals – Expression Trees – Binary Search Tree – Hashing – Hash Functions – Separate Chaining – Open Addressing – Linear Probing– Quadratic Probing – Double Hashing – Rehashing.		
Module – V	**Sorting and Searching Techniques**	**9**
Linear Search – Binary Search. Bubble Sort, Insertion sort – Merge sort – Quick sort – Heap Sort- Radix sort-Bucket sort		
		Total : 45 Periods

Text Books

1. Reema Thareja, "Programming in C", Oxford University Press, Second Edition, 2022.
2. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, "Fundamentals of Data Structures in C", Second Edition, University Press, 2022.

Reference Books

1. Kernighan, B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2021.
2. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Pearson Education, Second Edition, 2021.
3. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, 2020.

Additional References

1. **NPTEL** - https://nptel.ac.in/courses/106104128
2. **MOOC Courses** - https://www.mooc-list.com/course/trees-and-graphs-basics-coursera

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Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)															
COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	3	3	3	2									2	3	
CO 2	3	3	3	3									2	3	
CO 3	3	3	3	2									2	3	
CO 4	3	3	3	3									2	3	
CO 5	3	3	3	3									2	3	
	3	High				2	Medium					1	Low		

Formative Assessment			
Blooms Taxonomy	Assessment Component	Marks	Total marks
Remember	Quiz	5	15
Understand / Apply	Tutorial class / Assignment	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	Internal Assessment Examinations (IAE)			Final Examinations (FE)
	IAE – I (5)	IAE – II (10)	IAE – III (10)	60
Remember				
Understand	10	10	10	10
Apply	20	20	20	30
Analyse	20	20	20	60
Evaluate				
Create				

Passed in Board of Studies Meeting

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23CS202	Programming in C and Data Structures Laboratory (Common to AIDS / CSBS / IT)	L	T	P	C
		0	0	4	2
Nature of Course	Engineering Sciences				
Pre requisites	Problem solving using Python Programming Laboratory				

Course Objectives

The course is intended to

1. Make familiar with C programming Language
2. Write simple programs using arrays and pointers
3. Develop applications in C using functions and structures
4. Implement linear data structure List ADT in various applications
5. Implement Stack and Queue ADTS using C in real time applications

Course Outcomes

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO1	Apply simple C programs using basic language constructs	Apply
CO2	Solve problems using arrays and strings	Apply
CO3	Develop modular programs using functions, pointers and structures.	Apply
CO4	Generate various List ADTs for various applications.	Apply
CO5	Apply Stack and Queue ADT to solve real time problem.	Apply

Laboratory Components

S.No	List of Exercises	CO Mapping	RBT
1	Write programs using simple control statements	CO1	Apply
2	Write a program to implement functions and recursive functions	CO1	Apply
3	Implement C programs using arrays and String	CO2	Apply
4	Implement C programs using Files.	CO2	Apply
5	Implement a telephone directory using structures and pointers.	CO3	Apply
6	Choose an appropriate data structures and create a token system for banking service.	CO3	Apply
7	Choose an appropriate data structures and create a book rack Allocation system in a library.	CO4	Apply
8	Creation of Array and linked list implementation of Stack and Queue ADTs.	CO4	Apply
9	Create a food delivering system which allocates the path for Delivery of food using appropriate data structures.	CO5	Apply
10	Implementation of Sorting algorithms : Insertion Sort, Quick Sort, Merge Sort	CO5	Apply

Total 60 Periods

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Mapping of Course Outcomes (CO) with Programme Outcomes (PO) Programme Specific Outcomes (PSO)															
Cos	Pos												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	1	1	1	3						1	2	2	2	
2	3	1	1	1	3						1	2	2	3	
3	3	1	1	1	3						1	2	2	2	
4	3	2	1	2	3						1	2	2	2	
5	3	2	1	1	3						1	2	2	3	
	3	High				2	Medium					1	Low		

Assessment based on Continuous and Final Examination			
Bloom's Level	Continuous Assessment (60 marks) (Attendance – 5 marks)		Final Examination [40 marks]
	Rubric based Continuous Assessment [25 marks]	Model Examination [30 marks]	
Remember			
Understand	10	10	10
Apply	30	30	30
Analyze	60	60	60
Evaluate			
Create			

Passed in Board of Studies Meeting

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23AI201	OPERATING SYSTEMS	L	T	P	C
		3	0	0	3
Nature of Course	Professional core				
Pre requisites	NIL				

Course Objectives

The course is intended to

1. To explain about overview of operating system
2. To familiarize the operations performed by process management
3. To impart various scheduling policies and deadlock
4. To teach the different memory management techniques
5. To develop the knowledge on IO and disk scheduling

Course Outcomes

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO1	Outline various concepts and features of Operating systems	Understand
CO2	Explore the communication between inter process, synchronization techniques	Apply
CO3	Implement algorithm of CPU Scheduling and deadlock	Apply
CO4	Implement memory placement strategies, replacement algorithms related to main memory and virtual memory techniques	Apply
CO5	Explore the IO, device management and Disk scheduling	Apply

Course Contents

UNIT I **Operating System Overview** 9

Concept of Operating Systems (OS)-Generations of OS-Types of OS-Operating system services and systems calls-system programs-operating system structure-.Basic architectural concepts of an OS.

UNIT II **Process Management** 9

Process, Process State transitions, Process Control Block (PCB)-Context switching- Process Scheduling-Types of Schedulers, Scheduling criteria,CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time-Thread- Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads.

UNIT III **Scheduling Algorithms and Deadlocks** 9

Scheduling algorithms: Pre-emptive and non-pre-emptive, FCFS, SJF, Priority, RR -Concurrent processes-Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Process synchronization basics-monitor-Semaphores-Deadlocks: Definition, conditions for Deadlock, Deadlock Prevention and Deadlock Avoidance, Banker's algorithm, Deadlock detection and Recovery.

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UNIT IV **Memory management and File System** 9

Memory Management: Basic concept, Logical and Physical address maps-Memory allocation-Virtual Memory-paging-Segmentation-Demand paging-Page Replacement algorithms Optimal, First in First Out (FIFO) and Least Recently used (LRU), File Management- Concept of File, Access methods, File types, File operation, Directories, Implementing files-Contiguous allocation, Linked list allocation

UNIT V **IO and Disk Scheduling** 9

I/O devices-Device controllers-Direct Memory Access-Tertiary storage-Disk Management: Disk structure-Disk scheduling - FCFS, SSTF, SCAN, C-SCAN-Disk reliability, Disk formatting- Boot-block- Bad blocks.

TOTAL : 45 PERIODS

Text Books

1. Tanenbaum, Andrew S., and Albert S. Woodhull. Operating systems: design and implementation. Vol. 68. Englewood Cliffs: Prentice Hall, 2009.
2. Abraham Silberschatz, Peter B. Galvin, Greg Gagne-Operating System Concepts. Wiley, 10th Edition, 2018.

Reference Books

1. Gary Nutt, "Operating Systems", Pearson Education, 3rd Edition 2019
2. Andrew S. Tanenbaum," Modern Operating Systems", Pearson Education, 5th Edition 2018
3. Ramaz Elmasri, "A. Gil Carrick, David Levine. —Operating Systems – A Spiral Approach", Tata McGraw Hill, 3rdEdition 2015

Additional References:

1. https://nptel.ac.in/courses/106/105/106105214/
2. https://nptel.ac.in/courses/106/106/106106144/
3. https://onlinecourses.nptel.ac.in/noc21_cs44/preview

Mapping of Course Outcomes (CO) with Programme Outcomes (PO) Programme Specific Outcomes (PSO)

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	1										3	1	
CO2	3	2	2	2									3	1	
CO3	3	2	2	2									3	1	
CO4	3	2	2	2									3	1	
CO5	3	3	2	2							3	3	3	1	
	3	High				2	Medium					1	Low		

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Summative Assessment							
Bloom's Level	Continuous Assessment						Final Examination (Theory) (60)
	Theory				Practicals		
	IAE – I (5)	IAE – II (10)	IAE – III (10)	Attendance (5)	Quiz(5)	Assignment(5)	
Remember	10	10	10				20
Understand	20	20	20				20
Apply	20	20	20				50
Analyze							10
Evaluate							
Create							

23ME101	Engineering Graphics	L	T	P	C
		1	0	4	3
Nature of Course	Engineering Sciences				
Prerequisites	Nil				

Course Objectives:

The course is intended to

1. Understand technical drawings in various fields of engineering
2. Imagine and visualize the geometric details of engineering objects.
3. Translate the geometric information of engineering objects into engineering drawings.
4. Develop the graphical skills for communication of concepts, ideas and design of engineering products through technical drawings.
5. Visualize and draw isometric and perspective views

Course Outcomes

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO 1	Develop the conic sections, special curves, and draw orthographic views from pictorial views.	Apply
CO 2	Apply the principles of orthographic projections of points in all quadrants, lines and planes in first quadrant.	Apply
CO 3	Construct the projections of simple solids like prisms, pyramids, cylinder and cone.	Apply
CO 4	Build the sectional views of solids like cube, prisms, pyramids, cylinders & cones and development of its lateral surfaces.	Apply
CO 5	Organize and draw isometric view of simple solids.	Apply

Course Contents

Concepts and Conventions (Not for Examination) 1

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

Module -I Plane Curves and Free Hand Sketching (3+12)

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves. Visualization concepts and Free Hand sketching: Visualization principles – Representation of Three- Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of objects

Module –II Projection of Lines and Plane Surface (3+12)

Orthographic projection- principles-Principal Planes-First angle projection- Projection of points - Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method. Projection of planes

(polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

Module –III Projection of Solids (3+12)

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one of the principal planes by rotating object method.

Module- IV Projection of Sectioned Solids and Development of Surface (3+12)

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section, Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones. Development of lateral surfaces of solids with cut-outs and holes

Module -V Isometric Projections (3+12)

Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions and miscellaneous problems.

TOTAL: (15+60) Periods

TEXT BOOKS

1. Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited, 2011
2. Natarajan K.V., “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2012.

REFERENCE BOOKS

1. Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, 50th Edition, 2010.
2. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
3. Parthasarathy N S and Vela Murali, “Engineering Graphics”, Oxford University, Press, New Delhi, 2015.

Web References

1. http://nptel.ac.in/courses/112103019/Engineering drawing
2. http://pioneer.netserv.chula.ac.th/~kjirapon/self-practice.html

Publication of Bureau of Indian Standards

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

Special points applicable only to Final Examinations of Engineering Graphics:

1. There will be five questions, each of either-or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day

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Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)															
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2										1	2		
CO2	3	2										1	2		
CO3	3	2										1	2		
CO4	3	3										1	2		
CO5	3	2										1	2		
	3	High				2	Medium				1	Low			

Summative assessment						
Bloom's Level	**Continuous Assessment**					**Final Examination (Theory) [50 marks]**
	Theory				**Practical**	
	IAE-I [5]	**IAE-II [10]**	**IAE-III [10]**	**Attendance [5]**	**Rubric based CIA [20 Marks]**	
Remember	10	10	10		20	20
Understand	20	20	20		40	40
Apply	20	20	20		40	40
Analyse						
Evaluate						
Create						

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23LEJ06	JAPANESE	L	T	P	C
		2	0	2	3
Nature of Course	HSS				
Pre requisites	Nil				

Course Objectives

The course is intended to

1. Read & Write Hiragana and Katakana (Japanese Alphabets) letters.
2. Use words and phrases of greeting in Japanese, identify names of objects and do a self-introduction using short and simple sentences.
3. Demonstrate the use of time-related words, verb conjunctions and make light conversation asking for directions and answering questions.
4. Express their likes and dislikes, hobbies, describe the locations of different things and demonstrate counting in Japanese.
5. Demonstrate the minimum day to day conversation and describe their ability and experiences.

Course Outcomes

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO1.	Read & Write Hiragana and Katakana (Japanese Alphabets) letters	Understand
CO2.	Identify names of objects and do self-introduction using short and simple sentences	Apply
CO3.	Demonstrate the use of time-related words	Apply
CO4.	Articulate their likes and dislikes, hobbies and describe the locations of different things	Apply
CO5.	Express day to day conversation and describe their ability to share their experiences	Understand

Course Contents

Module – I		9
INTRODUCTION- はじめまして – ALPHABET - Hiragana - NUMBERS- すうじ- Classroom Words- きょうしつのことば – LISTENING		
Module – II		**9**
ALPHABET-Katakana - BASIC SENTENCE- じぶんのなまえ - COUNTRY NAMES- くにのなまえ- SAYING AGE- なんさいですか - LISTENING		
Module – III		**9**
SAYING MONTH- なにつき - SAYING BIRTHDAY- たんじょうび - KAZOKU- かぞく - KNOWINGTHINGS- あ/こ/そ – LISTENING		

Module – IV		**9**
PRONOUNS - ADJECTIVES - SAYING TIME, SHOPPING – LISTENING		
Module – V		**9**
SELF INTRODUCTION - MY TOWN - Watashino machi - GO, COME, RETURN - BASIC VERBS – TRANSPORT – LISTENING		
		Total : 45 Periods

Text Books

1. Minna no Nihongo – Elementary Japanese 1
2. Minna no Nihongo- Translation & Grammar Notes 1
3. Gateway to Japan Japanese Language school e-handouts / e-course materials.

Summative Assessment						
Bloom's Level	**Continuous Assessment**					**Final Examination (Theory) [50 marks]**
	Theory Marks				**Practical**	
	IAE-I [5]	**IAE-II [10]**	**IAE - III [10]**	**Attendance [5]**	**Rubric based CIA [20 Marks]**	
Remember	50				4	10
Understand		20	20		8	20
Apply		30	30		8	20
Analyse						
Evaluate						
Create						

23MC003	INTERPERSONAL SKILLS (Common to all B.E. / B.Tech Programme)	L	T	P	C
		0	0	2	0
Nature of Course	Mandatory – Non Credit				
Pre requisites	Nil				

Course Objectives

The course is intended to

1. Evaluate current relationships and their communication style.
2. Identify ways for improving important relationships.
3. Explore how the Bible correlates with principles from the chapter.
4. Describe how the communication processes impacts our ability to effectively communicate.
5. Identify challenges that may arise from interpersonal communication.

Course Outcomes

On successful completion of the course the students will be able to

CO.No	Course Outcome	Bloom's Level
CO 1	Practice interpersonal communication skills to influence and build good relationships.	Remember
CO 2	Identify and pursue personal learning goals.	Understand
CO 3	Give evident feedback.	Apply
CO 4	Reveal group dynamics and amiable behaviour.	Apply
CO 5	Emphasis the communication process.	Understand

Course Contents

Module – I	FUNDAMENTALS OF INTERPERSONAL COMMUICATION	6
Facts of communication and Interpersonal communication - culture and gender - Communication and Self disclosure - Presentation of Interpersonal perception - Learning goals - Feeling and feedback.		
Module – II	**INTERPERSONAL COMMUNICATION IN ACTION**	6
Nature of language - language and culture - usage and abuse of language -Positive communication -Non verbal communication - Listening strategies - Barriers of listening.		
Module – III	**EMOTIONAL INTELLIGENCE**	6
Influence of emotional experience and expressions - Accepting the responsibilities and changes - Negotiation tactics - Dealing with criticism and appreciation - Collaborative Problem Solving - Resilience Building.		
Module – IV	**TRANSACTIONS**	6
Different types of transactions - Building Positive Relationship - Managing Conflict - Connecting across Difference -Factors hampering Interpersonal interactions - Assertiveness in communication.		

Module – V	**ESSENTIAL INTERPERSONAL COMPETENCIES**	6
Behaviour - understanding limiting behaviour - Interpersonal and small and lateral thinking-Win -Win attitude - Positive thinking - Stress feedback - Personal Evaluation of Interpersonal Relationship Skills group behavior - Critical management - Assertive		
		Total : 30 Periods

Text Books

1. Bozeman, Jeanine C and Argile Smith, “Interpersonal Relationship Skills for Ministers” Gretna, LA: Pelican Publishing Company, 1st Edition, 2004.
2. Floyd, Kory, “Interpersonal Communication”, 2d. Boston: Mccraw-Hill, 2nd Edition, 2011.

Reference Books

1. Augsburger, David, “Caring Enough to Confront How to Understand and Express Your Deepest Feelings Towards Others”, updated ed Ventura, CA: Regal Books, 2nd Edition 2009.
2. Vohs, Kathleen D., and Eli J., Finkel, eds, “Self and Relationships: Connecting Intrapersonal and interpersonal Processes”. New York Guilford Press, 1st Edition, 2006.

Web References:

1. https://nptel.ac.in/courses/111104031
2. https://nptel.ac.in/courses/111106139
3. https://nptel.ac.in/courses/111105134

Laboratory Components:

S.No	List of Experiments	CO Mapping	RBT
1	Presentation of Interpersonal perception	1	Remember
2	Non-Verbal Communication	2	Understand
3	Negotiation tactics	3	Apply
4	Managing Conflict	4	Apply
5	Stress Management	5	Understand

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)														
COs	**Pos**												**PSOs**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
CO 1										3	2	1	2	
CO 2										3	2	1	2	
CO 3										3	2	1	2	
CO 4										3	2	1	2	
CO 5										3	2	1	2	
	3-High				**2-Medium**				**1-Low**					

Bloom's Level	**Summative Assessment (Internal Mode)**	
	Assessment 1 (50 Marks)	**Assessment 2 (50 Marks)**
Remember	20	20
Understand	10	10
Apply	20	20
Analyse		
Evaluate		
Create		

SEMESTER 3

23AI301	ARTIFICIAL INTELLIGENCE	L	T	P	C
		3	0	0	3
Nature of Course	Professional core (PC)				
Pre requisites	Nil				

Course Objectives

The course is intended to

1. Gain knowledge about solving gaming problems using various search strategies
2. Learn to represent knowledge in solving AI problems
3. Develop planning and acting agents for real-world problems.

Course Outcomes

On successful completion of the course the students will be able to

CO.No	Course Outcome	Bloom's Level
CO 1	Describe Artificial Intelligence methods and their foundations	Understand
CO 2	Illustrate how search algorithms play a vital role in problem-solving	Apply
CO 3	Integrate local search and adversarial search to solve gaming problems	Apply
CO 4	Articulate Constraint satisfaction Problem	Apply
CO 5	Demonstrate knowledge representation for solving real-world problems	Apply
CO 6	Classify the different ways of planning and acting in the real world	Apply

Course Contents

Module – I	Introduction and Agents	9
Definition - Evolution - Applications - Agents and Environments- The Nature of Environments- The Concept of Rationality- The Structure of Agents - Learning Agents		
Module – II	**Problem Solving Based on Searching Techniques**	**9**
Problem Solving by Searching Methods - Uninformed search strategies: Uniform Cost Search - Breadth First Search - Depth First Search - Depth limited search - Iterative deepening depth first search - Informed Search Methods: Best First Search - A* Search - Constraint Satisfaction Problems: Backtracking search – Local Search for CSP – Structure of CSP		
Module – III	**Local Search and Adversarial Search Algorithms**	**9**
Local Search algorithms – Hill climbing search - Simulated annealing - Genetic Algorithm - Adversarial Search: Game Trees and Minimax Evaluation - Elementary two players games: tic-tac-toe - Minimax with Alpha-Beta Pruning.		
Module – IV	**Knowledge-Based Agents**	**9**
Logical Agents -The Wumpus World - Propositional Logic – First order Logic: Syntax and Semantics of First order Logic - Inference in First order Logic: Unification - Forward Chaining - Backward Chaining - Resolution.		

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	Module – V	Planning	9
	Classical planning - Planning as State Space search: Forward search, Backward search - Planning graphs - Hierarchical Planning - Planning and acting in Non deterministic domains - Multi agent planning		
			Total : 45 Periods

Text Books

1. Stuart Russell and Peter Norvig, "Artificial Intelligence – A Modern Approach", Fourth Edition, Pearson Education, 2021.
2. K. R. Chowdhary, Fundamentals of Artificial Intelligence, Springer, 2020.

Reference Books

1. Lavika Goel, "Artificial Intelligence: Concepts and Applications", Wiley, 2021
2. Chelsea C. Chen , Robert H. Chen," Artificial Intelligence ", Taylor & Francis Ltd., 2022.

Additional/WebReferences:

1. https://nptel.ac.in/courses/106/102/106102220/
2. https://nptel.ac.in/courses/106/105/106105078/
3. https://nptel.ac.in/courses/106/106/106106126/

Mapping of Course Outcomes (CO's) with Programme Outcomes (PO's) and ProgrammeSpecific Outcomes (PSO's)

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	3	2	2										2	1	1
CO 2	3	2	2										3	3	3
CO 3	3	3	2										2	2	2
CO 4	3	3	2										3	3	3
CO 5	3	3	2										3	3	3
CO 6	3	3	2										3	3	3
	3-High				2-Medium				1- Low						

Formative Assessment			
Bloom's Level	Assessment Component	Marks	Total marks
Apply	Classroom or Online Quiz	5	15
Understand / Apply	Class Presentation/PowerPoint presentation	5	
	Attendance	5	

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Passed in Board of Studies

Approved in Academic Council

Summative Assessment				
Bloom's Category	Continuous Assessment (40)			Final Examination (60)
	IAE – I (5)	IAE – II (10)	IAE – III (10)	(60)
Remember	15	15	10	20
Understand	20	15	20	40
Apply	15	20	20	40
Analyse				
Evaluate				
Create				

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23AI302	DATA MINING AND MODELING	L	T	P	C
		3	0	2	4
Nature of Course	Professional Core (PC)				
Prerequisites	Nil				

Course Objectives

The course is intended to

1. Gain knowledge on Data warehousing and Mining
2. Impart knowledge of data Pre-processing.
3. Assesses the pros and cons of various data mining algorithm.

Course Outcomes

On successful completion of the course the students will be able to

CO.No	Course Outcome	Bloom's Level
CO 1	Interpret KDD and preprocess	Understand
CO 2	Design and modeling of data warehouse	Analyze
CO 3	Demonstrate kinds of patterns that can be discovered by association rule mining	Apply
CO 4	Design and deploy appropriate classification techniques	Apply
CO 5	Illustrate the cluster on different data	Apply
CO 6	Infer the advanced mining techniques	Apply

Course Contents

Module – I	Introduction	9
Data Mining: Kinds of data - functionalities - task primitives - Issues in Data Mining - Data Preprocessing - Data Cleaning - Data Integration - Data Reduction - Data Transformation and Data discretization		
Module – II	**Data Warehouse and OLAP Technology**	**9**
Basic concepts - OLAP vs OLTP - Multi dimensional Data mode - Schemas for Multidimensional Database - OLAP operations in Multidimensional Model - Data warehouse architecture - Data Warehouse Implementation - On-Line Analytical Processing to On-Line Analytical Mining		
Module – III	**Mining Frequent Patterns and Association Rule Mining**	**9**
Basic Concepts - Market basket analysis - Apriori algorithm - Generating association rules from frequent itemset - Fp growth algorithm - Mining Multilevel association rules - Association analysis to correlation rules –Constraint based association mining- Problems on Apriori algorithm		
Module – IV	**Classification**	**9**
Classification by Decision Tree Induction - Bayesian Classification - Rule-Based Classification - Neural networks - Support Vector Machines - Genetic algorithm – Prediction - Linear Regression		
Module – V	**Cluster Analysis**	**9**
Clustering - Partitioning Methods (K- Means, K- Medoids) - Hierarchical Methods: Agglomerative Vs Divisive - BIRCH - Text mining - Mining WWW - Applications and trends in data mining		
		Total : 45 Periods

Laboratory Exercises

S.No.	List of Exercises	CO Mapping	RBT
1	Write a python code for Data preprocessing tasks using libraries a) Loading the dataset b) Identifying the dependent and independent variables c) Dealing with missing data	CO1	Apply
2	Write pythod code for following data preprocessing tasks using libraries a) Dealing with categorical data b) Scaling the features. c) Splitting dataset into Training and Testing Sets.	CO2	Apply
3	Generate frequent item sets using Apriori Algorithm in python and also generate association rules for any data set.	CO2	Apply
4	Build a classification model using Decision Tree algorithm on iris dataset	CO4	Apply
5	Apply Naïve Bayes Classification algorithm on any dataset	CO4	Analyze
6	Build a model using linear regression algorithm on any dataset	CO4	Apply
7	Write the code to find Similarity and Dissimilarity Measures using python a) Euclidean Distance b) Manhattan Distance c) Minkowski Distance d) Cosine Similarity e) Pearson's Correlation	CO5	Apply
8	Apply K- Means clustering algorithm on any dataset.	CO5	Apply
9	Apply Hierarchical clustering algorithm on any dataset	CO5	Analyze
		Total : 30 Periods	

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Text Books

1. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", Elsevier, 4th Edition, 2022
2. Margaret H Dunham, "Data Mining Introductory and advanced topics", Pearson Education, 6th Edition, 2020

Reference Books

1. Dr.Jugneshkumar, "Data warehouse and Data mining : Concepts, techniques and real life applications", Edition 2024
2. K.P.Soman, Shyam Diwakar and V. Ajay, "Insight into Data Mining Theory and Practice", Prentice Hall of India, Eastern Economy Edition, 2021.

Additional References

1. https://nptel.ac.in/courses/106/105/106105174/
2. https://www.digimat.in/nptel/courses/video/106105174/L01.html
3. https://nptel.ac.in/courses/106/106/106106093/

Mapping of Course Outcomes (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes (PSO's)															
COs	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	3	3	2	2	1							2	2	2	2
CO 2	3	3	2	2	1							2	2	3	3
CO 3	3	3	2	2	1							2	2	2	2
CO 4	3	3	2	2	1							2	2	3	3
CO 5	3	3	2	2	1							2	2	3	3
CO 6	3	3	2	2	1							2	2	2	2
	3-High				2-Medium				1- Low						

Summative Assessment						
Continuous Assessment (50)						Final Examinations (FE) (50)
Theory				Attendance (5)	Practicals	
Bloom's Category	Internal Assessment Examinations (IAE) (25)				Rubrics Based CA (20)	
	IAE – I (5)	IAE – II (10)	IAE – III (10)			
Remember	10	10	10			20
Understand	30	30	30			60
Apply	10	10	10			20
Analyse						
Evaluate						
Create						

23AI303	PROLOG PROGRAMMING LABORATORY	L	T	P	C
		0	0	2	1
Nature of Course	Professional Core (PC)				
Prerequisites	Nil				

Course Objectives

The course is intended to

1. Implement various search algorithms.
2. Exploit CSP techniques.
3. Learn game playing techniques using search strategy.

Course Outcomes

On successful completion of the course the students will be able to

CO.No	Course Outcome	Bloom's Level
CO 1	Discover Artificial Intelligence using facts and rules	Apply
CO 2	Execute Programs Using List in Prolog	Apply
CO 3	Develop Logical Reasoning systems	Apply
CO 4	Deploy various search algorithms.	Apply
CO 5	Explore CSP techniques	Apply
CO 6	Generate game playing with search strategy	Analyze

List of Experiments

S.No	List of Experiments	CO Mapping	RBT
1.	Solve the Monkey Banana problem with facts and rules in PROLOG	CO1	Apply
2.	Solve 8 queens problem using PROLOG.	CO1	Apply
3.	Implement breadth first search algorithm to solve 8 puzzle problem	CO2	Apply
4.	Solve map colouring problem using PROLOG with CSP	CO2, CO5	Apply
5.	Implement min-max algorithm to solve tic tac toe game.	CO3	Apply
6.	Implement depth first search algorithm to solve water jug problem	CO3	Apply
7.	Solve Robot traversal problem using PROLOG	CO4	Apply

TOTAL: 30 Periods

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Mapping of Course Outcomes (CO's) with Programme Outcomes (PO's) and ProgrammeSpecific Outcomes (PSO's)															
CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	3	2	2											3	
CO 2	3	2	2											3	
CO 3	3	2	2											3	
CO 4	3	2	2											3	
CO 5	3	2	2											3	
CO 6	3	2	2											3	
	3-High				2-Medium				1- Low						

Summative Assessment			
Bloom's Category	Rubric based Continuous Assessment, Preparatory Examination (60)		Final Examinations (FE)
	Continuous Assessment (40)	Preparatory Examination (20)	(40)
Remember	10	5	20
Understand	10	5	40
Apply	20	10	40
Analyse			
Evaluate			
Create			

CHAIRMAN-BOARD OF STUDIES

23CB301	DESIGN AND ANALYSIS OF ALGORITHMS (COMMON TO CSE, AI&DS,CSBS)	L	T	P	C
		3	0	0	3
Nature of Course	Professional Core				
Pre requisites	Data Structures, Problem Solving and Programming				

Course Objectives

The course is intended to

1. Learn algorithms for various computing problems
2. Explore the time and space complexities of various algorithms
3. Familiarize the concepts of brute force and divide-and-conquer techniques
4. Make clear the Dynamic programming to solve searching and graph problems
5. Familiarize the concept of Greedy Technique to solve shortest path and Huffman code Problem
6. Learn the method of backtracking and branch & bound techniques

Course Outcomes

On successful completion of the course the students will be able to

CO. No	Course Outcome	Bloom's Level
CO 1	Design algorithms for various computing problems	Understand
CO 2	Analyze the efficiency of algorithms using various frameworks	Understand
CO 3	Make use of brute force and divide-and-conquer techniques to solve various problems and analyze their efficiency	Understand
CO 4	Explore Dynamic programming to solve searching and graph problems	Apply
CO 5	Acquire the knowledge of Greedy techniques to solve shortest path and Huffman code Problem.	Apply
CO 6	Solve combinatorial problems using backtracking and branch & bound techniques	Understand

Course Contents

MODULE – I Introduction to Algorithm 9

Basic concepts of Algorithm – Fundamentals of Algorithmic Problem Solving – Important Problem Types -Fundamentals of analysis of algorithm efficiency - Analysis Framework - Asymptotic Notations and its properties.

MODULE – II Mathematical Analysis of Algorithms 9

Mathematical Analysis of Non-recursive Algorithm - Mathematical Analysis of Recursive Algorithm through Recurrence Relation, Substitution Method, Recurrence Tree Method and Master's Method Example: Fibonacci Numbers - Empirical Analysis of Algorithms-Algorithm visualization

MODULE – III Fundamentals of Algorithmic Strategies-I 9

Brute Force Strategy: Selection and Bubble Sort, Sequential Search and Brute-force string matching- Divide and conquer: Merge sort, Quick Sort, Depth first Search and Breadth FirstSearch- - Binary tree traversals and related properties -Closest Pair and Convex-hull problem – Exhaustive search

9

MODULE– IV Fundamentals of Algorithmic Strategies-II

Dynamic Programming: Optimal Binary Search Tree, Warshall's and Floyd's Algorithm,Knapsack Problem and its Memory Functions-Greedy Technique: Prim's Algorithm, Kruskal's Algorithm, Dijkstra Algorithm -Huffman Trees and codes .

MODULE – V Backtracking and Branch & Bound 9

P, NP and NP Complete Problems -Backtracking: n-Queens Problem, Hamiltonian Circuit problem, Branch and bound: Assignment, Knapsack and Traveling salesman problem, Approximation Problem

Total : 45 Periods

Text Books

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithm", Pearson Education Asia Tenth Impression - Hub pvt ltd, 3rd Edition 2017.

2. Thomas H. Coremen, Charles E. Leiserson, Roland L. Rivest and Clifford Stein "Introduction to Algorithms", The MIT Press Cambridge, Massachusetts London PHI Pvt. Ltd., 2nd Edition 2019.

Reference Books

1. Sara Baase and Allen Van Gelder, "Computer Algorithms - Introduction to Design and Analysis", Pearson Education Asia, 3rd Edition 2018.
2. Aho.A.V, Hopcroft.J.E and Ullman.J.D, "The Design and Analysis of Computer Algorithms", Pearson Education Asia, 2nd Edition 2016.
3. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, "Computer Algorithms/ C++", Universities Press, 2nd Edition 2019

Additional References

1. https://nptel.ac.in/courses/106/106/106106131/
2. https://nptel.ac.in/courses/106/101/106101060/
3. https://onlinecourses.nptel.ac.in/noc19_cs47/preview

Mapping of Course Outcomes (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes (PSO's)

COs	PO's												PSO's	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	3	2	1	1									3	1
CO 2	3	2	1	1									3	1
CO 3	3	3	2	1									3	1
CO 4	3	3	2	1									3	1
CO 5	3	2	2	1									3	1
CO 6	3	2	2	1									3	1
	3-High				2-Medium				1- Low					

Passed in Board of Studies CHAIRMAN - BOARD OF STUDIES Approved in Academic Council

Formative Assessment			
Blooms Taxonomy	**Assessment Component**	**Marks**	**Total marks**
Remember	Quiz	5	15
Understand	Tutorial class / Assignment	5	
Apply			
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examinations (IAE) (40)**			**Final Examinations (FE)**
	IAE – I (5)	**IAE – II (10)**	**IAE – III (10)**	**(60)**
Remember	20	10	10	30
Understand	30	30	20	40
Apply		10	20	30
Analyse				
Evaluate				
Create				

23CS401	DATABASE MANAGEMENT SYSTEMS (COMMON TO CSE,IT,CSBS & AIDS)	L	T	P	C
		3	0	0	3
Nature of Course	Professional Core				
Pre requisites	23CS201				

Course Objectives

The course is intended to

1. Familiarize the fundamentals of data models and queries using SQL
2. Represent a database system using ER diagrams and normal forms, concepts of transaction processing- concurrency control
3. Identify the structures using different file and indexing techniques , knowledge about various advanced databases

Course Outcomes

On successful completion of the course the students will be able to

CO.No	Course Outcome	Bloom's Level
CO1.	Summarize the concepts of database models.	Understand
CO2.	Write SQL queries for a given context in relational database.	Apply
CO3.	Design ER Model and database for a given application by implementing functional dependencies	Apply
CO4.	Discover the concepts for transaction processing and concurrency control	Apply
CO5.	Employ indexing and hashing techniques to access and generate user reports for a database	Apply
CO6	Appraise how advanced databases differ from traditional databases	Analyze

Course Contents

MODULE – I INTRODUCTION TO DATABASES AND RELATIONAL DATABASES 9

Purpose of Database System – Types – Views of data – Data Models – Database System Architecture – Relational databases – Relational Model – Keys – SQL fundamentals, PL/SQL – Codd's 12 Rules - Object-Relational Mapping.

MODULE – II DATABASE DESIGN AND NORMALIZATION 9

Entity-Relationship model: Diagrams – Enhanced Model –Relational Mapping – ERD to tables- Relational Algebra – Functional Dependencies and Normal Forms: 1NF, 2 NF, 3 NF, BCNF, 4 NF, 5NF and 6 NF - Domain-Key Normal Form - Nested Normal Form – Denormalization

MODULE – III TRANSACTIONS MANAGEMENT AND CONCURRENCY CONTROL 9

Transaction Management – ACID Properties – Schedules – Serializability – Concurrency Control and Recovery System: Lock based protocols -Deadlock handling - Multi version concurrency control - Recovery: Kinds of failures - Failure controlling methods - Database errors - Recovery Techniques.

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Entity-Relationship model: Diagrams – Enhanced Model –Relational Mapping – ERD to tables- Relational Algebra – Functional Dependencies and Normal Forms: 1NF, 2 NF, 3 NF, BCNF, 4 NF, 5NF and 6 NF - Domain-Key Normal Form - Nested Normal Form – Denormalization

MODULE – III TRANSACTIONS MANAGEMENT AND CONCURRENCY CONTROL 9

Transaction Management – ACID Properties – Schedules – Serializability – Concurrency Control and Recovery System: Lock based protocols -Deadlock handling - Multi version concurrency control - Recovery: Kinds of failures - Failure controlling methods - Database errors - Recovery Techniques.

MODULE – IV INDEXING AND HASHING 9

RAID – File Organization – Organization of Records – Indexing and Hashing –Ordered Indices – B tree and B+ tree Index Files – Multiple key access- Static and Dynamic Hashing – Bitmap indices -Query Processing Overview: Basic Steps in Query Processing – Measures of Query Cost – Selection & join Process – Alternative ways of evaluating a given query.

MODULE – V ADVANCED DATABASES 9

Distributed Databases: Architecture, Storage, Transaction Processing - NoSQL Databases: Introduction - Properties – Types – CAP Theorem- MongoDB – Concepts and features-Firebase Database: Introduction – Features - Adding Firebase to App - Firebase vs. MySQL - Firebase Vs MongoDB.

Total : 45 Periods

Text Books

1. Abraham Silberschatz, Henry Korth, and S. Sudarshan, "Database System Concepts", 7thEdition, McGraw-Hill, 2021.
2. RamezElmasri, Shamkant B. Navathe, —Fundamentals of Database Systems, 6th Edition, Pearson, 2020.

Reference Books

1. C. J. Date, A.Kannan, S. Swamynathan, —An Introduction to Database Systems Pearson Education, 10th Edition, 2012.
2. Peter Rob and Corlos Coronel, Database System, Design, Implementation and Management,Thompson Learning Course Technology, 10th edition, 2019
3. Raghu Ramakrishnan, —Database Management Systems, McGraw-Hill College Publications, 5 th Edition, 2019.
4. G.K.Gupta, "Database Management Systems, Tata McGraw Hill, 2018.
5. Guy Harrison , Next Generation Databases: NoSQLand Big Data, A press.

Additional References

1. NPTEL: https://archive.nptel.ac.in/courses/106/105/106105175/
2. IGNOU :http://hdl.handle.net/123456789/10079

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Mapping of Course Outcomes (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes (PSO's)															
COs	**PO's**												**PSO's**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	3	3		3							3	3	3	3
CO2	3	3	3		3							3	3	3	3
CO3	3	3	3		3							3	3	3	3
CO4	3	3	3		3							3	3	3	3
CO5	3	3	3		3							3	3	3	3
CO6	3	3	3		3							3	3	3	3
	3- High				**2- Medium**				**3- Low**						

Formative Assessment			
Blooms Taxonomy	**Assessment Component**	**Marks**	**Total marks**
Remember	Quiz	5	15
Understand	Tutorial class / Assignment	5	
Apply			
	Attendance	5	

Summative Assessment				
Bloom's Category	**Internal Assessment Examinations (IAE) (40)**			**Final Examinations (FE)**
	IAE – I (5)	**IAE – II (10)**	**IAE – III (10)**	**(60)**
Remember	10	10	10	20
Understand	30	30	30	60
Apply	10	10	10	20
Analyse				
Evaluate				
Create				

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23CS403	Database Management Systems laboratory	L	T	P	C
		0	0	2	1
Nature of Course	Professional core(PC)				
Pre requisites	NIL				

Course Objectives

The course is intended to

1. Learn how to populate and query a database using DML / DDL commands and Joins.
2. Get familiar with the use of tables, views and cursors.
3. Learn the concept of procedures, functions and triggers.
4. Design ER Model for different database application using case study

Course Outcomes

On successful completion of the course the students will be able to

CO.No	Course Outcome	Bloom's Level
CO 1	Use typical data definitions and manipulation commands and write queries to retrieve data from the database.	Apply
CO 2	Critically analyze the use of Tables, Views and Cursors.	Apply
CO 3	Implement the Procedures, Functions and triggers for the data in the database	Understand
CO 4	Design ER model for a defined problem.	Apply
CO 5	Build a GUI application by incorporating the database connectivity using any programming language as front end.	Apply
CO 6	Construct ER Model for different database application	Apply

Course Contents

S.No	List of Experiments	Bloom's Level
1.	Implementation of DDL, DML for inserting, deleting, updating and retrieving Tables and Transaction Control statements.	Apply
2.	Implementation of Database Querying – Simple queries, Nested queries, Sub queries and Joins	Apply
3.	Write a SQL queries to perform creation of views, synonyms, sequence.	Apply
4.	Write a PL/SOL High-level language extension with Cursors	Apply
5.	Write a PL/SOL High-level language extension with Triggers	Apply
6.	Implementation of stored Procedures and Functions.	Apply
7.	Database Design using ER modeling, normalization and Implementation for any application	Apply
8.	Database Connectivity with Front End Tools	Apply
9.	Case Study using real life database applications (Student Progress Monitoring System)	Apply

Mapping of Course Outcomes (CO's) with Programme Outcomes (PO's) and Programme Specific Outcomes (PSO's)															
COs	**PO's**												**PSO's**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO 1	3	3	3	2	3							3	3	3	3
CO 2	3	3	3	2	3							3	3	3	3
CO 3	3	3	3	2	3							3	3	3	3
CO 4	3	3	3	2	3							3	3	3	3
CO 5	3	3	3	2	3							3	3	3	3
CO 6	3	3	3	2	3							3	3	3	3
	3-High				**2-Medium**				**1- Low**						

	Summative assessment based on Continuous and End Semester Examination		
Bloom's Level	**Rubrics based Continuous Assessment [40 marks]**	**Preparatory Examination [20 Marks]**	**End Semester Examination [40 marks]**
Remember	10	5	20
Understand	10	5	40
Apply	20	10	40
Analyze			
Evaluate			
Create			

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23MA302	PROBABILITY AND STATISTICS (Common to AIDS, BME, CSBS, CSE, IT & M.TECH. CSE)	L	T	P	C
		3	0	2	4
Nature of Course	Basic Sciences				
Pre requisites	Foundation of Mathematics				

Course Objectives

The course is intended to

1. Learn the fundamental concepts of random variables.
2. Acquire essential knowledge of random variables necessary for subsequent studies in digital communication.
3. Develop an understanding of hypothesis testing for both small and large samples.
4. Familiarize students with the basic concepts of experimental design types used in engineering.
5. Study classification types and principles of statistical quality control.
6. Utilize statistical methods to analyze data, infer patterns, and make informed decisions.

Course Outcomes

On successful completion of the course, the students will be able to

CO.No.	Course Outcome	Bloom's Level
CO1	Construct the concepts of a random variables and Probability distributions.	Apply
CO2	Examine the functions of multiples random variable.	Apply
CO3	Implement hypothesis testing techniques for small and large samples.	Apply
CO4	Predict the design of experiments in the field of engineering by the concept of classification..	Apply
CO5	Identify the sampling distribution and statistical techniques	Apply
CO6	Utilize data infer patterns and mastery in statistical reasoning and application.	Apply

Course Contents:

MODULE - I	UNIVARIATE RANDOM VARIABLES	9
Random Variables – Discrete & Continuous random variables – Probability distributions – Discrete Probability Distributions: Binomial and Poisson probability distributions – Continuous Probability Distributions: Uniform and Exponential Probability distributions.		
MODULE - II	**BIVARIATE RANDOM VARIABLES**	**9**
Joint distributions – Marginal distributions – Covariance – Correlation Coefficient - linear regression – Central limit theorem (Statement only).		

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MODULE - III	STATISTICAL HYPOTHESIS TESTING	9
Distribution of samples – Parameter Estimation – Statistical hypothesis – Large sample tests relying on Normal distribution for individual mean and mean difference - Test utilizing t for mean - Chi-square test for Goodness of fit.		
MODULE - IV	**EXPERIMENTAL DESIGN AND ANALYSIS**	**9**
One way and two way classifications – Completely randomized design – Randomized block design – Latin square design.		
MODULE - V	**STATISTICAL QUALITY CONTROL**	**9**
Control charts for measurements (Mean and Range charts) – Control charts for attributes (p, c and np charts) – Tolerance limits – Acceptance sampling.		
		Total: 45 Periods

Text Books:

1. Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, 5th Edition, 2018.
2. Oliver.C.Ibe, 'Fundamentals of Applied Probability and Random Processes", Elsevier India, 3rd Edition, 2021.
3. Freund John, E and Miller, Irvin, "Probability and Statistics for Engineering", Prentice Hall, 5th Edition2022.

Reference Books:

1. Bali N.P and Manish Goyal, "A Text book of Engineering Mathematics", Lakshmi Publications Pvt Ltd, 10th Edition, 2020.
2. Ronald E. Walpole, Raymond H. Myersand Sharon L. Myers "Probability and Statistics for Engineers and scientists ", Pearson India ,14th Edition, 2021.
3. Jay L.Devore," Probability and Statistic for Engineering and the Sciences", Cengage Learning, 10th Edition, 2021.

Additional References:

1. https://onlinecourses.nptel.ac.in/noc21_ma74/preview
2. https://onlinecourses.swayam2.ac.in/cec21_ma02/preview
3. https://onlinecourses.nptel.ac.in/noc22_mg31/preview
4. https://onlinecourses.nptel.ac.in/noc20_ge05/preview

Laboratory Components using MATLAB:

S.No.	List of Experiments	CO Mapping	RBT
1	Poisson distribution	1	Apply
2	Uniform distributions	1	Apply
3	Marginal Distributions	2	Apply
4	Correlation Coefficient	2	Apply

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5	Individual mean by Student's t - test	3	Apply
6	Goodness of fit by Chi – Square test	3	Apply
7	One way classification	4	Apply
8	Two way classification	4	Apply
9	Control Chart for Variables using Mean Chart	5	Apply
10	Control Chart for Variables using Range Chart	5	Apply

Total: 30 Periods

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

Cos	Pos												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	2	2	-	-	-	-	-	-	-	-	2	-
CO2	3	2	2	3	-	-	-	-	-	-	-	-	2	-
CO3	3	3	2	3	-	-	-	-	-	-	-	-	2	-
CO4	3	2	3	3	-	-	-	-	-	-	-	-	1	-
CO5	3	2	2	3	-	-	-	-	-	-	-	-	2	-
	3	High				2	Medium					1	Low	

Bloom's Level	Summative Assessment						
	Continuous Assessment						Final Examination (Theory) [50]
	Theory			Practical			
	IAE I (5)	IAE II (10)	IAE III (10)	Attendance [5]	Rubric based [10]	Model Exam [10]	
Remember	10	10	10				10
Understand	10	10	10		40	40	30
Apply	30	30	30		60	60	60
Analyze							
Evaluate							
Create							

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23MC002	ENVIRONMENTAL SCIENCES (Common for all branches)	L	T	P	C
		2	0	0	0
Nature of Course	Mandatory, Non Credit				
Pre requisites	Nil				

Course Objectives

The course is intended to

1. Understand the concept of eco system and environment.
2. Become conversant with ecological balance and values of biodiversity.
3. Know the role of human in prevention of pollution and making a clean environment.
4. Get knowledge about conservation of non-conventional energy resources.
5. Study about the nature and management of e-waste and solid waste.

Course Outcomes

On successful completion of the course the students will be able to

CO.No	Course Outcome	Bloom's Level
CO 1	Explain the knowledge about ecosystem and environment	Understand
CO 2	Interpret the ecological balance and preservation of bio diversity	Understand
CO 3	Demonstrate various types of pollution in order to control pollution	Apply
CO 4	Classify the energy sources for the conservation of non conventional energy sources	Understand
CO 5	Identify the nature and management of e-waste and solid waste	Apply

Course Contents

Module – I	ECOSYSTEM	6
Eco system - Food chains, Food webs and Ecological pyramids. Ecosystem (a) Forest eco system, (b) Aquatic eco system (pond ecosystem and marine ecosystem).		
Module – II	**BIODIVERSITY**	**6**
Introduction to Bio diversity, Values of Bio diversity, Threads to Bio diversity, Endangered and Endemic species of India, Hotspots of biodiversity. Conservation of Biodiversity: In-Situ and Ex-Situ conservation of biodiversity.		
Module – III	**ENVIRONMENTAL POLLUTION**	**6**
Definition, Causes, Effects and Control of (a) Air pollution (b) Water pollution (c) Soil pollution. Electrostatic Precipitator for controlling air pollution.		
Module – IV	**NON-CONVENTIONAL ENERGY RESOURCES**	**6**
Introduction, Types, Working and Applications of: Solar Energy- Photovoltaic (PV) solar energy, Wind Energy-Onshore wind power- and Geo Thermal Energy-Geo thermal power plant.		

Module – V	ENVIRONMENTAL MANAGEMENT	6
Sustainable Development, Waste Management: Types, sources and disposal of municipal, industrial solid Waste, Role of Information technology in Environment and Human. COVID-19 and JN-1 Virus.		
		Total : 30 Periods

Activity Components

S.No	List of Experiments	CO Mapping	RBT
1	Field study of simple eco system: pond, river and hill slopes	CO1	Understand
2	Case study regarding environmental management	CO5	Apply

Text Books

1. AnubhaKaushik and C.P. Kaushik, "Environmental Science and Engineering, New Age International Publishers, New Delhi, 2nd Edition, 2019.
2. V. Kumar, "An Introduction to Green Chemistry" Vishal publishing Co. Reprint Edition, 2020.

Reference Books

1. Santosh Kumar Garg and Rajeshwari Garg "Ecological and Environmental Studies", Khanna Publishers, Nai Sarak, Delhi, 2nd Edition, 2019.
2. Masters, Gilbert M, "Introduction to Environmental Engineering and Science", Pearson Education, New Delhi, 2nd Edition, 2020.

Web References:

1. https://nptel.ac.in/courses/122103039/38
2. https://bch.cbd.int/cms/ui/collaboration/download/download.aspx?id=909
3. https://nptel.ac.in/courses/105102089/air%20pollution%20(Civil)/Module-3/3a.htm
4. www.vssut.ac.in/lecture_notes/lecture1428910296.pdf
5. nptel.ac.in/courses/120108004/module7/lecture8.pdf

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)

COs	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1		3					1					3		
CO 2		3					3					1		
CO 3		3					2					3		
CO 4		2					3					2		
CO 5		3					3					2		
	3-High				2-Medium				1-Low					

Passed in Board of Studies Meeting on 28.12.2023 *Passed in Academic Council Meeting on*

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Summative Assessment					
Bloom's Level	Continuous Assessment				
	IAE-I [20]	IAE-II [20]	IAE-III [20]	Attendance [20]	Activity [20]
Remember	20	20	15		
Understand	30	25	25		
Apply		5	10		
Analyze					
Evaluate					
Create					

23UH001	UNIVERSAL HUMAN VALUES (Common to all B.E. / B.Tech Programme)	L	T	P	C
		3	0	0	3
Nature of Course	Humanities and Sciences				
Pre requisites	Nil				

Course Objectives

The course is intended to

1. Encourage respect for the inherent dignity and worth of all individuals, regardless of differences in race, ethnicity, gender, religion, or socioeconomic status.
2. Cultivate empathy and compassion towards others, promoting understanding and solidarity across diverse communities.
3. Promote peaceful coexistence and harmony among individuals and communities.
4. Foster a sense of responsibility towards the environment and future generations, promoting sustainable practices and conservation efforts.
5. Hold and celebrate cultural diversity, recognizing the richness and value of different traditions, languages, and perspectives.
6. Contribute to the realization of universal human values and create a more just, compassionate, and sustainable world.

Course Outcomes

On successful completion of the course the students will be able to

CO.No	Course Outcome	Bloom's Level
CO 1	Embrace values such as empathy, tolerance, and respect can lead to decreased conflict and violence, both at interpersonal and societal levels.	Understand
CO 2	Support values like equality, justice, and human rights can lead to more equitable societies, where everyone has access to opportunities and resources	Understand
CO 3	Emphasize values such as empathy, compassion, and honesty fosters healthier and more meaningful relationships among individuals and groups.	Apply
CO 4	Grasp values of environmental stewardship and responsibility contributes to sustainable development practices that preserve natural resources.	Apply
CO 5	Celebrate cultural diversity and promoting values of inclusivity and acceptance enriches societies by fostering creativity, innovation, and mutual understanding	Understand
CO 6	Create a world that is more just, compassionate, and sustainable for all.	Apply

Course Contents

Module – I	NEED, BASIC GUIDELINES, CONTENT AND PROCESS FOR VALUE EDUCATION	9

Purpose and motivation for the course, recapitulation from Universal Human Values-I - Self-Exploration – what is it? – Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration – Continuous Happiness and Prosperity-A look at basic Human Aspirations - Right understanding, Relationship and Physical Facility - the basic requirements for fulfilment of aspirations of every human being with their correct priority – Understanding Happiness and Prosperity correctly -

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A critical appraisal of the current scenario – Method to fulfil the above human aspirations: understanding and living in harmony at various levels.		
Module – II	**UNDERSTANDING HARMONY IN THE HUMAN BEING - HARMONY IN MYSELF!**	**9**
Understanding human being as a co-existence of the sentient 'I' and the material 'Body' – Understanding the needs of Self ('I') and 'Body'- happiness and physical facility – Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) – Understanding the characteristics and activities of 'I' and harmony in 'I' – Understanding the harmony of I with the Body : Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail Programs to ensure Sanyam and Health.		
Module – III	**UNDERSTANDING HARMONY IN THE FAMILY AND SOCIETY- HARMONY IN HUMAN- HUMAN RELATIONSHIP**	**9**
Understanding values in human - human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship – Understanding the meaning of Trust; Difference between intention and competence - Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship – Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals – Visualizing a universal harmonious order in society-Undivided Society, Universal Order- from family to world family.		
Module – IV	**UNDERSTANDING HARMONY IN THE NATURE AND EXISTENCE-WHOLE EXISTENCE AS COEXISTENCE**	**9**
Understanding the harmony in the Nature – Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self regulation in nature – Understanding Existence as Co-existence of mutually interacting units in all- pervasive space Holistic perception of harmony at all levels of existence.		
Module – V	**IMPLICATIONS OF THE ABOVE HOLISTIC UNDERSTANDING OF HARMONY ON PROFESSIONAL ETHICS**	**9**
Natural acceptance of human values – Definitiveness of Ethical Human Conduct – Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order - Competence in professional ethics – Case studies of typical holistic technologies, management models and production systems – Strategy for transition from the present state to Universal Human Order: **a.** At the level of individual: as socially and ecologically responsible engineers, technologists and managers **b.** At the level of society: as mutually enriching institutions and organizations		
		Total : 45 Periods

Text Books

1. Premvir Kapoor, Professional Ethics and Human Values, Khanna Book Publishing, New Delhi, 2022.
2. R R Gaur, R Asthana, G P Bagaria, 2019 (2nd Revised Edition), A Foundation Course in Human Values and Professional Ethics. ISBN 978-93-87034-47-1, Excel Books, New Delhi.
3. A N Tripathy, Human Values, New Age International Publishers, 2003.

Reference Books

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) Krishi Tantra Shodh, Amravati.
3. Human Values, A. N. Tripathi, New Age Intl.Publishers, NewDelhi, 2004.

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Web References

1. https://www.studocu.com/in/document/i-k-gujral-punjab-technical-university/universal-human-values/uhv-complete-notes/46743542.
2. https://www.youtube.com/watch?v=NhFBzn5qKIM&list=PLWDeKF97v9SO8vvjC1Kyqte ziTbTjN1So
3. https://www.youtube.com/watch?v=Ff0LUTOCuLE&list=PLWDeKF97v9SO8vvjC1Kyqte ziTbTjN1So&index=16

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)														
COs	Pos												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1									1	2	1		1	-
CO 2									1	2	1		1	
CO 3									1	2	1		1	
CO 4									1	2	1		1	
CO 5									1	2	1		1	
	3-High				2-Medium				1-Low					

Formative assessment			
Bloom's Level	Continuous Assessment (IAE)		Total marks
	Assessment component	Marks	
Remember	Online Quiz	5	15
Understand	Tutorial class/Assignment	5	
	Attendance	5	

Summative assessment				
Bloom's Level	Continuous Assessment (IAE)			Final Examination [60 marks]
	Theory Marks			
	IAE-I [5]	IAE-II [10]	IAE-III [10]	
Remember	20	10	10	10
Understand	30	20	20	20
Apply		20	20	20
Analyse				
Evaluate				
Create				

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SEMESTER 4

23AI401	DATA SCIENCE	L	T	P	C
		3	0	0	3
Nature of Course	Professional Core (PC)				
Prerequisites	23AI302				

Course Objectives

The course is intended to

1. Know the fundamental concepts of data sciences
2. Learn the different techniques used for data preprocessing
3. Identify various tools in Python and R programming for data science

Course Outcomes

On successful completion of the course, students will be able to

CO. No.	Course Outcome	Bloom's Level
CO1	Illustrate the data Science Roles and its stages	Understand
CO2	Interpret various preprocessing techniques for data mining	Analyze
CO3	Design framework for exploratory data analytics	Apply
CO4	Demonstrate various techniques in R programming.	Understand
CO5	Appraise the data visualization using tools.	Analyze
CO6	Infer various mathematical and statistical methods for data analysis	Analyze

Course Contents

Module – I Introduction	**9**
Data - Information (vs) Data - Data Science – Evolution – Roles – Stages in Data Science Project – Applications – Data Security Issues - Data analysis tools - Knowledge and Skills for Data Science Professionals - Statistical / mathematical reasoning - Machine Learning.	
Module - II Data Collection and Data Pre-Processing	**9**
Data Collection Strategies – Primary & Secondary Data Collection – Data Pre-Processing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization	
Module – III Exploratory Data Analytics	**9**
Descriptive Statistics – Mean – Median - Mode - Standard Deviation – Probability - The need of probability - Conditional probability and data science - Random variables - Probability distribution - Skewness – Positive & Negative Skew – Box Plots – Pivot Table – Heat Map – Correlation Statistics – ANOVA.	
Module – IV R Programming	**9**
Basics - R vs Python – Variables - Basic Data Type – Vectors – Numbers - Built-in Math Functions - String - Boolean / Logical Value – Operators - Control Statement - Function – Matrices – List – Data Frame – Arrays – Class.	
Module - V Python For Data Handling & Data Visualization	**9**
Numpy array – Aggregation – Computations on arrays: Comparisons – Masks - Boolean Logic – Fancy Indexing – Structured Array – Data Manipulation with Pandas – Data Indexing and Selection – Operation on Data - Visualization with Matplotlib – Lineplot – Scatterplot – Visualizing Error – Density and Contour Plot – Histogram – Three Dimensional Plotting – Geographic Data.	
	Total : 45 Periods

Text Books:

1. David Dietrich, Barry Heller, Beibei Yang, "Data Science and Big data Analytics", Wiley, 2021.
2. Sanjeev J. Wagh, Manisha S. Bhende, Anuradha D. Thakare "Fundamentals of Data Science"CRC Press,2022
3. Jake VanderPlas, "Python Data Science Handbook: Essential Tools for Working with Data",. O'Reilly, 2022

Reference Books:

1. Joel Grus, "Doing Data Science From Scratch: First Principles with Python, Second Edition", O'Reilly, 2019.
2. Hadley Wickham, Mine Çetinkaya-Rundel, Garrett Grolemund , "R for Data Science: Import, Tidy, Transform, Visualize, and Model Data 2nd Edition, O'Reilly, 2023
3. Dr Reema Thareja, "Data Science and Machine Learning Using Phython", Mc Graw Hill, 2022.

Additional / Web References:

1. https://nptel.ac.in/courses/106/106/106106179/
2. https://nptel.ac.in/courses/111/104/111104146/
3. https://nptel.ac.in/courses/110/106/110106064/

Mapping of Course Outcomes (CO's) with Programme Outcomes (PO's) and ProgrammeSpecific Outcomes (PSO's)

CO's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	3	3	3	3	2							2	3	3	3
CO 2	2	2	2	2	3							3	3	2	3
CO 3	2	2	2	3	2							2	2	3	3
CO 4	3	2	3	2	3							3	3	3	2
CO 5	3	2	3	2	3							2	3	3	3
CO 6	2	3	3	2	2							2	2	2	2
	3-High				2-Medium				1- Low						

Formative Assessment			
Blooms Taxonomy	Assessment Component	Marks	Total marks
Remember	Quiz	5	15
Understand / Apply	Tutorial class / Assignment	5	
	Attendance	5	

Passed in Board of Studies

CHAIRMAN-BOARD OF STUDIES

Approved in Academic Council

Summative Assessment				
Bloom's Category	Internal Assessment Examinations (IAE) (40)			Final Examinations (FE)
	IAE – I (5)	IAE – II (10)	IAE – III (10)	(60)
Remember	10	10	10	20
Understand	30	30	30	40
Apply	10	10	10	20
Analyse				20
Evaluate				
Create				

CHAIRMAN - BOARD OF STUDIES

23AI402	THEORY OF COMPUTATION (COMMON TO CSE, AI&DS)	L	T	P	C
		3	0	0	3
Nature of Course	Professional Core				
Prerequisites	Nil				

Course Objectives

The course is intended to

1. Understand basic mathematical proof and grammar to identify the formal languages
2. Understand the relationship of formal languages with types of automaton.
3. Analyze the complexity of computation.

Course Outcomes

On successful completion of the course, students will be able to

CO.No.	Course Outcome	Bloom's Level
CO1.	Design Automata for accepting or generating certain languages	Apply
CO2.	Interpret automata and regular expression for any pattern	Apply
CO3.	Formulate Context free grammar and pushdown automata	Apply
CO4.	Analyze the use of Turing Machine and properties of context freegrammar	Analyze
CO5.	Analyze the decidability and undesirability of various problem	Analyze
CO6	Analyze the polynomial problems	Analyze

Course Contents:

MODULE-I Automata Fundamentals 9

Introduction to formal proof – Inductive Proofs– Finite Automata –Deterministic Finite Automata – Non-deterministic Finite Automata – Finite Automata with Epsilon Transitions-Equivalence of NFA and DFA-Equivalence of NFAs with and without epsilon moves.

MODULE-II Regular Expressions and Languages 9

Types of grammar - Regular Expressions - Equivalence of FA and regular expression - Pumping Lemma for regular language – Closure Properties of Regular Languages – Minimization of Automata - Applications of Regular Expressions.

MODULE-III Context Free Grammar and Push Down Automata 9

CFG – Parse Trees – Ambiguity in Grammars and Languages – Push Down Automata (PDA): Definition - instantaneous description- Languages of a Pushdown Automata – Equivalence of Pushdown Automata and CFG.

MODULE–IV Normal Forms and Turing Machines 9

Normal Forms for CFG – simplifications of CFG - Chomsky Normal Form (CNF) and Greibach Normal Form (GNF) - Pumping Lemma for CFL – Closure Properties of CFL – Turing Machine: definition and representation-Language acceptance by Turing Machine.

MODULE-V Undecidability 9

Non-Recursive Enumerable (RE) Language – Undecidable Problem with RE – Undecidable Problems about TM – Post's Correspondence Problem - The Class P and NP - Kruskal's algorithm-Travelling Salesman problem.

Total:45 Periods

Passed in Board of Studies CHAIRMAN-BOARD OF STUDIES *Approved in Academic Council*

Text Books:

1. Hopcroft J.E, Motwani and Ullman.D, "Introduction to Automata Theory, Languages and Computations", Pearson Education, 4th Edition 2021.
2. Micheal Sipser, "Introduction of the Theory and Computation", Thomson Learning,4th Edition 2020.

Reference Books:

1. Lewis H.R and Papadimitriou C.H, "Elements of the theory of Computation", Prentice-Hall of India Pvt .Ltd, 4th Edition 2020.
2. Martin.J, "Introduction to Languages and the Theory of Computation", Tata Mc Graw Hill, New Delhi, 3rd Edition 2020.
3. Kamala Krithivasan and Rama.R, "Introduction to Formal Languages Automata Theory and Computation", Pearson Education, 3rd Edition 2018.

Additional References:

1. https://nptel.ac.in/courses/111/103/111103016/
2. https://nptel.ac.in/courses/106/106/106106049/
3. https://www.digimat.in/nptel/courses/video/111103016/L01.html

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

Cos	Pos												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3										3	3	2
CO2	3	3	3										3	3	2
CO3	3	3	3										3	3	2
CO4	3	3	3										3	3	2
CO5	3	3	3										3	3	2
CO5	3	3	3										3	3	2
	3	High				2	Medium					1	Low		

Formative assessment			
Bloom's Level	Assessment Component	Marks	Total Marks
Remember	Online Quiz	5	15
Understand	Tutorial Class/Assignment	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	Internal Assessment Examinations			Terminal Examination (60)
	IAE–I (5)	IAE –II (10)	IAE– III (10)	
Remember	10	10	0	20
Understand	20	20	10	20
Apply	10	10	20	40
Analyze	10	10	20	20
Evaluate				
Create				

23AI403	JAVAPROGRAMMING	L	T	P	C
		3	0	0	3
Nature of Course	Professional Core (PC)				
Prerequisites	23CS201				

Course Objectives

The course is intended to

1. Understand the OOPS concepts
2. Explore the java programming
3. Know the advanced concepts in java and develop the program on it

Course Outcomes

On successful completion of the course the students will be able to

CO.No	Course Outcome	Bloom's Level
CO 1	Infer the concepts of oops and java fundamentals	Understand
CO 2	Interpret the Inheritance and Polymorphism	Apply
CO 3	Build exceptions in programs	Analyze
CO 4	Explore the Concepts of Multithreading	Apply
CO 5	Java Connectivity to database	Apply
CO 6	Understand the event driven programming	Apply

Course Contents

Module – I	OOPs and Java	9
Basics of OOPs- Applications - Features of java - Java Environment - Java Program Structure- Tokens – Constants - Variables - Data types – Type Conversion - Operators and Expressions- Operator Precedence -Control Structure– Command Line Arguments - Array - Strings – Class– Object - Method – Constructor		
Module – II	**Inheritance and Polymorphism**	**9**
Basics – Types of Inheritance –this - super - Abstract Class – Polymorphism: Method Overloading - Method Overriding – Interfaces - Garbage Collection - Access Protection - Package- Importing Packages - Nested Class - Wrapper Classes.		
Module – III	**Exception Handling and Streams**	**9**
Exception : Types - try, catch, finally and throws clause–Catching Multiple Exceptions–User Defined Exceptions I/O streams-Byte streams–Character streams - File Streams–Reading and Writing files.		
Module – IV	**Multithreading and Database Connectivity**	**9**
Thread - Life Cycle - Thread Class and Runnable Interface – Thread Priority – Thread Exceptions- Synchronization - Interthread Communication - JDBC basics — Components of JDBC – Architecture – Types of Drivers – Steps to connect database in Java.		

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Module – V	Event Driven Programming	9
GUI Programming -AWT classhierarchy – Container Class – Layout – Components - Event handling : Event handlers and listener Interfaces – Adapter Classes – Mouse, Keyboard Actionsand Events–Swing.		
		Total : 45 Periods

Text Books

1. Herbert Schildt,"Java The complete reference"12th Edition, Mc Graw Hill Education,2021.
2. Cay S.Horstmann, Gary cornell,"Core Java Volume–II Fundamentals"12th Edition, Pearson, 2023

Reference Books

1. PaulDeitel,HarveyDeitel,"JavaHowtoprogram,EarlyObjects",GlobalEdition,11thEdition,Pearson, 2020.
2. Hetal Bhaidasna, "object oriented programming with Java", Notion Press, 2021
3. C.Xavier,"Java Programming- A Practical Approach ", Tata Mc Graw Hill publication, 2019

Additional References

1. NPTEL - https://nptel.ac.in/courses/107/106/107106088/
2. MOOC Courses - https://www.mooc-list.com/tags/

Mapping of Course Outcomes (CO's) with Programme Outcomes (PO's) and ProgrammeSpecific Outcomes (PSO's)

COs	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	3	2	1										3	1	
CO 2	3	2	1										3	1	
CO 3	3	2	2	1								1	3	1	
CO 4	3	2	2	2								1	3	1	
CO 5	3	2	2	2								1	3	1	
CO 6	3	2	2	2								1	3	1	
	3-High				2-Medium				1- Low						

Formative Assessment			
Blooms Taxonomy	Assessment Component	Marks	Total marks
Apply	Class Room/ Online Quiz	5	15
Understand	ClassPresentation/Powerpointpresentation	5	
	Attendance	5	

Summative Assessment				
Bloom's Category	Internal Assessment Examinations (IAE) (40)			Final Examinations (FE)
	IAE – I (5)	IAE – II (10)	IAE – III (10)	(60)
Remember	10	10	10	20
Understand	20	20	10	60
Apply	20	20	20	20
Analyse			10	
Evaluate				
Create				

CHAIRMAN-BOARD OF STUDIES

23MA401	NUMERICAL METHODS (Common to AIDS ,BME, CSBS, CSE, ECE, EEE, IT and M.Tech CSE)	L	T	P	C
		3	0	2	4
Nature of Course	Basic Sciences				
Pre requisites	Foundations of Mathematics				

Course Objectives

The course is intended to

1. Introduce the basic concepts of algebraic and transcendental equations.
2. Indicate the Numerical techniques of interpolation in various intervals.
3. Learn the concept of numerical techniques of differentiation and integration.
4. Study the numerical techniques in solving ordinary differential equations.
5. Provide the Numerical techniques in solving one dimensional and two dimensional heat equations.
6. Acquire proficiency in employing computational techniques to solve mathematical problems efficiently and accurately.

Course Outcomes

On successful completion of the course, students will be able to

Co. No.	Course Outcome	Bloom's Level
CO1	Demonstrate the algebraic and transcendental equations.	Apply
CO2	Perform the numerical techniques of interpolation and error approximations in various Intervals.	Apply
CO3	Compute the numerical techniques of differentiation and integration for engineering problems.	Apply
CO4	Classify the numerical techniques for solving first order ordinary differential equations.	Apply
CO5	Illustrate the solution of boundary value problems.	Apply
CO6	Utilize computational techniques to solve mathematical problems efficiently and accurately.	Apply

Course Contents:

Module – I	SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS	9
Solution of Algebraic and Transcendental equations – Newton - Raphson method- Solution of linear system of equations -Gauss elimination method – Gauss Jordan method – Iterative methods of Gauss Jacobi method and Gauss Seidel method.		
Module – II	**INTERPOLATION AND APPROXIMATION**	**9**
Interpolation with unequal intervals – Lagrange's interpolation – Newton's divided difference interpolation – Interpolation with equal intervals – Newton's interpolation formulae.		

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Module – III	NUMERICAL DIFFERENTIATION AND INTEGRATION	9
Approximation of derivatives using interpolation polynomials – Numerical integration using Trapezoidal and Simpson's 1/3 rules – Two point and three point Gaussian quadrature formulae.		
Module – IV	**NUMERICAL SOLUTIONS OF ORDINARY DIFFERENTIAL EQUATIONS**	**9**
Single step methods: Euler's method – Fourth order Runge - Kutta method for solving first order equations – Shooting Method – Multi step methods: Milne's predictor corrector methods for solving first order equations.		
Module – V	**BOUNDARY VALUE PROBLEMS IN PARTIAL DIFFERENTIAL EQUATIONS**	**9**
Finite difference techniques for the solution of two dimensional Laplace's equations on rectangular domain – One dimensional heat flow equation – Bender Schmidt method by explicit – Crank Nicholson methods.		
		Total: 45 Periods

Text Books:

1. Grewal B.S, and Grewal J.S, " Numerical methods in engineering and science "Khanna Publishers, 10th Edition, 2015.
2. Burden, R.L. and Faires, J.D, "Numerical Analysis" Cengage Learning, 9th Edition, 2016.
3. Gupta, S.K., "Numerical Methods for Engineers", New Age Publishers, Third Edition, 2015.

Reference Books:

1. Sankara Rao. K., "Numerical Methods for Scientists and Engineers", Prentice Hall of India Pvt. Ltd, New Delhi, 4th Edition, 2017.
2. Sastry, S.S., "Introductory Methods of Numerical Analysis", PHI Learning pvt Ltd, 5th Edition, 2015.
3. Jain, M.K., Iyengar, S.R.K. and Jain, R.K., "Computational Methods for Partial Differential Equations", New Age Publishers, 2016.
4. Curtis F.Gerald, Patrick.O. Wheatley, "Applied Numerical Analysis", Pearson Education, 8th Edition, 2022.

Additional References:

1. https://nptel.ac.in/courses/111/107/111107105
2. https://nptel.ac.in/courses/127/106/127106019
3. https://archive.nptel.ac.in/content/storage2/courses/122104018/node126.html

Laboratory Components using MATLAB:

S.No	List of Excercises	CO Mapping	RBT
1	Gauss Elimination Method	1	Apply
2	Gauss Seidel Method	1	Apply
3	Lagrange's Interpolation Formula	2	Apply

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4	Newton's Forward and Backward difference formula	2	Apply
5	Trapezoidal Rule	3	Apply
6	Simpson's 1/3 rd rule	3	Apply
7	Euler's Method	4	Apply
8	Runge – Kutta Method	4	Apply
9	Finite Difference Method	5	Apply
10	Bender Schmidt method	5	Apply

Total: 30 Periods

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) Programme Specific Outcomes (PSOs)

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	1	-	-	-	-	-	-	-	-		2		
CO2	3	2	2	-	-	-	-	-	-	-	-		2		
CO3	3	2	1	-	-	-	-	-	-	-	-		2		
CO4	2	2	1	-	-	-	-	-	-	-	-		1		
CO5	3	3	1	-	-	-	-	-	-	-	-		2		
CO6	3	2	2	-	-	-	-	-	-	-	-		2		
	3	High				2	Medium					1	Low		

Bloom's Level	Summative Assessment						
	Continuous Assessment						Final Examination (Theory) [50]
	Theory			Practical			
	IAE I (5)	IAE II (10)	IAE III (10)	Attendance [5]	Rubric based [10]	Model Exam [10]	
Remember	10	10	10				10
Understand	10	10	10		40	40	30
Apply	30	30	30		60	60	60
Analyze							
Evaluate							
Create							

CHAIRMAN-BOARD OF STUDIES

23EC309	DIGITAL LOGICs AND MICROPROCESSOR	L	T	P	C
		3	0	2	4
Nature of Course	Engineering Physics				
Pre requisites	-				

Course Objectives

The course is intended to

1. Learn Digital fundamentals, Boolean theorems and Minimization of logical functions for logic circuit implementation.
2. Acquire the Knowledge of Combinational Logic Circuits using Logic Gates
3. Expose Synchronous and Asynchronous Sequential Circuits
4. Study the 8086 Microprocessor Architecture and its Configuration with Timing Diagram
5. Know Assembly Language Programming and Interfacing of 8086 Microprocessor for different applications.

Course Outcomes

On successful completion of the course the students will be able to

CO No.	Course Outcome	Bloom's Level
CO1	Realize logical functions with minimization techniques.	Understand
CO2	Construct the combinational digital circuits using logic gates.	Understand
CO3	Analyze the Synchronous Sequential Circuits.	Analyze
CO4	Analyze the Asynchronous Sequential Circuits.	Analyze
CO5	Explain the 8086 microprocessor architecture and its configuration.	Understand
CO6	Develop the assembly language Programme and interfacing of 8086 microprocessor for various applications.	Apply

Course Contents

Module – I	**NUMBER SYSTEM AND DIGITAL LOGIC GATES**	**9**
Number Systems -Codes - Binary, BCD, Excess 3, Gray, , Boolean theorems & Postulates, Logic gates, Universal gates, Sum of products and product of sums, Minterms and Maxterms, Karnaugh Map Minimization. McCluskey Method.		
Module – II	**COMBINATIONAL LOGIC CIRCUITS**	**9**
Constructions of adder, Subtractor, Carry look ahead Adder, BCD Adder, Multiplier, Magnitude Comparator– Encoder, Decoder, Multiplexer and De-multiplexer – Parity Checker & Generator Realization of combinational circuits using decoders and multiplexers.		
Module – III	**SEQUENTIAL LOGIC CIRCUITS**	**9**
Synchronous : Latches, Flip flops - SR, JK, T, D, Master/Slave FF - operation and excitation tables, Shift Registers – Counters.(Up/Down ,Mod Counter) **Asynchronous:** Design procedure for Asynchronous Sequential Circuits, Reduction of State and Flow Tables, cycles and races, state reduction, race free assignments.		
Module – IV	**8086 MICROPROCESSOR**	**9**
Architecture, Pin Diagram – Memory segmentation – Physical address generation, Minimum mode and Maximum mode Configurations –Timing Diagram – Comparison on advanced processors.		

Module – V	**ASSEMBLY LANGUAGE PROGRAMMING(8086) AND its INTERFACING APPLICATIONS**	**9**
Addressing modes and Instruction set– Assembly language programming– Interfacing of Keyboard and display–Traffic Light Interfacing – Stepper Motor Interfacing.		
		Total : 45 Periods

Laboratory Components

S.No	List of Experiments	CO Mapping	RBT
1	Verification of Boolean theorems using digital logic gates	CO1	Apply
2	Design and implementation of Half adder / Half subtractor, Full adder / Full subtractor using basic gates	CO2	Apply
3	Design and implementation of Shift registers	CO3	Apply
4	Basic arithmetic and Logical operations for Microprocessor	CO4	Apply
5	Key board and Display interfacing	CO5	Apply

Total: 30 Periods

Text Books

1. Morris Mano. M and Michael D. Ciletti, ”Digital Design”, Pearson Publication, Sixth Edition 2018.
2. Doughlas V.Hall, —Microprocessors and Interfacing, Programming and Hardwarell,TMH, 2012.
3. Yu-Cheng Liu, Glenn A.Gibson, —Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design, Second Edition, Prentice Hall of India, 2007.

Reference Books

1. Charles H.Roth, ”Fundamentals of Logic Design”, 6th Edition, Thomson Learning, 2013.
2. Thomas L. Floyd,” Digital Fundamentals”, 10th Edition, Pearson Education Inc, 2011
3. Soumitra Kumar Mandal, ”Digital Electronics”, McGraw Hill Education Private Limited, 2016.
4. Savaliya.M.T,”8086 Programming and Advanced Processor Architecture” , Wiley India, New Delhi, 2nd Revised Edition 2019.

Additional References

1. **NPTEL:** https://archive.nptel.ac.in/courses/108/105/108105132/

Mapping of Course Outcomes (CO’s) with Programme Outcomes (PO’s) and Programme Specific Outcomes (PSO’s)

COs	PO’s												PSO’s		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	3	3	1										1	1	1
CO 2	3	3	3										1	1	1
CO 3	3	3	3										2	2	2
CO 4	3	3	2										2	2	2
CO 5	3	2	2										1	1	1
CO 6	3	2	2										2	2	2
	3-High				2-Medium				1- Low						

Summative Assessment				
Bloom's Category	**Internal Assessment Examinations (IAE) (40)**			**Final Examinations (FE)**
	IAE – I (5)	**IAE – II (10)**	**IAE – III (10)**	**(60)**
Remember	10	10	10	10
Understand	40	20	10	60
Apply		10	20	10
Analyse		10	10	20
Evaluate				
Create				

CHAIRMAN-BOARD OF STUDIES

23AI404	JAVA PROGRAMMING LABORATORY	L	T	P	C
		0	0	2	1
Nature of Course	Practical				
Prerequisites	23CS201				

Course Objectives

The course is intended to

1. Make familiar with java programming Language
2. Develop applications in java using I/O streams and Exception handling
3. Implement generic programming on real time applications

Course Outcomes

On successful completion of the course the students will be able to

CO.No	Course Outcome	Bloom's Level
CO 1	Write java programs using basic language constructs	Understand
CO 2	Execute programs using inheritance and interfaces	Apply
CO 3	Understand the Exception Handling programs	Apply
CO 4	Design the program using thread	Create
CO 5	Explore the concepts of Multithreading to solve real world problems	Apply
CO 6	Integrate the concept of event driven programming to develop GUI based applications	Analyze

List of Experiments

S.No	List of Exercises	CO Mapping	RBT
1	Create java applications using classes and methods	CO1	Apply
2	Develop java applications using constructors	CO1	Apply
3	Write a Java program to create a class called "ElectronicsProduct" with attributes for product ID, name, and price. Implement methods to apply a discount and calculate the final price. Create a subclass " WashingMachine" that adds a warranty period attribute and a method to extend the warranty	CO2	Create
4	Develop a simple program to get and display data using command line arguments.	CO2	Apply
5	Write a Java program to create a class called "Book" with attributes for title, author, and ISBN, and methods to add and remove books from a collection	CO3	Create
6	Create programs to read and display the contents of a file using I/O streams	CO3	Apply
7	Implement the concept of exception handling to solve complex problems.	CO4	Apply
8	Develop a real time applications using Multithreading	CO4	Apply
9	Write java program to set up connections and get all data from table	CO5	Apply
10	Write a java program using Swing	CO5	Create

Total: 60 Periods

Mapping of Course Outcomes (CO's) with Programme Outcomes (PO's) and ProgrammeSpecific Outcomes (PSO's)															
COs	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO 1	3	1	1	1	3						1	2	3	3	
CO 2	3	1	1	1	3						1	2	3	3	
CO 3	3	1	1	1	3						1	2	3	2	
CO 4	3	2	1	2	3						1	2	3	2	
CO 5	3	2	1	1	3						1	2	3	2	
CO 6	3	2	1	1	3						1	2	3	2	
	3-High				2-Medium				1- Low						

Summative Assessment			
Bloom's Category	Rubric based Continuous Assessment, Preparatory Examination (60)		Final Examinations (FE)
	Continuous Assessment (40)	Preparatory Examination (20)	(40)
Remember	10	5	20
Understand	10	5	40
Apply	20	10	40
Analyse			
Evaluate			
Create			

Passed in Board of Studies

CHAIRMAN-BOARD OF STUDIES

Approved in Academic Council

23AI405	DATA SCIENCE LABORATORY	L	T	P	C
		0	0	2	1
Nature of Course	Professional Core				
Pre requisites	23AI202				

Course Objectives

The course is intended to

1. Install and use R for simple programming tasks.
2. Understand the functionality of R data types.
3. Demonstrate visualization effects in Python.

Course Outcomes

On successful completion of the course, students will be able to

CO.No.	Course Outcome	Bloom's Level
CO 1	Deploy R for simple programming tasks.	Apply
CO 2	Manipulate operations on different R data types	Apply
CO 3	Discover the concepts of functions and strings	Apply
CO 4	Interpret data manipulation techniques in R	Apply
CO 5	Demonstrate different visualization effects in Python	Apply
CO 6	Use simple and multiple linear regressions in Python	Apply

Laboratory Components

S.No	List of Exercises	CO Mapping	RBT
1	Create two matrix with two rows and three columns and perform following operation on those matrix i)Adding two matrix ii)Subtraction of matrix iii)Multiplication of matrix iv)Division of matrix & v)Transpose of matrix Finally print the result of all the above operation.	CO1	Apply
2	Create an Employee database with employee name, ID, salary etc using data frame. Then perform i)Display employee database ii)Extraction of any two rows from the database iii)Extract 3rd and 5th row with 2nd and 4th column. iv)Display summary of the database	CO1	Apply

Passed in Board of Studies

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<table>
<tr><td>3</td><td>Write a R program for merging two data frame of Student details and Mark details.</td><td>CO2</td><td>Apply</td></tr>
<tr><td>4</td><td>Create two list and perform
i) Merge of two list.
ii)Convert list to vectors
iii)Addition of two vectors
iv)Subtraction of two vectors
v)Multiplication and division of vectors</td><td>CO2</td><td>Apply</td></tr>
<tr><td>5</td><td>Consider the following air quality data set for visualization in R:
<table>
<tr><th>Ozone</th><th>Solar</th><th>Wind</th><th>Temp</th><th>Month</th><th>Day</th></tr>
<tr><td>41</td><td>190</td><td>7.4</td><td>67</td><td>5</td><td>1</td></tr>
<tr><td>36</td><td>118</td><td>8.0</td><td>72</td><td>5</td><td>2</td></tr>
<tr><td>12</td><td>149</td><td>12.6</td><td>74</td><td>5</td><td>3</td></tr>
<tr><td>18</td><td>313</td><td>11.5</td><td>62</td><td>5</td><td>4</td></tr>
<tr><td>NA</td><td>NA</td><td>14.3</td><td>56</td><td>5</td><td>5</td></tr>
<tr><td>28</td><td>NA</td><td>14.9</td><td>66</td><td>5</td><td>6</td></tr>
</table>
i)Display two types of bar plots - horizontal and vertical which represent data points as horizontal or vertical bars of certain lengths proportional to the value of the data item.
ii) Present statistical summary of the given data using a boxplot.</td><td>CO2</td><td>Apply</td></tr>
<tr><td>6</td><td>Write a Python program to demonstrate the data cleaning process using Pandas.</td><td>CO3</td><td>Apply</td></tr>
<tr><td>7</td><td>Write a Python program to visualize relationship between two variables using Scatter plots.</td><td>CO3</td><td>Apply</td></tr>
<tr><td>8</td><td>Write a Python program to visualize relationship between two variables using Line Chart on X and Y axis.</td><td>CO4</td><td>Apply</td></tr>
<tr><td>9</td><td>Write a Python program to represent data in the form of some groups using Histogram.</td><td>CO4</td><td>Apply</td></tr>
<tr><td>10</td><td>Write a Python program to visualize data using high-level interface using Seaborn.</td><td>CO4</td><td>Apply</td></tr>
</table>

Total: 30 Periods

Passed in Board of Studies

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Mapping of Course Outcomes (CO's) with Programme Outcomes (PO's), Programme Specific Outcomes (PSO's)															
Co's	PO's												PSO's		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	2	1							1	3	3	2
CO2	3	3	2	2	1							1	3	3	2
CO3	3	3	2	2	1							1	3	3	2
CO4	3	3	2	2	1							1	3	3	2
CO5	3	3	2	2	1							1	3	3	2
CO6	3	3	2	2	1							1	3	3	2
	3	High				2	Medium					1	Low		

Summative Assessment			
Bloom's Category	Rubric based Continuous Assessment, Preparatory Examination (60)		Final Examinations (FE)
	Continuous Assessment (40)	Preparatory Examination (20)	(40)
Remember	10	5	20
Understand	10	5	40
Apply	20	10	40
Analyse			
Evaluate			
Create			

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23MC005	YOGA AND VALUES FOR HOLISTIC DEVELOPMENT (Common to all B.E. / B.Tech Programme)	L	T	P	C
		0	0	2	0
Nature of Course	Mandatory Course				
Pre requisites	Fundamentals of Yoga				

Course Objectives

The course is intended to

1. Know the various types of yoga and their benefits.
2. Practice essential yoga postures and techniques.
3. Give mental clarity and focus through the practice of pranayama.
4. Incorporate relaxation technique into their daily routine works.
5. Use meditation to reduce stress and anxiety.
6. Promote positive health, prevention of stress related health problems and rehabilitation through Yoga.

Course Outcomes

On successful completion of the course the students will be able to

CO.No	Course Outcome	Bloom's Level
CO 1	Balance their full potential and confidence.	Understand
CO 2	Understand the knowledge of fundamental yoga postures.	Understand
CO 3	Realize the enhanced the functions of inner organs.	Understand
CO 4	Achieve a deep state of relaxation and release physical and mental tension.	Understand
CO 5	Cultivate a sense of calm and well-being.	Understand
CO 6	Experience enhanced flexibility, strength and balance as well as reduced stress.	Understand

Course Contents

Module – I	INTRODUCTION TO YOGA	6
Foundations of Yoga - History and Development of Yoga - Etymology and Definitions, Misconceptions, Aim and Objectives of Yoga, True Nature and Principles of Yoga - Introduction to Vedas – Upanishads - Prasthanatrayee - Purushartha Chatushtaya.		
Module – II	**POSTURES (ASANA)**	**6**
Trikonasana - Ardha-Kati – Chakrasana – Tadasana - Vrikshasana - Padmasana, Simhasana - Paschimottanasana, Uttanpadasana – Salabhasana - Shavasana Pawanmuktasana - Anti-Rheumatic Series - Digestive / Abdominal Group - Energy Bock Series - Back Strengthening Exercises - Sun Salutation (Surya Namaskar) - Classical Sequence.		
Module – III	**BREATHING**	**6**
The Foundations - Abdominal Breathing - Thoracic (mid-chest) breathing - Clavicular (upper chest breathing) - The Complete Yoga Breath. Pranayama Techniques - Breathing Ratios - Nadi Shodhana (Alternate Nostril Breathing) - Ujjayi (the 'whispering breath' or the 'psychic breath') - Bhramari (Humming Bee breath).		

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Module – IV	RELAXATION	6
Quick Relaxation techniques - Tense & Relax - Short Yoga Nidra (Power Nap) - Extended Shavasana - Yoga Nidra – Sankalpa.		
Module – V	**MEDITATION**	**6**
Develop a good, comfortable sitting posture - Kaya Sthairyam (Body Stillness) - Om Chanting - Trataka (Concentrated Gazing).		
		Total : 30 Periods

Text Books

1. Stephen Sturges, The Yoga Book. Motilal Banarsidass, Delhi, 2004.
2. Singh S.P & Yogi, Foundation of Yoga, Standard Publication, New Mukesh Delhi, 2010.
3. Sahay G.S. HathaYoga Pradeepika of Svatmarama, MDNIY Publication, 2013.

Reference Books

1. Bhat, Krishna K. The Power of Yoga: SuYoga Publications Mangalore,2006.
2. Fenerstein, George, The Yoga Tradition: It's History, Literature, Philosophy practice, Bhavana Books and Prints, 2002.
3. Tiwari, O.P, Asana Why and How? Kaivalyadhama, Lonavla, 2011.

Web References:

1. https://www.india.gov.in/sites/upload_files/npi/files/coi_part_full.pdf.
2. https://edukemy.com/blog/upsc-ncert-notes-indian-polity-state-legislature/#Organization_and_Composition_of_State_Legislature
3. https://blog.ipleaders.in/dpsp-and-fundamental-rights/

Bloom's Level	Summative Assessment (Internal Mode)	
	Assessment 1 (50 Marks)	Assessment 2 (50 Marks)
Remember	10	10
Understand	10	10
Apply	30	30
Analyze		
Evaluate		
Create		

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