NEHRU INSTITUTE OF TECHNOLOGY

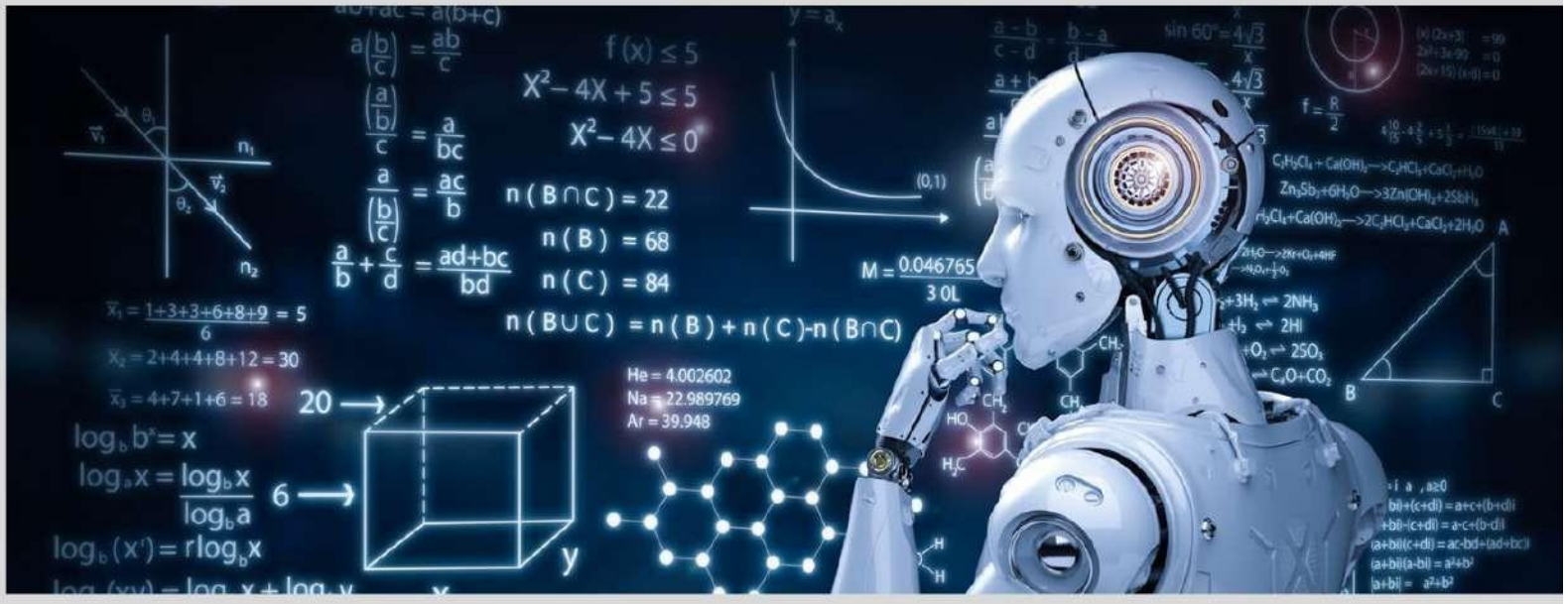
AN AUTONOMOUS INSTITUTION

COIMBATORE I TAMILNADU

Curriculum and Syllabi

Regulation 2023

B.E Computer Science and Engineering (Artificial Intelligence and Machine Learning)



VISION AND MISSION OF THE INSTITUTION

Vision

- To be leading Institution in Academic excellence, Multidisciplinary Research, Innovation, Entrepreneurship and Industry relation in order to mould true citizens of the country

Mission

- To create innovative and vibrant young leaders in Engineering and Technology field for building India as a knowledge power by improving the teaching-learning process.
- To enhance employability, entrepreneurship and to improve the research competence to address Societal needs.
- To generate engineering graduates who use knowledge as a powerful tool to drive societal transformation and inculcate in them ethical and moral values.

DEPARTMENT OF CSE- ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Vision

- To be a center of excellence in Information Science &Technology with a focus on Artificial Intelligence and Machine Learning through Research &Innovations embedding ethics to solve societal problems with advanced intelligent systems to have a global impact.

Mission

- **Impart strong theoretical and experiential knowledge** in Computer Science, Artificial Intelligence, and Machine Learning to develop innovative and sustainable solutions.
- **Encourage research, innovation, and ethical practices** by fostering critical and Creative thinking, multidisciplinary learning, to develop and contribute for the societal growth.
- **Strengthen industry and community engagement** through collaborative projects, internships, and partnerships to prepare students for real-world challenges and global impact

Program Educational Objectives (PEOs)

The CSE- Artificial Intelligence and Machine Learning graduate can

PEO 1: To equip graduates with strong foundations in AI and ML to design intelligent and sustainable solutions.

PEO 2: To foster research, innovation, ethical values and social responsibility for technological and societal advancement.

PEO 3: To prepare graduates for global careers through industry collaboration and multidisciplinary skills.

Program Outcomes

PO1: Engineering Knowledge

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

PO2: Problem Analysis

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

PO3: Design / Development of Solutions

Design solutions for complex engineering problems and design system components or processes that meet specified needs with appropriate consideration for public health and safety, and the cultural, societal, and environmental aspects.

PO4: Conduct Investigations of Complex Problems

Use research-based knowledge and research methods including the design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.

PO5: Modern Tool Usage

Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling, to complex engineering activities with an understanding of their limitations.

PO6: The Engineer and Society

Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to professional engineering practice.

PO7: Environment and Sustainability

Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of, and need for, sustainable development.

PO8: Ethics
Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

PO9: Individual and Team Work
Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings.

PO10: Communication
Communicate effectively on complex engineering activities with the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project Management and Finance
Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects in multidisciplinary environments.

PO12: Life-long Learning
Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broad context of technological change.

Programme Specific Outcomes (PSOs)

PSO 1: Apply Artificial Intelligence and Machine Learning techniques to design intelligent, data-driven, and sustainable solutions for real-world problems.

PSO 2: Demonstrate ethical responsibility, innovation, and effective use of modern tools to address societal and industrial challenges.

SEMESTER-I								
S.No.	**COURSE CODE**	**COURSETITLE**	**CATEGORY**	**PERIODS PER WEEK**			**TOTAL CONTACT PERIODS**	**CREDITS**
				L	**T**	**P**		
	U23IP101	Induction Program	MC	-	-	-	-	0
THEORY								
1	U23EN101	English for Engineers	HSMC	3	0	0	3	3
2	U23MA101	Calculus And Differential Equations	BSC	3	1	0	4	4
3	U23PH101	Engineering Physics	BSC	3	0	0	3	3
4	U23CY101	Engineering Chemistry	BSC	3	0	0	3	3
5	U23CS101	C-Programming	ESC	3	0	0	3	3
6	U23HS101	Heritage of Tamil	HSMC	1	0	0	1	1
7	U23EE101	Career Enhancement Training I	EEC	3	0	0	3	1
PRACTICAL								
8	U23BS111	Basic Science Laboratory	BSC	0	0	4	4	2
9	U23EN111	Communicative English Laboratory	HSMC	0	0	2	2	1
10	U23CS111	C-Programming Laboratory	ESC	0	0	4	4	2
11	U23VECx1	Vocational Enhancement Training-I	VEC	0	0	2	2	1*
Total				**19**	**1**	**12**	**32**	**23**

SEMESTER-II								
S.No.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PERIODS PER WEEK**			**TOTAL CONTACT PERIODS**	**CREDITS**
				L	**T**	**P**		
THEORY								
1	U23PH203	Physics for Information Science	BSC	3	0	0	3	3
2	U23HS202	Tamil &Technology	HSMC	1	0	0	1	1
3	U23CS201	Python Programming and Practices	ESC	3	0	0	3	3
4	U23EN203	Technical English	HSMC	2	0	0	2	2
THEORYWITHLABCOMPONENT								
5	U23CS204	Basic Electrical and Electronics Engineering	ESC	3	0	0	3	3
6	U23MA202	Advanced calculus and Statistics	BSC	3	0	2	5	4
PRACTICAL								
7	U23CS211	Python Programming Lab	ESC	0	0	2	2	1
8	U23GE212	Engineering PracticesLab	ESC	0	0	2	2	1
9	U23GE213	Engineering Graphics Lab	ESC	0	0	2	2	1
10	U23EE212	Career Enhancement Training II	EEC	0	0	2	2	1
11	U23VECx2	Vocational Enhancement Training-II	VEC	0	0	2	2	1*
Total				**15**	**0**	**12**	**27**	**20**

SEMESTER-III								
S.No.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PERIODS PER WEEK**			**TOTAL CONTACT PERIODS**	**CREDITS**
				L	**T**	**P**		
THEORY								
1	U23MA309	Discrete Mathematics for computing	BSC	3	1	0	4	4
2	U23AL301	Data Structures and Algorithms	PCC	3	0	0	3	3
3	U23IT301	Object oriented Programming Using JAVA	PCC	3	0	0	3	3
THEORY WITH LAB COMPONENT								
4	U23AL302	Digital principles and Computer Organization	ESC	3	0	2	5	4
5	U23IT405	Foundations of Data Science	PCC	3	0	2	5	4
PRACTICAL								
6	U23AL311	Data Structures Laboratory	PCC	0	0	4	4	2
7	U23AL312	JAVA Programming Laboratory	PCC	0	0	4	4	2
8	U23EE313	Aptitude and Communications for Engineers - I	EEC	0	0	2	2	1
9	U23VECx3	Vocational Enhancement Training-III	VEC	0	0	2	2	1*
10	U23MC301	Life Skills and Ethics	MC	2	0	0	2	NC
Total				**17**	**1**	**16**	**34**	**23**

SEMESTER-IV								
S.No.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PERIODS PER WEEK**			**TOTAL CONTACT PERIODS**	**CREDITS**
				L	**T**	**P**		
THEORY								
1	U23MA410	Linear Algebra and Number Theory	BSC	3	1	0	4	4
2	U23AL401	Theory of Computation	PCC	3	0	0	3	3
3	U23AL402	Artificial Intelligence	PCC	3	0	0	3	3
4	U23AL403	Machine Learning	PCC	3	0	0	3	3
THEORY WITH LAB COMPONENT								
5	U23AL404	Operating Systems	PCC	3	0	2	5	4
6	U23AL405	Database Design and Management	PCC	3	0	2	5	4
PRACTICAL								
7	U23AL411	Artificial Intelligence Laboratory	PCC	0	0	4	4	2
8	U23AL412	Machine Learning Laboratory	PCC	0	0	4	4	2
9	U23EE415	Aptitude and communication for Engineering -II	EEC	0	0	2	2	1
10	U23VECx4	Vocational Enhancement Training-IV	VEC	0	0	2	2	1*
11	U23MC402	Environmental Ecosystem and Sustainability	MC	2	0	0	2	NC
Total				**20**	**0**	**16**	**37**	**26**

SEMESTER-V								
S.No.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PERIODS PER WEEK**			**TOTAL CONTACT PERIODS**	**CREDITS**
				L	**T**	**P**		
THEORY								
1	U23AL501	Deep Learning for vision	PCC	3	0	0	3	3
2	U23AL502	Generative AI	PCC	3	0	0	3	3
3		Professional Elective I	PEC	3	0	0	3	3
4		Professional Elective-II	PEC	3	0	0	3	3
5	U23AL503	Compiler Design	PCC	3	0	0	3	3
THEORY WITH LAB COMPONENT								
6	U23AL504	Data Exploration and Visualization	PCC	3	0	2	5	4
PRACTICAL								
7	U23AL511	Deep Learning Laboratory	PCC	0	0	4	4	2
8	U23AL512	Compiler Design Laboratory	PCC	0	0	4	4	2
8	U23EE517	Campus to Corporate - I	EEC	0	0	2	2	1
9	U23VECx5	Vocational Enhancement Training- V	VEC	0	0	2	2	1*
10	U23MC504	Entrepreneurship and Innovation	MC	2	0	0	2	NC
Total				**20**	**0**	**14**	**34**	**24**

SEMESTER-VI								
S.No.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PERIODS PER WEEK**			**TOTAL CONTACT PERIODS**	**CREDITS**
				L	**T**	**P**		
THEORY								
1	U23AL601	Natural Language Processing	PCC	3	0	0	3	3
2		Open Elective I	OEC	3	0	0	3	3
3		Professional Elective III	PEC	3	0	0	3	3
4		Professional Elective IV	PEC	3	0	0	3	3
5		Professional Elective V	PEC	3	0	0	3	3
THEORY WITH LAB COMPONENT								
6	U23AL602	Embedded Systems and IoT	PCC	3	0	2	5	4
PRACTICAL								
7	U23AL611	Natural Language Processing Laboratory	PCC	0	0	4	4	2
8	U23EE618	Campus to Corporate - II	EEC	0	0	2	2	1
9	U23VECx6	Vocational Enhancement Training- VI	VEC	0	0	2	2	1*
10	U23MC605	Intellectual Property Rights	MC	2	0	0	2	NC
Total				**20**	**0**	**10**	**30**	**22**

SEMESTER-VII								
S.No.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PERIODS PER WEEK**			**TOTAL CONTACT PERIODS**	**CREDITS**
				L	**T**	**P**		
THEORY								
1		Management Elective	HSMC	3	0	0	3	3
2		Professional Elective VI	PEC	3	0	0	3	3
3		Open Elective II	OEC	3	0	0	3	3
4		Open Elective III	OEC	3	0	0	3	3
5		Open Elective IV	OEC	3	0	0	3	3
PRACTICAL								
6	U23AL711	Mini Project / Internship cum Mini Project	EEC	0	0	4	4	2
Total				**15**	**0**	**4**	**19**	**17**

SEMESTER-VIII								
S.No.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**PERIODS PER WEEK**			**TOTAL CONTACT PERIODS**	**CREDITS**
				L	**T**	**P**		
PRACTICAL								
1	U23AL811	Project Work/ Internship cum Project Work	EEC	0	0	20	20	10
Total				0	0	20	20	10

Artificial Intelligence and Machine Learning - Batch 2024

Vertical I **Data Science**	**Vertical II** **Full Stack Development**	**Vertical III** **Cloud Computing and Data Center Technologies**	**Vertical IV** **Cyber Security and Data Privacy**	**Vertical V** **Emerging Technologies**	**Vertical VI** **Artificial Intelligence and Machine Learning**
Exploratory Data Analysis	Web Technologies	Cloud Computing	Ethical Hacking	Augmented Reality/Virtual Reality	Genetic Algorithms and its Applications
Recommender Systems	App Development	Virtualization	Digital and Mobile Forensics	Robotic Process Automation	Artificial Neural Networks
Neural Networks and Deep Learning	Cloud Services Management	Cloud Services Management	Social Network Security	Neural Networks and Deep Learning	Fuzzy logic and its Applications
Text and Speech Analysis	UI and UX Design	Data Warehousing	Modern Cryptography	Cyber security	Digital Image Processing
Business Analytics	Software Testing and Automation	Storage Technologies	Engineering Secure software systems	Quantum Computing	Statistical Machine Learning
Image and Video Analytics	Web Application Security	Software Defined Networks	Crypto currency andBlockchain Technologies	Crypto currency andBlockchain Technologies	Applied Machine Learning
Computer Vision	DevOps	Stream Processing	Network Security	Game Development	Computational Neuro Science
BigData Analytics	Principles of Programming Languages	Security and Privacy in Cloud	Security and Privacy in Cloud	3D Printing and Design	Intelligent Machining

OPEN ELECTIVE OFFERED BY AI&ML

MANAGEMENT ELECTIVE								
S.NO	COURSE CODE	COURSE NAME	CATEGORY	PERIODS PERWEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	U23ALO11	Introduction to Artificial Intelligence	OEC	3	0	0	3	3
2	U23ALO12	Introduction to Machine Learning	OEC	3	0	0	3	3
3	U23ALO13	Business Analytics	OEC	3	0	0	3	3

MANAGEMENT ELECTIVE								
S.NO	COURSE CODE	COURSE NAME	CATEGORY	PERIODS PERWEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	U23ALM01	Principles of Management	HSMC	3	0	0	3	3
2	U23ALM02	Total Quality Management	HSMC	3	0	0	3	3
3	U23ALM03	Human Resource Management	HSMC	3	0	0	3	3
4	U23ALM04	Knowledge Management	HSMC	3	0	0	3	3
5	U23ALM05	Industrial Management	HSMC	3	0	0	3	3

S.No.	Stream	I	II	III	IV	V	VI	VII	VIII	NIT	AICTE Norms	Anna University
1.	Humanities and Management Courses(HSMC)	5	3					3		11	12	12
2.	Basic Science Course (BSC)	12	7	4	4					27	24	25
3.	Engineering Science Course(ESC)	5	9	4						18	29	18
4.	Professional Core Course(PCC)			14	21	17	9			61	49	61
5.	Professional Elective Course(PEC)					6	9	3		18	18	18
6.	Open Elective Course(OEC)						3	9		12	12	12
7.	Employability Enhancement Course (EEC)	1	1	1	1	1	1	2	10	18	15	16
8.	Vocational Enhancement Course (VEC)	1	1	1	1					4*		
9.	Mandatory Course(MC)			✓	✓	✓	✓				Non Credit	
NIT		23	20	23	26	24	22	17	10	165		
AICTE		17.5	20.5	24	22	21	22	18	15		159	
Anna University		22	26	23.5	22	22	20.5	16	10			162

Vertical I

Data Science	
Course Code	**Course Name**
U23ALP11	Exploratory Data Analysis
U23ALP12	Recommender Systems
U23ALP13	Neural Networks and Deep Learning
U23ALP14	Text and Speech Analysis
U23ALP15	Business Analytics
U23ALP16	Image and Video Analytics
U23ALP17	Computer Vision
U23ALP18	BigData Analytics

Vertical II

Full Stack Development	
Course Code	**Course Name**
U23ALP21	Web Technologies
U23ALP22	App Development
U23ALP23	Cloud Services Management
U23ALP24	UI and UX Design
U23ALP25	Software Testing and Automation
U23ALP26	Web Application Security
U23ALP27	DevOps
U23ALP28	Principles of Programming Languages

Vertical III

Cloud Computing and Data Center Technologies	
Course Code	**Course Name**
U23ALP31	Cloud Computing
U23ALP32	Virtualization
U23ALP33	Cloud Services Management
U23ALP34	Data Warehousing
U23ALP35	Storage Technologies
U23ALP36	Software Defined Networks
U23ALP37	Stream Processing
U23ALP38	Security and Privacy in Cloud

Vertical IV

Cyber Security and Data Privacy	
Course Code	**Course Name**
U23ALP41	Ethical Hacking
U23ALP42	Digital and Mobile Forensics
U23ALP43	Social Network Security
U23ALP44	Modern Cryptography
U23ALP45	Engineering Secure software systems
U23ALP46	Crypto currency and Blockchain Technologies
U23ALP47	Network Security
U23ALP48	Security and Privacy in Cloud

Vertical V

Course Code	Course Name
U23ALP51	Augmented Reality/Virtual Reality
U23ALP52	Robotic Process Automation
U23ALP53	Neural Networks and Deep Learning
U23ALP54	Cyber security
U23ALP55	Quantum Computing
U23ALP56	Crypto currency andBlockchain Technologies
U23ALP57	Game Development
U23ALP58	3D Printing and Design

Vertical VI

Course Code	Course Name
U23ALP61	Genetic Algorithms and its Applications
U23ALP62	Artificial Neural Networks
U23ALP63	Fuzzy logic and its Applications
U23ALP64	Digital Image Processing
U23ALP65	Statistical Machine Learning
U23ALP66	Applied Machine Learning
U23ALP67	Computational Neuro Science
U23ALP68	Intelligent Machining

SEMESTERI					
U23EN101 **SDG: 4**	**ENGLISH FOR ENGINEERS** **(Common to all Branches)**	**Category:HSMC**			
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSEOBJECTIVE:

1. To enable learners of engineering and technology to develop their basic communication skills in English.
2. To acquire, command in both the respective skills (listening and reading) and the productive skills (writing and speaking) of the English language.
3. Tounderstandthekeyconceptsofvalues,lifeskillsandbusinesscommunicationand motivate students to look within and create a better version of themselves.
4. Tofocus onthedevelopmentofbasicfluencyinEnglish,usageofvocabularyinthetechnical field, and strengthening reading and official written communication skills.
5. Touselanguageefficientlyinexpressingtheiropinionsviavariousmedia.

UNIT 1	**INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION**	9

Listening– listening to Audio/video(formal& informal);Telephonic conversation (Activity) Speaking-Self Introduction; Introducing a friend (Activity);Conversation-politeness strategies; Reading - Reading brochures (technical context), telephone messages / social media messages relevant to technical contexts-Writing-Writing on self, Writing Definition; Jumbled sentence Grammar– Simplepresenttense,Presentcontinuous,Presentperfect,Presentperfectcontinuous; Question types: Wh/ Yes or No/ and Tags; Word formation, One-word substitution.

UNIT 2	**NARRATION AND SUMMATION**	9

Listening- Listening to the podcast, anecdotes/stories/event narration; documentaries and interviews with celebrities (Activity). Speaking-Narrating personal experiences/events; interviewing a celebrity (Activity). Reading- Reading biographies, travelogues, newspaper reports, Writing-GuidedWriting-Paragraphwriting,ShortReportonanevent(fieldtripetc.)-Grammar– Simple past tense, Past continuous, Past perfect, Past perfect continuous; Subject- Verb Agreement;Prepositions,Wordforms(prefixes&suffixes);ErrorCorrection.

UNIT 3	**DESCRIPTION OF PROCESS / PRODUCT**	9

Listening – Listening to specific audio tracks (Activity) Speaking – Picture description; giving instruction to use the product; presenting a product; Role play (Activity) -Reading – Reading advertisements, gadget reviews; finding key information from a given text- Writing - Instructions; Process description; Grammar-Simple future tense, Future continuous, Future perfect, Future Perfect continuous; Imperatives; Adjectives; Degrees of comparison; Compound Words.

UNIT 4	**CLASSIFICATIONANDRECOMMENDATIONS**	9

Listening–watching videos / documentaries and responding to the questions based on them, Scientific lectures; and educational videos. Speaking–Small Talk; Mini presentations (Activity)-Reading– Journal reports, predicting content of reading habits, Reading articles (Activity) -Writing

–Memos to colleagues or friends; Opinion Blogs; Grammar –Articles; Pronouns –Possessive & Relative pronouns, Cause and Effect.

UNIT 5	**EXPRESSION**	9

Listening – Listening to different accent, Listening to speeches or presentation- Speaking – Debates and Expressing opinions through Simulations, exchanging personal information -(Activity)- Reading – Reading editorials; Poster making (Activity)-Writing – Creative Writing, Checklist- Grammar – Punctuation; Compound Nouns, Homonyms; and Homophones, Simple, Compound &Complex Sentences.

COURSE OUTCOMES:

At the end of the course, students would

CO1: Listen and comprehend complex academic texts.

CO2: Understand the denotative and connotative meanings of technical texts.

CO3: Identify definitions, descriptions, narrations and essays on various topics.

CO4: Apply different methods of integration in solving practical problems.

CO5: Express their opinions effectively in both oral and written medium of communication.

TOTAL:45 PERIODS

TEXT BOOKS:

1. English for Engineers & Technologists Orient Blackswan Private Ltd. Department of English, Anna University (2020 edition).

2. English for Science& Technology Cambridge University Press, 2021. Authored by Dr.VeenaSelvam, Dr.Sujatha Priyadarshini, Dr.Deepa Mary Francis, Dr.KN.Shoba and Dr.Lourdes Joevani, Department of English, Anna University.

REFERENCES:

1. Technical Communication – Principles and Practices By Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2016, New Delhi.
2. A Course Book on Technical English by Lakshmi Narayanan, Scitech Publications (India) Pvt.Ltd.
3. EnglishforTechnicalCommunication(withCD)byAyshaViswamohan,Mc-grawHill Education, ISBN:0070264244.
4. EffectiveCommunicationSkill,KulbhusanKumar,RSSalaria,KhannaPublishingHouse.Learning to Communicate–Dr.V.Chellammal, Allied Publishing House, NewDelhi, 2003.

CO's-PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	1	1	-	3	1	-	2	-	-
CO2	-	-	-	-	-	1	1	-	3	-	-	2	-	-
CO3	-	-	-	-	-	1	1	-	3	2	-	3	-	-
CO4	-	-	-	-	-	1	2	-	3	1	-	2	-	-
CO5	-	-	-	-	-	1	2	-	3	2	-	3	-	-

Correlation levels: 1 – low 2 –medium 3 – high "-" – no correlation

U23MA101 SDG: 4	CALCULUS AND DIFFERENTIAL EQUATIONS (Common to all Branches)	Category:BSC			
		L	T	P	C
		3	1	0	4

COURSEOBJECTIVE:

1. To develop the use of matrix algebra techniques that is needed by engineers for practical applications.
2. To familiarize the students with differential calculus.
3. To enlighten the students with functions of several variables. This is needed in many branches of engineering.
4. To make the students acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.
5. To acquaint the students with mathematical tools needed in evaluating multiple integrals and their applications

UNIT 1	MATRICES	9+3

Characteristic equation– Eigen values and Eigen vectors of areal matrix– Properties of Eigen values and Eigen vectors (without proof)– Cayley – Hamilton theorem (Statement and applications only) - Orthogonal matrices – Orthogonal transformation of a symmetric matrix to diagonal form – Quadratic form – Nature of Quadratic forms - Reduction of quadratic form to canonical form by orthogonal transformation.

UNIT 2	DIFFERENTIAL CALCULUS	9+3

Representation of functions - Limit of a function - Continuity - Derivatives -Differentiation rules (sum, product, quotient, chain rules) - Implicit differentiation - Logarithmic differentiation - Applications: Maxima and Minima of functions of one variable.

UNIT 3	MULTI VARIABLE CALCULUS	9+3

Functions of two variables–Partial derivatives– Total differential–Taylor's series for functions of two variables– Jacobian's– Constrained maxima and minima– Lagrange's multiplier and its applications

UNIT 4	ORDINARY DIFFERENTIAL EQUATIONS OF SECOND ORDER	9+3

Linear differential equations of second order with constant coefficients. Linear differential Equations of second order with variable coefficients: Cauchy's linear differential equation –Method of variation of parameters for second order differential equations

UNIT 5	MULTIPLE INTEGRALS	9+3

Double integration with constant and variable limits - Region of integration - Area as double integral in Cartesian coordinates. Triple integral in Cartesian coordinates. Application of integration – Volume of Solids

COURSE OUTCOMES:

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

CO1: Comprehend the concepts of Eigen values, Eigen vectors, limits, continuity, functions of several variables, double integration and region of integration for solving complex problems.

CO2: Use rules of differentiation to solve maxima and minima problems.

CO3: Apply various techniques in solving ordinary and partial differential equations for practical applications.

CO4: Apply differential and integral calculus tools in modeling problems.
CO5: Evaluate integrals to compute area, volume and other practical problems.

TOTAL:45 PERIODS

TEXT BOOKS:

1. Grewal. B. S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition2018.
2. James Stewart, " Calculus: Early Transcendentals", Cengage Learning, 8th Edition, New Delhi,2015.
3. Kreyszig. E," Advanced Engineering Mathematics", John Wileyand Sons,10th Edition,Newdelhi,2016.

REFERENCES:

5. Bali. N., Goyal. M. and Watkins. C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009
6. Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New delhi,2016
7. Anton. H, Bivens. I and Davis.S,"Calculus",Wiley,10th Edition, 2016
8. Narayanan. S. and Manicavachagom Pillai. T. K., "Calculus" Volume I and II,S. Viswanathan Publishers Pvt. Ltd., Chennai, 2009.
9. Jain. R.K. and Iyengar .S. R. K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 5th Edition, 2016.
10. Srimanthapal and Bhunia. S. C, "Engineering Mathematics" Oxford University Press,2015

CO's-PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	1	1	3	-	-	-	-	-	-	-	-
CO2	3	3	1	-	-	3	-	-	-	-	-	-	-	-
CO3	3	3	2	-	1	3	-	-	-	-	-	-	-	-
CO4	3	3	3	-	-	3	-	-	-	-	-	-	-	-
CO5	3	3	2	1	-	3	-	-	-	-	-	-	-	-

Correlation levels: 1 – low 2 –medium 3 – high "-" – no correlation

U23PH101 SDG: 4	ENGINEERING PHYSICS (Common to CSE & IT)	Category: BSC			
		L	T	P	C
		3	0	0	3

COURSEOBJECTIVE:

1. Understand the basics of Properties of Matter and apply them to Engineering.
2. Explore the applications of Lasers and Fiber optics in engineering contexts.
3. ApplyprinciplesofUltrasonicsandThermalPhysicstoEngineeringchallenges.
4. GraspfoundationalQuantumPhysicsconceptsandtheirmodernapplications.
5. AnalyzeCrystalsystemsandtheirstructuresinEngineeringandTechnology.

UNIT 1	PROPERTIESOFMATTER	9

Elasticity–Stress-straindiagramanditsuses-Factorsaffectingelasticmodulus–Torsionalstress and deformations – Torsion pendulum: theory and experiment - Bending of beams- Bending moment – Cantilever: theory and experiment – Uniform and non-uniform bending: theory and experiment - I-shaped girders - Applications. – Basic Solved Problems.

UNIT 2	LASERANDFIBER OPTICS	9

Introduction – Principle of Spontaneous emission and stimulated emission. Population inversion, pumping-Einstein'sAandBcoefficients:derivation.Typesoflasers–Nd-YAG,CO_2-Industrial ApplicationsofLasers–FiberOptics:Principleandpropagationoflight–NumericalapertureandAcceptanceangle-Typesofoptical fibres (material,refractiveindex,mode)–Temperatureanddisplacementsensors.

UNIT 3	ULTRASONICSANDTHERMALPHYSICS	9

Introduction – Piezoelectric effect - piezoelectric generator - Velocity measurement – Acoustic grating – Ultrasonic Medical applications - Introduction to heat - Transfer of heat energy:Thermal conduction, convection and radiation –Thermal conductivity - Forbe's and Lee's disc method: theory and experiment – Applications: heat exchangers, refrigerators, ovens and solar water heaters.

UNIT 4	QUANTUMPHYSICS	9

Black body radiation – Planck's theory (derivation) – Deduction of Wien's displacement law and Rayleigh-Jeans'LawfromPlanck'stheory–Comptoneffect:TheoryandexperimentalverificationMatterwaves–Schrödinger'swaveequation:TimeindependentandtimedependentequationsPhysicalsignificanceofwave function–Particleinaone-dimensional box-Microscope:ScanningTunnellingmicroscope.

UNIT 5	CRYSTALPHYSICS	9

Lattice – Unit cell – Bravais lattice – Lattice planes – Miller indices – 'd' spacing in cubic lattice– Calculation of number of atoms per unit cell – Atomic radius – Coordination number – Packing factor forSC,BCC,FCCandHCPstructures–Diamondandgraphitestructures–Polymorphism and allotropy-Crystaldefects–Point,lineandsurfacedefects-Burger vector.

COURSE OUTCOMES:

At the end of the course, students would

CO1: Realize the fundamental engineering ideas of matter, optics, heat, sound, and quantum theory.

CO2: Demonstrate a solid understanding of fundamental matter properties , Laser and Fiber optics

classification , Quantum concepts and apply them successfully to solve practical engineering problems.

CO3: Apply the elastic modul ustheory,FiberOpticSensors,Ultrasonicsandthermalapplications to integrate knowledge and problem solve at an advanced level.

CO4: Categorize the Elastic moduli concepts, Fiber optic lasers and Crystal structures to implement in Engineer problems in Material Science and electronics.

CO5: AnalyzethefoundationalQuantumandCrystalPhysicsconceptstoimplementsolutions formodernengineeringproblems.

TOTAL:45 PERIODS

TEXT BOOKS:

1. Bhattacharya,D.K.&Poonam,T."EngineeringPhysics".OxfordUniversityPress,2015.
2. Gaur,R.K.&Gupta,S.L."EngineeringPhysics".DhanpatRaiPublishers,2012.
3. Pandey,B.K.&Chaturvedi,S."EngineeringPhysics".CengageLearningIndia,2012

REFERENCES:

11. Halliday,D.,Resnick,R.&Walker,J."PrinciplesofPhysics".Wiley,2015.
12. Serway, R.A. & Jewett, J.W. "Physics for Scientists and Engineers". Cengage Learning, 2010.
13. PalanisamyP.K.EngineeringPhysics.SCITECHPublications,2011.
14. Kittle,C,:IntroductiontosolidstatePhysics:,Wiley, 2005.
15. ManiP.EngineeringPhysics I.DhanamPublications, 2011.
16. SenthilkumarG.EngineeringPhysicsI.VRBPublishers,2011.

CO's-PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	-	1	-	1	-	-	1	-	1	-	-
CO2	3	3	1	-	1	-	1	-	1	-	-	1	-	-
CO3	3	3	1	-	1	-	1	-	1	-	-	1	-	-
CO4	3	2	1	-	1	-	-	-	-	1	-	1	-	-
CO5	3	3	1	-	-	-	1	-	1	-	-	1	-	-

Correlation levels: 1 – low 2 –medium 3 – high "-" – no correlation

U23CY101 SDG: 9	ENGINEERING CHEMISTRY (Common to all Branches)	Category: BSC			
		L	T	P	C
		3	0	0	3

COURSEOBJECTIVE:

1. Learn boiler feed water requirements, and water treatment techniques.
2. To acquire knowledge about the preparation, properties and applications of polymers.
3. Understand the basic concepts of electro chemistry and its applications.
4. Learn corrosion control and protective techniques.
5. Acquirethe knowledge aboutthefuelsandpropertiesofenergystorage devices.

UNIT 1	WATER TECHNOLOGY	9

Introduction - Sources of water - Impurities in water - Types of water –Hardness of water - Expression of hardness - Units of hardness - Estimation of hardness of water by EDTA method - Disadvantagesofusinghardwater-Boilertroubles-Scaleandsludge-Softeningofwater-External treatmentmethod-Demineralizationprocess-Internaltreatmentprocess–Carbonate, Phosphate and Calgon conditioning Desalination by reverse osmosis method.

UNIT 2	POLYMERS	9

Introduction: Classification of polymers – Natural and synthetic; Thermoplastic and Thermosetting. Functionality – Degree of polymerization. Types: Addition, condensation and copolymerization and mechanism of Addition polymerization (Free Radical); Techniques of polymerization: Bulk, emulsion, solution and suspension. Preparation, properties and uses of Nylon (6,6 and 11) and Epoxy resin. Engineering application of plastics- PVC, PTFE and Bakelite. Types of compounding
Of plastics- Moulding, injection moulding.

UNIT 3	ELECTROCHEMISTRY	9

Electrochemistry**:** Introduction-Cells-Representationofagalvaniccell-Reversibleandirreversible cells - Electrode potential - Nernst equation - Reference electrode (Calomel electrode) - Standard hydrogen electrode-Glass electrode-Electro chemical series and its applications –Battery: Introduction, Types of batteries-alkaline battery-lead storage battery-H_2-O_2 fuel cell- applications. Construction of solar cells and E-Vehicle.

UNIT 4	CORROSION AND ITS CONTROL	9

Introduction - Chemical corrosion and Wet corrosion - Galvanic and differential aeration (Pitting, Crevice and Pipeline) - Factors influencing rate of corrosion - Corrosion- causes- factors- corrosion control materials election and design aspects-electro chemical protection–sacrificial anode method and impressed current cathodic method-Cathodic protection method.

UNIT 5	FUELS AND COMBUSTION	9

Introduction - Classification of fuels - Requirements of a good fuel – Combustion: Principle of combustion-Calorificvalue-Grossandnetcalorificvalues-Explosiverange-Spontaneousignition temperature. Fuels: Solid fuels - Coal and its varieties - Proximate analysis - Significance – Metallurgical coke-Otto-Hoffman by product method- Liquid fuel: Manufacture of synthetic petrol-Bergius method- Knocking- Octane number-Cetane number- Gaseous fuel: Liquefied petroleum gas (LPG), Compressed natural gas (CNG).

COURSE OUTCOMES:

At the end of the course, students would

CO1: Recall the concept about water technology, engineering polymers, electrodes, corrosion and combustion of fuels.

CO2: Understand the boiler problems and categorize the polymers.

CO3: Classify plastics, batteries, corrosion, and the calorific value of fuels.

CO4: Apply enough knowledge of contemporary water softening, polymerization, fuel cell, electrochemical protection, and fuel manufacturing procedures.

CO5: Analyze the hardness of water using the EDTA technique and characterization of coal.

TOTAL:45 PERIODS

TEXT BOOKS:

1. Jain P C and Monica Jain, "Engineering Chemistry", 17th Edition, Dhanpat Rai Publishing Co., 2018.
2. Sivasankar B., "Engineering Chemistry", Tata Mc Graw-Hill Publishing Company Ltd, New Delhi, 2017.

REFERENCES:

17. B. S. Murty, P. Shankar, Baldev Raj, B. B. Rath and James Murday, "Textbook of nanoscience and nanotechnology", Universities Press-IIM Series in Metallurgy and Materials Science, 2018.
18. O.G.Palanna,"EngineeringChemistry"McGrawHillEducation(India)PrivateLimited,2nd Edition, 2017.
19. FriedrichEmich,"EngineeringChemistry",ScientificInternationalPvt,Ltd,NewDelhi,2017.
20. ShikhaAgarwal, "EngineeringChemistry-Fundamentalsand Applications",Cambridge University Press, Delhi, Second Edition, 2019.
21. R.D.Madan,"ModernInorganicChemistry",S.Chand,NewDelhi,2012
22. S.S.Dara,"ATextbook ofEngineeringChemistry",S.ChandPublishing,12th Edition, 2018.

CO's-PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	2	-	-	2	-	-	-	-	1	-	-
CO2	3	-	-	2	2	-	2	-	-	-	-	2	-	-
CO3	3	-	-	2	2	-	2	-	-	-	-	2	-	-
CO4	3	-	-	2	3	-	2	-	-	-	-	3	-	-
CO5	3	-	-	2	3	-	2	-	-	-	-	3	-	-

Correlation levels: 1 – low 2 –medium 3 – high "-" – no correlation

U23CS101 SDG: 8	C-PROGRAMMING (CommontoCSE&IT)	Category:ESC			
		L	T	P	C
		3	0	0	3

COURSEOBJECTIVE:

1. To acquire knowledge abouttheconceptofCprogramming,keywordsandoperators.
2. Toclassifythedatatypes,structureofCprogram, loopingstatements,arraysandstrings.
3. Toidentifythebasicsoffunctions,structures,nestedstructureandUnion.
4. Totheconceptofsearching,recursionandarrayofstructurewithdynamic memoryallocation
5. To defund the pointers, file fundamentals of sequential,randomaccess file and command line arguments.

UNIT 1	BASICSOFCPROGRAMMING	9

Introduction to Computer and programming paradigms – Applications of C Language - Structure ofCprogram-Cprogramming:DataTypes-Constants–EnumerationConstants-KeywordsOperators:PrecedenceandAssociativity-Expressions-Input/Outputstatements,Assignmentstatements –Decision making statements - Switch statement - Looping statements – Preprocessor directives -Compilation process.

UNIT 2	ARRAYSANDSTRINGS	9

IntroductiontoArrays:Declaration,Initialization–Onedimensionalarray–Twodimensional arrays-Stringoperations:length,compare,concatenate,copy–Selectionsort,linearandbinarysearch.

UNIT 3	FUNCTIONSANDPOINTERS	9

Modular programming - Function prototype, function definition, function call, Built-in functions (string functions, math functions) – Recursion, BinarySearch using recursive functions –Pointers –Pointeroperators–Pointerarithmetic–Arraysandpointers–Arrayofpointers–Parameterpassing:Passbyvalue,Passbyreference.

UNIT 4	STRUCTURESANDUNION	9

Structure-Nestedstructures–PointerandStructures–Arrayofstructures–Self-referential structures – Dynamic memory allocation - Union - Storage classes and Visibility.

UNIT 5	FILEPROCESSING	9

Files–Typesoffileprocessing:Sequentialaccess,Randomaccess–Sequentialaccessfile- Random access file-Command line arguments.

COURSE OUTCOMES:

Attheendofthecourse,students would

CO1: Remember the concept of C programming to understand the functionalknowledgeabout operators and the keywords used.

CO2: DemonstrateCprogramfordatatypes,looping&array.

CO3: Illustratethebasicsforfunctions,structures,pointersandunion.

CO4: Make use of the concept to perform the operations dynamic memory allocation, searching and recursion.

CO5: Examinethefileprocessingforsequential,randomaccessandcommandlinearguments.

TOTAL:45 PERIODS

TEXT BOOKS:

1. ReemaThareja,"ProgramminginC",OxfordUniversityPress,SecondEdition, 2016.
2. Kernighan, B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2015.

REFERENCES:

23. PaulDeitelandHarveyDeitel,"CHowtoProgramwithanIntroductiontoC++",Eighth edition, Pearson Education, 2018.
24. YashwantKanetkar, Let usC,17th Edition,BPBPublications,2020.
25. ByronS.Gottfried,"Schaum'sOutlineofTheoryandProblemsofProgrammingwithC", McGraw-Hill Education, 1996.
26. PradipDey, Manas Ghosh,"Computer Fundamentals andProgrammingin C",Second Edition, Oxford University Press, 2013.
27. Anita Goeland Ajay Mittal, "Computer Fundamentals and Programming in C", 1st Edition,Pearson Education, 2013

CO's-PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	2	-	2	-	-	-	2	-	-	2	1	2
CO2	2	2	2	-	2	-	-	-	2	-	-	3	2	2
CO3	3	3	2	-	2	-	-	-	2	-	-	2	2	2
CO4	2	2	2	-	3	-	-	-	2	-	-	3	2	2
CO5	2	3	3	-	2	-	-	-	2	-	-	2	2	3

Correlation levels: 1 – low 2 –medium 3 – high "-" – no correlation

U23HS101	HERITAGE OF TAMIL (Common to all Branches)	Category:HSMC			
		L	T	P	C
		1	0	0	1

COURSEOBJECTIVE:

1. To learn the extensive literature of classical Tamil.
2. To review the fine arts heritage of Tamil culture.
3. To realize the contribution in Indian freedom struggle

UNIT 1	LANGUAGE AND LITERATURE	3

Language Families in India - Dravidian Languages – Tamil as a Classical Language – Classical LiteratureinTamil–SecularNatureofSangamLiterature–DistributiveJusticeinSangamLiterature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land-BakthiLiteratureAzhwarsandNayanmars-FormsofminorPoetry-DevelopmentofModern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.

UNIT 2	HERITAGE-ROCKARTPAINTINGSTOMODERNART– 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 3	FOLK AND MARTIAL ARTS	3

Therukoothu,Karagattam,VilluPattu,KaniyanKoothu,Oyillattam,Leatherpuppetry,Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

UNIT 4	THINAI CONCEPT OF TAMILS	3

Flora and Fauna of Tamils &AhamandPuram 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 5	CONTRIBUTIONOFTAMILSTOINDIANNATIONAL MOVEMENT AND INDIAN CULTURE	3

Contribution of TamilstoIndianFreedomStruggle-TheCulturalInfluenceofTamilsovertheother parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.

COURSE OUTCOMES:

At the end of the course, students would

CO1: Remember the extensive literature of tamil and its classical nature, musical instruments, Folk, thinai concept, Indian Freedom Struggle& Aham, Puram and Aram Concept.

CO2: Remember the principles in Thirukural, Bakthi Literature Azhwars and Nayanmars , heritage of

sculpture, painting and musical instruments of ancient people, victory of chozha dynasty.

CO3: Understand on folk and martial arts of tamil people, Justice in Sangam Literature, Development of Modern literature in Tamil, Making of musical instruments.

CO4: Understand the role of Temples in Social and Economic Life of Tamils, Ancient Cities and Ports of Sangam Age, Conquest of Cholas.

CO5: Understand the Cultural Influence of Tamils over the other parts of India, contribution of Tamils self-esteem movement and siddha medicine, Print History of Tamil Books.

TOTAL:15 PERIODS

TEXT BOOKS:

1. தமிழ் வரலாறு – மக்கள் பண்பாடுகள் (வாய்ப்பாடு): தமிழகப் பாடல்கள் மற்றும் கலைப்பணிகள் கழகம்
2. கணினித்தமிழ் – பயன்பாடு மற்றும் இலக்கணம் (அடிப்படைப்பரிமாணம்)
3. தமிழ்மொழி வளர்ச்சி – நகரங்களின் உருவாக்கம்மற்றும்சங்ககாலநகரநாகரிகம் (வாய்ப்பாடு)

REFERENCES:

28. Social Life of Tamils (Dr. K. K. Pillay) A joint publication of TNTB & ESC and RMRL(in print)
29. Historical Heritage of the Tamils (Dr. S. V. Subaramanian, Dr. K. D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
30. The Contributions of the Tamils to Indian Culture (Dr. M. Valarmathi) (Published by: International Institute of Tamil Studies)
31. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
32. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text BookandEducationalServicesCorporation,TamilNadu)

CO's-PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	3	3	-	2	-	3	-	-
CO2	-	-	-	-	-	-	3	3	-	2	-	3	-	-
CO3	-	-	-	-	-	-	3	3	-	2	-	3	-	-
CO4	-	-	-	-	-	-	3	3	-	2	-	3	-	-
CO5	-	-	-	-	-	-	3	3	-	2	-	3	-	-

Correlation levels: 1 – low 2 –medium 3 – high "-" – no correlation

U23EE101 SDG: 17	CAREER ENHANCEMENT TRAINING (Common to all Branches)	L	T	P	C
		3	0	0	1

COURSEOBJECTIVE:

1. To improve mathematical and analytical abilities of students, particularly in the context of comprehendingengineering concepts and making data-driven decision.
2. To develop critical thinkings kills including problem solving, logic, patterns, and reasoning.
3. To Comprehend and appreciate mathematical terminologies and concepts in order to understand, interpret, and represent science and technology.

UNIT 1	**FUNDAMENTALS**	6
DivisibilityTest-SquarerootandCuberoots–HCF&LCM-problemsonNumbers		
UNIT 2	**ALGEBRA**	5
Simplification–Surds&Indices–Linear&QuadraticEquations		
UNIT 3	**BANKING ESSENTIALS**	8
Average–Percentage–Profit & Loss–Simple Interest–Compound Interest		
UNIT 4	**TIME AND EFFICIENCY**	8
Time Speed Distance–Problems on Trains–Boats & Streams–Time & Work–Pipes &Cisterns		
UNIT 5	**LOGICAL REASONING**	3
Number & letter series –Analogy–Pattern classification–Coding &Decoding		

COURSE OUTCOMES:

At the end of the course, students would

CO1: Exhibit a clear understanding of fundamental concepts of aptitude for engineering.

CO2: Demonstrate problem-solvingskillsandcriticalthinkingabilitiesinthecontextofrecruitment aptitude tests.

CO3: To use appropriate strategies and shortcuts to improve speed and accuracy in solving aptitude problems during recruitment processes.

CO4: Evaluate and interpret aptitude test results to identify areas of improvement and develop a personalized study plan for further enhancement.

TOTAL: 30 PERIODS

TEXT BOOKS:

1. The Pearson Guide to Quantitative Aptitude for Competitive Examinations, Dinesh Khattar. Pearson

2. QuantitativeAptitudeDr.R.S.AggarwalS.ChandPublication.

3. AmodernApproachtoVerbalandNon-VerbalReasoningR.s.Aggarwal.

REFERENCES:

33. Quantitative Aptitude for CAT, Arun Sharma.
34. Fast Track Objective Arithmetic, Rajesh Verma, Arihant Publication.
35. Quantitative Aptitude Quantum CAT Common Admission Tests for Admission into IIMs, Sarvesh K. Verma.
36. Effective Communication Skill, Kulbhusan Kumar, R S Salaria, Khanna Publishing House.
37. Wiley's Exam Expert Quantitative Ability for CAT,2ed, Ashu Jain.

CO's-PO's & PSO's MAPPING														
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	2	1	3	-	-	-	-	-	-	-	-	-	-
CO3	3	1	1	2	-	-	-	-	-	-	-	-	-	-
CO4	1	1	1	1	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Correlation levels: 1 – low 2 –medium 3 – high "-" – no correlation														

U23BS111 SDG:4	BASICSCIENCE LABORATORY	Category: BSC			
		L	T	P	C
		0	0	2	2

COURSEOBJECTIVE:

COURSEOBJECTIVE:

1. Realize the fundamental engineering ideas of matter, optics, heat, sound, and quantum theory.
2. Demonstrate a solid understanding of fundamental matter properties, Laser and Fiber optics classification, Quantum concepts and apply them successfully to solve practical engineering problems.
3. Apply the elastic modulus theory, Fiber Optic Sensors, Ultrasonics and thermal applications to integrate knowledge and problem solve at an advanced level.
4. Categorize the Elastic module concepts, Fiber optic lasers and Crystal structures to implement in Engineer problems in Material Science and electronics.
5. Analyse the foundational Quantum and Crystal Physics concepts to implement solutions for modern engineering problems.

PHYSICS-LISTOFEXPERIMENTS(Any5Experiments)

1. Determination of rigidity modulus–Torsionpendulum
2. Determination of Young's modulus-Nonuniform bendingmethod.
3. Determination of Young's modulus-Uniformbendingmethod.
4. Determination of thickness of a thin wire–Airwedgemethod.
5. Determination of the wavelengthofthelaserusinggrating.
6. Determination of NumericalApertureandacceptanceangleusing Opticalfibre.
7. Determination of velocityofsoundandcompressibilityofliquid–Ultrasonic interferometer.
8. Determination of thermalconductivityof abadconductor–Lee'sDisc method.
9. Melde'sstringexperiment.
10. Determination of Bandgapofasemiconductor.

CHEMISTRY- LISTOFEXPERIMENTS(Any5Experiments)

1. Estimation of total, temporary and permanent hardness of water by EDTA method.
2. Estimation of alkalinity of the given water sample.
3. Determination of chloride content of water sample by Argento metric method.
4. Determination of strength of given hydrochloride acid using pH meter
5. Determination of DO content of water sample by Winkler's method.
6. Conduct metric titration strong acid Vs Strong Base.
7. Estimation of BOD of the given water sample.
8. Estimation of iron content of the given solution using potentio meter.
9. Estimation of Iron content by spectrophotometer.
10. Estimation of sodium present in water using flame photometer.

COURSE OUTCOMES:

At the end of the course, students would

CO1: Apply Physics principles of elasticity to evaluate engineering properties of materials.
CO2: Analyze the physical principles involved in various instruments in acoustics, optics, and thermal physics.
CO3: Characterize the quality of water samples with respect to their acidity, alkalinity, and hardness.
CO4: Apply Chemistry principles to evaluate DO, BOD, and Iron content of the given samples.

CO5: Analyze the strength and amount of acids using pH meter, potentiometer, and conductivity meter, and determine the amount of chloride and sodium ions using Argentometric method and flame photometer for the given solution.

TOTAL:60 PERIODS

CO's-PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	-	-	1	-	1	-	-	-	-	-
CO2	3	2	1	1	-	-	1	-	1	-	-	1	-	-
CO3	3	2	1	1	-	-	1	-	1	-	-	-	-	-
CO4	3	2	1	1	-	-	1	-	1	-	-	1	-	-
CO5	3	2	-	1	-	-	1	-	1	-	-	1	-	-

Correlation levels: 1 – low 2 –medium 3 – high "-" – no correlation

U23EN111 SDG: 4	COMMUNICATIVE ENGLISH LABORATORY (Common to all Branches)	Category: HSMC			
		L	T	P	C
		0	0	2	1

COURSEOBJECTIVE:

1. To enable learners of engineering and technology to develop their basic communication skills in English.
2. To acquire command in both the receptive skills (listening and reading) and the productive skills (writing and speaking) of the English language.
3. To understand the key concepts of values, life skills, and business communication, and to motivate students to look within and create a better version of themselves.
4. To focus on the development of basic fluency in English, the usage of vocabulary in the technical field, and the strengthening of reading and official written communication skills.
5. To use language efficiently in expressing their opinions through various media.

LISTOFEXPERIMENTS

1. Conversation: Introduction to classmates – Audio/Video (formal & informal)
2. Self-Introduction
3. Telephone Conversation
4. Listening to voicemail & messages
5. Listening and filling a form
6. Debate
7. Group Discussion
8. Exchanging personal information
9. Introducing a friend – Politeness strategy
10. Essay Writing

COURSE OUTCOMES:

At the end of the course, students would

CO1: Improve the communicative competence of learners.

CO2: Use language effectively in academic and work contexts.

CO3: Develop various listening strategies to comprehend different types of audio materials such as lectures, discussions, and videos.

CO4: Build students' English language skills by engaging them in listening, speaking, and grammar learning activities relevant to authentic contexts.

CO5: Use language efficiently in expressing their opinions through various media. **TOTAL:30 PERIODS**

CO's-PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	1	1	1	-	-	2	-	2	2	2	2
CO2	3	2	2	2	1	1	-	-	2	-	2	2	3	3
CO3	3	2	3	2	1	2	-	-	2	-	2	2	2	2
CO4	3	2	2	2	1	2	-	-	3	-	2	3	3	3
CO5	3	2	3	1	1	2	-	-	3	-	2	3	2	3

Correlation levels: 1 – low 2 –medium 3 – high "-" – no correlation

U23CS111 SDG: 4	C-PROGRAMMING LABORATORY	Category: ESC			
		L	T	P	C
		0	0	4	2

COURSEOBJECTIVE:

1. To familiarize students with C programming constructs.
2. To develop programs in C using basic constructs.
3. To develop programs in C using arrays.
4. To develop applications in C using strings, pointers, and functions.
5. To develop applications in C using structures.
6. To develop applications in C using file processing.

LIST OF EXPERIMENTS

1. Writing algorithms, flowcharts, and pseudocodes for simple problems.
2. Programs on expressions and conversions.
3. Programs using `if`, `if-else`, `switch`, and nested `if` statements.
4. Programs using `while`, `do-while`, and `for` loops.
5. Programs on one-dimensional arrays, passing arrays to functions, and array operations.
6. Programs using two-dimensional arrays and passing 2D arrays to functions.
7. Programs using string functions.
8. Programs using function calls, recursion, and call by value.
9. Programs on pointer operators, call by reference, and pointers with arrays.
10. Programs using structures and unions.
11. Programs on file operations and file modes.
12. Working with text files, random access files, and binary files.

COURSE OUTCOMES:

At the end of the course, students would

CO1: Demonstrate knowledge of C programming constructs.
CO2: Develop programs in C using arrays.
CO3: Develop applications in C using strings, pointers, and functions.
CO4: Develop applications in C using structures.
CO5: Develop applications in C using file processing.

TOTAL:60 PERIODS

CO's-PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	1	1	1	-	-	2	-	2	2	2	2
CO2	3	2	2	2	1	1	-	-	2	-	2	2	3	3
CO3	3	2	3	2	1	2	-	-	2	-	2	2	2	2
CO4	3	2	2	2	1	2	-	-	3	-	2	3	3	3
CO5	3	2	3	1	1	2	-	-	3	-	2	3	2	3

Correlation levels: 1 – low 2 –medium 3 – high "-" – no correlation

SEMESTER II					
U23PH203 **SDG : 4**	**PHYSICS FOR INFORMATION SCIENCE (Common to CSE&IT)**	**Category: HSMC**			
		L	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSE OBJECTIVE:

1. Make the students understand the importance in studying electrical properties of materials.
2. Enable the students to gain knowledge in semiconductor physics.
3. Make the students learn the origin of magnetism in magnetic materials and their classifications; to learn the physics of superconductivity and various properties exhibited by superconductors.
4. Make the students learn the mechanisms of polarization in dielectric materials, and about classification and properties of dielectric materials; familiarize with the optical properties of materials.
5. Inculcate an idea of significance of nanostructures, quantum confinement, ensuing nanomaterials preparation and applications.

UNIT 1	**ELECTRICALPROPERTIESOFMATERIALS**	9

Introduction - Classical free electron theory - Expressions for Electrical and Thermal conductivity - Wiedemann-Franzlaw–LorentzNumber-Quantumfreeelectrontheory–Fermidistributionfunction – Effect of temperature on fermifunction-Density of energy states – Carrier concentration in metals - Electron effective mass- concept of hole.

UNIT 2	**SEMICONDUCTORPHYSICS**	9

Elementalandcompoundsemiconductors-Intrinsicsemiconductor–carrierconcentrationderivation – Fermi level – Variation of Fermi level with temperature – electrical conductivity – band gap determination – Extrinsic semiconductor - Derivation of carrier concentration in n-type and p-type semiconductor – variation of Fermi level with temperature and impurity concentration — Hall effect–Determination of Hall coefficient– Applications.

UNIT 3	**MAGNETISMANDSUPERCONDUCTIVITY**	9

Origin of magnetic moment – Bohr magneton – Comparison of Dia, Para and Ferro magnetism – Domaintheory–Hysteresis–softandhardmagneticmaterials–anti-ferromagneticmaterials–Ferrites and its applications. Superconductivity: properties – Type I and Type II superconductors – High Tc superconductors – Applications of superconductors – SQUID, cryotron, magnetic levitation.

UNIT 4	**DIELECTRICANDOPTICALPROPERTIESOFMATERIALS**	9

Electrical susceptibility – Dielectric constant – Electronic, ionic, orientational and space charge polarization – Frequency and temperature dependence of polarisation – Internal field – Claussius – Mosottirelation(derivation)–Dielectricloss-Lightabsorption-Luminescence,Phosphorsand WhiteLEDs-Birefringence,Dichroism-Electro-opticeffectandamplitudemodulators.

UNIT 5	**NANODEVICES**	9

Introduction - Quantum confinement – Quantum structures: quantum wells, wires and dots — Band gap of nano-materials - Classification of nanomaterials - Thin Film Growth, Ball Milling, Sol-Gel – Properties and applications – Carbon nanotubes: types and applications.

COURSE OUTCOMES:

At the end of the course,students would

CO1: Grasp the fundamental principles of classical and quantum mechanics, semiconductor physics, magnetic properties of materials, dielectric materials, superconducting materials, optical and nano materials and acquire insights into the essentials of emerging engineering materials.

CO2: Demonstrate a comprehensive understanding of classical and quantum mechanics, semiconductor physics, magnetic properties of materials, dielectric materials, and superconducting materials optical andnanomaterials,enablingtheadeptresolutionofpracticalengineeringchallenges.

CO3: Applythefoundationaltheoriesofclassicalandquantummechanics,semiconductorphysics,and the properties of magnetic, dielectric, superconducting materials, optical and nano materials to seamlessly integrate knowledge into diverse engineering applications.

CO4: Classify the semiconductor, magnetic, dielectric, and superconducting properties of materials, utilizingthissystematiccategorizationtoeffectively addressing ineeringproblemsinMaterialScience.

CO5: Analyze the foundational knowledge of conductors, semiconductors, magnetic, dielectric,superconducting materials, optical and nano materials to formulate and implement solutions for contemporary engineering issues.

TOTAL:45 PERIODS

TEXT BOOKS:

1. Arumugam.M.,MaterialsScience.Anuradhapublishers, 2010.
2. S.O.Kasap.PrinciplesofElectronicMaterialsandDevices,McGrawHillEducation(Indian Edition), 2020.
3. ThePhysicsandChemistryofNanoSolidsbyFrankJ.OwensandCharlesP.pooleJr,Wiley-Interscience,2006

REFERENCES:

1. Palanisamy, P. K. Materials Science. SCITECH Publishers, 2011.
2. Senthilkumar, G. Engineering Physics II. VRB Publishers, 2011.
3. W. Gaddand, D. Bernner, S. L. Solnki& G. J. Infrate (Eds). Handbook of Nanoscience, Engineering & Technology. CRC Press, 2002.
4. Charles Kittel. Introduction to Solid State Physics. Wiley India Edition, 2019.
5. Amnon Yariv & P. Yeh. Photonics: Optical Electronics in Modern Communications. Oxford University Press, 2007.
6. Nanostructure and Nanomaterials: Synthesis, Properties and Applications. Imperial College Press, 2004.

CO's-PO's & PSO's MAPPING														
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	-	1	-	-	-	-	1	-	-
CO2	3	2	-	-	1	-	1	-	-	-	-	-	-	-
CO3	3	2	1	-	1	-	1	-	-	1	-	1	-	-
CO4	3	2	1	-	1	-	1	-	-	1	-	1	-	-
CO5	3	2	1	-	1	-	1	-	-	1	-	1	-	-
Correlation levels: 1 – low 2 –medium 3 – high "-" – no correlation														

U23HS202	TAMILANDTECHNOLOGY	Category:HSMC			
		L	T	P	C
		1	0	0	1

COURSEOBJECTIVE:

1. To learn the extensive literature of classical Tamil.
2. To review the fine arts heritage of Tamil culture.
3. To realize the contribution in Indian freedom struggle.

UNIT 1	TAMILANDTECHNOLOGY	3

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.

UNIT 2	DESIGNANDCONSTRUCTIONTECHNOLOGY	3

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– SculpturesandTemplesofMamallapuram-GreatTemplesofCholasandotherworshipplaces-Temples ofNayakaPeriod-Typestudy(MaduraiMeenakshiTemple)-ThirumalaiNayakarMahal-ChettiNadu Houses,Indo–SaracenicarchitectureatMadrasduringBritish Period.

UNIT 3	MANUFACTURINGTECHNOLOGY	3

ArtofShipBuilding-Metallurgicalstudies-Ironindustry-Ironsmelting,steel-Copperandgold-Coins as source ofhistory - Minting of Coins – Beads making-industries Stonebeads -Glass beads - Terracotta beads-Shellbeads/bonebeats-Archeologicalevidences-GemstonetypesdescribedinSilappathikaram.

UNIT 4	AGRICULTUREANDIRRIGATIONTECHNOLOGY	3

Dam,Tank,ponds,Sluice,SignificanceofKumizhiThoompuofCholaPeriod,AnimalHusbandry-Wellsdesigned forcattleuse-AgricultureandAgroProcessing –KnowledgeofSea-Fisheries –Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.

UNIT 5	SCIENTIFICTAMIL&TAMILCOMPUTING	3

Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of TamilSoftware–TamilVirtualAcademy–TamilDigitalLibrary–OnlineTamilDictionaries–SorkuvaiProject.

COURSEOUTCOMES:

Attheendofthecourse,studentswould

CO1: UnderstandtheextensiveliteratureofTamilanditsclassicalnature (understand).

CO2: Understand the heritage of sculpture, painting and musical instruments of ancient people (understand).

CO3: ReviewonfolkandmartialartsofTamilpeople(understand).

CO4: Realizationofthinaiconcepts,tradeandvictoryofchozhadynasty(understand).

CO5: UnderstandthecontributionofTamilsinIndianfreedomstruggle,self-esteemmovementand siddha medicine (understand).

TOTAL:15 PERIODS

TEXT BOOKS:

1. தdழகவரலா – மக்க◌ம்பண்பா◌ம்– .கக.ககmள்ைள (வைaP◌): தdழ்நா◌பாட◌ல்மற்◌ம்கல்a◌யல்பணிகள்கழகம்.
2. கணினித்தdழ்–◌ளனவர்இல.Bந்தரம்.(aகடன்ரBரம்).
3. ◌ழ–ளவளகந◌க்களர◌ல்சங்ககாலநகரநாகரிகம்(வதால்aயல்Fைள(வைaP◌).

REFERENCES:

1. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
2. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
3. National The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: InterlInstitute of Tamil Studies).
4. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Departmentof Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu.
5. Porunai Civilization (Jointly Published by: Department of Archaeology& Tamil Nadu Text Book and
6. JourneyofCivilizationIndustoVaigai(R.Balakrishnan)(Publishedby:RMRL)–ReferenceBook.

CO's-PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	3	3	-	2	-	3	-	-
CO2	-	-	-	-	-	-	3	3	-	2	-	3	-	-
CO3	-	-	-	-	-	-	3	3	-	2	-	3	-	-
CO4	-	-	-	-	-	-	3	3	-	2	-	3	-	-
CO5	-	-	-	-	-	-	3	3	-	2	-	3	-	-

Correlation levels: 1 – low 2 –medium 3 – high "-" – no correlation

U23CS201 SDG:4	PYTHON PROGRAMMING AND PRACTICES	Category: H			
		L	T	P	C
		3	0	0	3

COURSE OBJECTIVE:

1. To understand and develop programs using Python.
2. To use the concepts of strings, control flow, data types in python programs.
3. To create programs using list,tuples,dictionaries,and files concept in Python.
4. To analyze image processing,net working and object-oriented programming in Python.
5. To create new ideas for proble msin real world application using python

UNIT 1	INTRODUCTION TO PYTHON PROGRAMMING	6

Introduction to Python Programming- Python Interpreter and Interactive Mode -Variables- Numerical types- Arithmetic operators and Expressions-Psuedo Code-Values and types:int,float, Boolean - Variables, Expressions, Statements -Illustrative Problems.

UNIT 2	DATA TYPES,CONTROL FLOW,STRINGS	8

Control Flow -conditional (if), Alternative (if-else), Chained conditional (if-else if-else)- Iteration: state, while, for, break, continue, pass - Strings: string slices, immutability, string functions and methods, string module, Regular expression, Pattern matching. - Illustrative Problems.

UNIT 3	LISTS,TUPLES DICTIONARIES AND FUNCTIONS	10

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists,list parameters- Tuples: tuple assignment, tuple as return value- Dictionaries: operations and methods, advanced list processing – list comprehension. Functions and User Defined Functions: Simple and Mathematical Built–in Functions, Recursion -Illustrative Problems.

UNIT 4	FILES AND OOPS CONCEPT IN PYTHON	10

Files, Text files, reading and writing files-format operator; Files and exception handling - Introduction to Object Oriented Programming – Basic principles of Object Oriented Programming in Python – Class Definition-Object Creation - Inheritance, Composition, Operator Overloading.

UNIT 5	IMAGE PROCESSING & NETWORKING WITH PYTHON AND APPLICATIONS	11

Basics of Image processing-Image File Formats–Introduction to Classic Image Processing Algorithm-Image Processing Tools-Fundamentals of Net working-Introduction to Python Sockets- Simple Client/Server Programming-Python Applications.

COURSE OUTCOMES:

At the end of the course,students would

CO1 : Explain the concepts of Python.

CO2 : Use appropriate construct store present data.

CO3 : Write programs using different constructs in Python.

CO4 : Develop real world applications in image processing and net working.

CO5 : Develop various simple programs for real world application using python.

TOTAL:45 PERIODS

TEXT BOOKS:

1. Python Programming for Beginners: Skyrocket Your Code and Master Python in Less than a Week.

2. Discover the Fool proof, Practical Route to Uncover Insider Hacks,Unlock New Opportunities, and Revolution Kindle Edition by Kit Jackson (Author), 31 May 20232.Introducing Python, 2nd Edition, by Bill Lubanovic, O'Reilly Media, Inc., 2019.

REFERENCES:

1. Python Programming for Beginners,ISBN-13-979-8870875248,Narry Prince, 2023.

2. Python Programming,West Mc Kinney,ISBN-13-979-8870534817,2023.

3. Python Quick Start Guide:The Simplified Beginner's Guide to Python Programming Using Hands-On Projects and Real-World Applications,by Robert Oliver,ISBN-13-978-163610037,2023.

4. Mastering Python Net working:Utilize Python packages and frame works for net work automation, monitoring, cloud, and management by Eric Chou,2023.

CO's-PO's&PSO'Smapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	-	1	-	-	-	-	-	1	1	-	3	1	1
CO2	2	-	1	-	-	-	-	-	1	1	-	3	1	1
CO3	2	-	1	-	-	-	-	-	1	1	-	3	1	1
CO4	2	3	1	-	3	-	-	1	1	1	3	3	1	1
CO5	2	3	1	1	3	-	-	1	3	1	3	3	1	1

Correlation levels: 1 – low 2 –medium 3 – high "-"-nocorrelation

U23PH203 SDG : 4	TECHNICAL ENGLISH	Category:HSMC			
		L	T	P	C
		2	0	0	2

COURSEOBJECTIVE:

1. Toimprovethecommunicativecompetenceof learners.
2. Tohelplearnersuselanguageeffectivelyinacademic/workcontexts.
3. Todevelopvariouslisteningstrategiestocomprehendvarioustypesofaudiomaterialslike lectures, discussions, videos, etc.
4. Tobuildonstudents'Englishlanguageskillsby engaging theminlistening,speaking,and grammar learning activities that are relevant to authentic contexts.
5. Touselanguageefficientlyinexpressingtheiropinionsviavariousmedia.

UNIT 1	INTRODUCTION OF FUNDAMENTALSOFCOMMUNICATION	6

Listening-conversation:Introductiontoclassmates-Audio/video(formal&informal),Speaking- making telephone calls-Self Introduction; Introducing a friend; - politeness strategies.

UNIT 2	NARRATIONANDSUMMATION	6

Listening-Listeningtopodcasts,anecdotes/stories/eventnarration;documentariesandinterviews withcelebrities.Speaking-Narratingpersonalexperiencesdescribingexperiencesandfeelings-Engaginginsmalltalk-describingrequirementsandabilities.

UNIT 3	DESCRIPTIONOFAPROCESS/PRODUCT	6

Listening-Listentoproductandprocessdescriptions;aclassroomlecture;andadvertisementsabout products. Speaking – Picture description- describing locations in workplaces- Giving instruction to use the product- explaining uses and purposes- Presenting a product.

UNIT 4	CLASSIFICATIONANDRECOMMENDATIONS	6

Listening–Listeningtolectures-andeducationalvideos.Speaking–Small Talk;discussing andmaking plans-talkingabouttasks-talkingaboutprogresstalkingabouttravelpreparations.

UNIT 5	EXPRESSION	6

Listening – Listening to debates/ discussions; panel discussions. Speaking –making predictions- talking about a given topic-giving opinions.

COURSE OUTCOMES:

At theendofthecourse,studentswould

CO1: Tolistenandcomprehendgeneralaswellascomplexacademicinformation

CO2: Tolistentoandunderstanddifferentpointsofviewinadiscussion.

CO3: Tospeakfluentlyandaccuratelyinformalandinformalcommunicativecontexts.

CO4: Todescribeproductsandprocessesandexplaintheirusesandpurposesclearlyandaccurately.

CO5: Toexpresstheiropinionseffectivelyinbothformalandinformaldiscussions.

TOTAL:45 PERIODS

TEXTBOOKS:

1. English for Engineers & Technologists, Orient Blackswan Private Ltd. Department of English, Anna University, 2020.
2. EnglishforScience&TechnologyCambridgeUniversityPress,2021.AuthoredbyDr.VeenaSelvam, Dr.SujathaPriyadarshini,Dr.DeepaMaryFrancis,Dr.KN.Shoba,andDr.LourdesJoevani,Department of English, Anna University.
3. AHandbookforEnglishLanguageLaboratories, E. Suresh Kumar, Department ofEnglish, Collegeof Engineering, Osmania University, P. Sreehari, Department of English, College of Engineering, Osmania University. 2011.

REFERENCES:

1. TechnicalCommunication–PrinciplesAndPracticesByMeenakshiRaman&SangeetaSharma, Oxford Univ. Press, 2016, New Delhi.
2. ACourseBookonTechnicalEnglishByLakshmiNarayanan,ScitechPublications(India)Pvt.Ltd.
3. English For Technical Communication (With CD) By AyshaViswamohanMcgraw Hill Education,ISBN : 0070264244.
4. EffectiveCommunicationSkill,KulbhusanKumar,RSSalaria,KhannaPublishingHouse.
5. LearningtoCommunicate–Dr.V.Chellammal,AlliedPublishingHouse,NewDelhi,2003.
6. AManualForEnglishLanguageLaboratory,D.SudhaRani,PearsonEducationIndia,2009.

CO's-PO's&PSO'sMAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	-	-	-	-	-	-	1	2	2	2	-	3	-	-
CO2	-	-	-	-	-	-	-	-	3	3	1	-	2	-
CO3	-	-	-	-	-	-	-	-	2	-	2	-	3	-
CO4	-	-	-	-	-	-	-	2	3	3	1	-	3	-
CO5	-	-	-	-	-	-	-	1	3	2	1	-	3	-

Correlation levels: 1 – low2 –medium 3 – high "-"-nocorrelation

U23CS203 SDG:4,12	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	Category:HSMC			
		L	T	P	C
		3	0	0	3

COURSEOBJECTIVE:

1. Tofamiliarizewithvariouslawsandtheoremstosolveelectricandelectronic circuits
2. Provide an overview on working principle of machines.
3. Exceltheconceptsofsemiconductordevices,op-ampsanddigital circuits

UNIT 1	DC CIRCUITS	7

Basic circuit elements and sources; Ohms law; Kirchhoff's laws; Series and Parallel connection of circuit elements; Mesh current analysis; Node voltage analysis; Theorems: Thevenin's, Maximum power transfer and Superposition theorem.

UNIT 2	AC CIRCUITS	8

Alternatingvoltagesandcurrents,RMS,average,maximumvalues,SinglePhaseRL,RC,RLCseries circuits, Power in AC circuits, Power Factor, Three phase balanced systems, Star and delta Connections, Electrical Safety, Fuses and Earthing.

UNIT 3	MAGNETIC CIRCUITS	7

Magneticfield;Toroidalcore:Fluxdensity,Fluxlinkage;Magneticcircuitwithairgap;Reluctance in series and parallel circuits; Self and mutual inductance; Transformer: turn ratio determination.

UNIT 4	DC MACHINES	8

Construction, working principle and applications of DC Machines, Transformers, Three phase Inductionmotors,synchronousgenerators,singlephaseinductionmotors,specialmachinesstepper motor,universalmotorandBLDCmotor

UNIT 5	D/A AND A/D CONVERTERS	7

Characteristics:PNjunctiondiode,Zenerdiode,BJT,MOSFET;Applications:Rectifier,Voltage regulator, Operational amplifier.

UNIT6	DIGITAL ELECTRONICS	8

Binaryarithmetic;Numberbaseconversion;Booleanalgebra:simplificationofBooleanfunctions using K-maps; Logic gates; Design of basic combinational circuits: adders, multiplexers, de- multiplexers.

COURSEOUTCOMES:

At the end of the course, students would

CO1: Recall and describe basic circuit elements, electrical sources, Ohm's Law, Kirchhoff's laws, Magneticfieldconcepts,Fluxdensity,Fluxlinkage,andSelf/Mutualinductanceprinciplesintoroidalcores.

CO2: Understandandexplaintheprinciplesofseriesandparallelconnections,electricalsafety mechanisms, Characteristics of semiconductor devices.

CO3: Illustratevarioustypesofelectricalmachinesandtheirapplications,aswellasBinaryarithmetic and Number base conversions.

CO4: ApplylawsandtheoremstoconstructDCcircuitparameters,andutilizeBooleanalgebraandK- maps to design digital circuits by simplifying Boolean functions.

CO5: AnalyzeACcircuitparameters,Magneticcircuits(includingairgapsandreluctance),turnsratios, and design adders, multiplexers, and de-multiplexers using logic gates.

TOTAL:45 PERIODS

TEXTBOOKS:

1. AllanR.Hambley,"ElectricalEngineering-Principles&Applications",2019,6th Edition, Pearson Education

2. V.D.Toro,Electrical EngineeringFundamentals,2nd edition.PHI,2014

REFERENCES:

1. DPKothari&Nagrath,"BasicElectricEngineering",2019,TataMcGrawHill

2. R.L.BoylestadandL.Nashelsky,ElectronicDevicesandCircuitTheory,11th edition. Pearson, 2012

WEB RESOURCES:

1. *https://onlinecourses.nptel.ac.in/noc22_ee113/preview*

2.*https://onlinecourses.nptel.ac.in/noc21_ee55/preview*

1. CO's-PO's & PSO's MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO1 2	PSO 1	PSO 2
CO1	3	2	-	-	-	-	-	-	-	-	-	1	1	-
CO2	3	1	-	-	-	1	-	-	-	-	-	1	-	1
CO3	3	1	-	-	-	-	-	-	-	-	-	1	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	1	-	-
CO5	3	3	2	-	-	-	-	-	-	-	-	1	1	-

Correlationlevels:1 –low 2 –medium 3– high "-"-nocorrelation

U23MA202	ADVANCED CALCULUS AND STATISTIS	Category:HSMC			
		L	T	P	C
		1	0	0	1

COURSEOBJECTIVE:

1. Familiarize the student withvectorcalculusideasinordertofindline,surfaceandvolumeintegrals in basic coordinate systems.
2. Understandanddemonstratebasicconclusionsbyusing Gauss, Stokes and Greens theorems.
3. Providetherequiredskilltoapplythestatisticaltools inengineeringproblems.
4. Learnthetheoryofhypothesistestingforboth smallaswellaslargesamples,whichisanessential skill for solving real life problems
5. Introducethebasicconceptsofclassificationsofdesignofexperimentswhichplaysveryimportant roles in the field of statistical quality control.

UNIT 1	VECTORDIFFERENTIALCALCULUS	3

Differentiation of Vectors– Scalar and Vector Point Functions–Gradient, divergence and curl– Directional derivative–Irrotational and Solenoidal vector fields– Application: Decision Review System in Cricket and Hit Distance Using Differentiation of Vectors.

UNIT 2	VECTORINTEGRALCALCULUS	3

Vectorintegration–Green'stheoreminaplane,GaussdivergencetheoremandStokes' theorem (excluding proofs). Simple applications involving cubes and rectangular parallelepipeds.

UNIT 3	CORRELATIONANDLINEARREGRESSION	3

Correlation–Karl Pearson's correlation coefficients–Spearman's Rank Correlation– Regression–Estimation of Regression line–Application: Measuring the influences between factors- Estimation of association among the variables.

UNIT 4	HYPOTHESISTESTING	3

Smallsampletests: Student-test-Singlemeananddifferenceoftwomeans–FTest for Variance - Chi square test for goodness of fit –Independence of attributes. Application: Performance analysis- Comparative analysis–Quality testing.

UNIT 5	DESIGNOFEXPERIMENTS	3

AnalysisofVariance:Onewayandtwo–wayClassifications-Completelyrandomized design– Randomizedblockdesign–Latinsquaredesign.Application:ResponseSurfaceMethodology.

COURSE OUTCOMES:

Attheendofthecourse,studentswould

CO1: Determinetheidentitiesthatlinkgrad,divandcurlinCartesianandotherbasiccoordinate systems

CO2: ApplytheGauss,StokesandGreenstheoremstostreamlineintegralcomputationsand demonstrate basic outcomes.

CO3: Compute correlation between variables and use regression to predict unknown values usingR- studio.

CO4 : Applytheideaofhypothesistestingforbothsmallandlargesamplesinpracticalproblems utilizing R- studio.

CO5: ConstructthedesignofexperimentsmodelingandanalysisofvarianceusingR-studio.**TOTAL:45 PERIODS**

TEXT BOOKS:

1. Erwin Kreyszig," Advanced Engineering Mathematics ", John Wileyand Sons, 10th Edition, New Delhi, 2016.
2. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 41st Edition,2011.
3. VeerarajanT.,Probability,StatisticsandRandomProcesses,TataMcGraw Hill,3rdedition, 2008.

CO's-PO's&PSO'Smapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	3	3	3	-	2	-	-	-	1	-	-	1	-	-
CO2	3	3	3	-	2	-	-	-	1	-	-	2	-	-
CO3	3	3	3	-	2	-	-	-	1	-	-	2	-	-
CO4	3	3	3	-	2	-	-	-	1	-	-	2	-	-
CO5	3	3	3	-	2	-	-	-	1	-	-	2	-	-

Correlationlevels: 1 – low 2 –medium 3 – high "-"-nocorrelation

SEMESTER III

CODE U23MA309 **DISCRETE MATHEMATICS FOR COMPUTING** **Category : PCC**

L	T	P	C
3	1	0	4

SDG: 9

COURSEOBJECTIVE:

1.To build problem solving skills by enhancing students logical and mathematical maturity
2. To acquire the knowledge of combinatorics
3. To gain the knowledge of graph theory and to solve the practical problems.
4. To familiarize the applications of algebraic structures.
5. To Understand the basic concepts in sets and relations

UNIT 1 LOGIC 12

Truth Tables, Tautology and Contradiction - Logical Equivalence: The Laws of Logic, Logical Implication, - Disjunctive and Conjunctive Normal Form. Application: Knowledge representation in artificial intelligence using Basic Connectives.

UNIT 2 COMBINATORICS 12

Mathematical induction – Strong induction and well ordering – The basics of counting – Permutations and combinations – Recurrence relations - Solving linear recurrence relations. Application : Pigeon hole principle.

UNIT 3 GRAPH THEORY 12

Graphs and graph models – Graph terminology and special type of graph – Matrix representation of graphs and graph isomorphism – Degree, Connectivity – Path – Cycle – Sub Graph, Isomorphism – Eulerian and Hamiltonian paths and circuits. Application: Map for Online Food Delivery System

UNIT 4 ALGEBRAIC STRUCTURES 12

Algebraic systems – Semi groups and monoids – Groups – Subgroups – Normal subgroup and cosets – Lagrange's theorem. Application: Error detection and encoding functions.

UNIT 5 SET THEORY AND LATTICES 12

Set theory – Operations and Laws of Sets - Cartesian Product, Binary Relation - Equivalence Relation - Partial ordering – Poset – Lattices as Posets – Hasse diagram. Application: Vehicle Model Catalogue

COURSE OUTCOMES*:*

At the end of the course, students would

CO1: Solve the problems using the concepts of sets, Truth Tables, counting techniques**,** properties of algebraic structures and graph network techniques to solve engineering problems.

CO2: Comprehend the concepts needed to test the relations, laws of logic, Strong induction, Groups and Properties of Graphs

CO3: Demonstrate the knowledge in functions, Logical Implication, Mathematical induction, Subgroups

and Graph Coloring

CO4: Analyze the concepts and Poset, Normal Form , Permutations and combinations, Normal subgroup and Eulerian and Hamiltonian paths and circuits

CO5: Apply and Analyze Hasse diagram, Rules of Inference, linear recurrence relations, Lagrange's theorem and Matrices of Graph Isomorphism **TOTAL:60 PERIODS**

TEXT BOOKS:

1. Rosen. K.H., "Discrete Mathematics and its Applications", 7th Edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2017.
2. Tremblay. J.P. and Manohar. R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Pub. Co. Ltd, New Delhi, 30th Reprint, 2011.
3. Venkatraman M.K, Sridharan. N and Chandrasekaran N. Discrete Mathematics, The National Publishing Company, Chennai, Fourth edition, 2014.

REFERENCES:

1. Grimaldi. R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", 5th Edition, Pearson Education Asia, Delhi, 2013.
2. Lipschutz. S. and Mark Lipson., "Discrete Mathematics", Schaum's Outlines, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 3rd Edition, 2010.
3. Koshy. T. "Discrete Mathematics with Applications", Elsevier Publications, 2006.
4. Kenneth. H. Rosen, Discrete Mathematics and its Applications, Tata McGraw Hill P.Co, New Delhi, Seventh Edition, 2014.
5. Bernard Kolman, Robert C. Busby, Sharan Cutler Ross, Discrete Mathematical Structures, Pearson Education Pvt Ltd ,New Delhi, Sixth Edition, 2013.

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	3	3	3	1	-	-	-	-	-	-	-	-	-	-
CO 2	3	3	3	1	-	-	-	-	-	-	-	-	-	-
CO 3	3	3	3	1	-	-	-	-	-	-	-	-	-	-
CO 4	3	3	3	1	-	-	-	-	-	-	-	-	-	-
CO 5	3	3	3	1	-	-	-	-	-	-	-	-	-	-

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

CODE: U23AL301 **DATA STRUCTURES AND ALGORITHMS** **Category : PCC**

L	T	P	C
3	0	0	3

SDG: 4

COURSEOBJECTIVE:

5. To get exposure to the various algorithm design and analysis techniques
6. To design linear data structures – lists, stacks, and queues
7. To implement Tree structures
8. To understand the graph structures
9. To introduce the concepts of searching, sorting and hashing

UNIT 1 INTRODUCTION TO ALGORITHMS AND ANALYSIS 9

Fundamentals of algorithm analysis, Space and time complexity of an algorithm, Types of asymptotic notations and orders of growth, Algorithm efficiency – best case, worst case, average case, Analysis of non-recursive and recursive algorithms, Asymptotic analysis for recurrence relation – Recursive Tree Method.

UNIT 2 LINEAR DATA STRUCTURES 9

List ADT – array-based implementations – linked list implementations – singly linked lists – circularly linked lists – doubly linked lists – Stack ADT – Queue ADT – double ended queues – applications

UNIT 3 NON– LINEAR DATA STRUCTURES – TREES 9

Tree Traversals – Binary Tree ADT – Expression trees – Applications of trees – Binary Search Tree ADT – Threaded Binary Trees – AVL Trees – B Tree – B+ Tree – Heap – Applications of heap.

UNIT 4 GRAPHS 9

Graph – basic definition and Terminology – Representation of Graph – Graph Traversal: Breadth First Search (BFS), Depth First Search (DFS) - Minimum Spanning Tree: Prim's, Kruskal's- Single Source Shortest Path: Dijkstra's Algorithm.

UNIT 5 SEARCHING AND SORTING 9

Searching: Linear Search – Binary Search – Sorting : Bubble Sort – Selection Sort – Insertion Sort – Shell Sort – Radix Sort – Hashing: Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing.

COURSE OUTCOMES:

At the end of the course, students would

CO1: Understand various algorithm design and analysis techniques [U]

CO2: Design, implement, and analyze linear data structures, such as lists, queues, and stacks, according to the needs of different applications [C]

CO3: Construct the efficient tree structures to meet requirements such as searching, indexing, and sorting [C]

CO4: Model problems as graph problems and implement efficient graph algorithms [A]

CO5: Implement various sorting, searching and hashing [A]

TOTAL:45 PERIODS

TEXT BOOKS

1. M.A.Weiss, Data Structures and Algorithm Analysis in C, Second Edition, Pearson Education, 2016.
2. Aaron M. Tenenbaum , Yedidyah Langsam, Moshe J. Augenstein, "Data Structures Using C",Pearson India, 2019.

REFERENCE BOOKS

1. R. F. Gilberg, B.A. Forouzan, "Data Structures: A Pseudocode approach with C", Second Edition, Cengage India, 2007.
2. A. V. Aho, J. E. Hopcroft, and J. D. Ullman, "Data Structures and Algorithms", Pearson India, 2009.

CO-PO MAPPING

CO	PO												PSO	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	2	3	1	2	2	-	-	-	-	-	-	-	2	1
2	1	2	1	2	1	-	-	-	-	-	-	-	2	2
3	2	3	1	2	2	-	-	-	-	-	-	-	2	1
4	2	1	1	1	2	-	-	-	-	-	-	-	2	3
5	1	2	1	2	2	-	-	-	-	-	-	-	2	2
Correlation levels:1 –low 2 – medium 3 – high "-"-no correlation														

CODE: U23IT301	**OBJECT ORIENTED PROGRAMMING USING JAVA**	**Category : PCC**			
		L	**T**	**P**	**C**
SDG: 4		**3**	**0**	**0**	**3**

COURSEOBJECTIVE:

1. To understand the Object Oriented Programming concepts
2. To implement Java program using methods and inheritance
3. To know the principles of packages, exception handling and interfaces.
4. To demonstrate the use of threads and I/O.
5. To familiarize students with GUI based application development and database connectivity.

UNIT 1 **INTRODUCTION TO OOP** **9**

Object Oriented Programming concepts - Features – Benefits of Object Oriented Methodology- Input and Output statements - Decision control and looping statements-Functions-Arrays-Classes and Objects-Memory allocation - Array of objects – Constructors - Destructors

UNIT 2 **OVERVIEW TO JAVA** **9**

Introduction to Java Programming –Features of Java- Classes and Objects - Arrays – Methods – Constructor - Access Specifier – Static members - Command Line Arguments - Strings Handling - Method Overloading– Method Overriding - Inheritance

UNIT 3 **PACKAGES , INTERFACES AND EXCEPTION HANDLING** **9**

Packages - Access Protection - Importing Packages – Interfaces - Exception Handling basics – Multiple catch Clauses- Nested try Statements – Java's Built-in Exceptions – User defined Exception

UNIT 4 **MULTITHREADING AND I/O** **9**

Java Thread Model - Creating a Thread –Creating Multiple Threads – Synchronization – Interthread Communication. Enumerations – Type Wrappers - Auto Boxing. I/O Basics - Reading and Writing Console I/O – PrintWriter Class - Reading and Writing Files..

UNIT 5 **EVENT HANDLING** **9**

Event Handling – Mechanisms - Event Classes –Action Event – Sources of Events - Event Listener Interfaces – Action Listener. AWT Fundamentals Introduction to Java Applets - Accessing Databases with JDBC –Case Study: ATM System, Payroll System.

COURSE OUTCOMES:

At the end of the course, students would

1. Understand the concepts of classes and objects [U]
2. Develop simple applications using JAVA programming paradigm [A]
3. Build applications making use of packages, interfaces and exception handling in Java [A]
4. Implement Java programs with multithreading and I/O streams [A]
5. Exhibit the functions of JAVA collections and JDBC [A]

TOTAL:45 PERIODS

TEXT BOOKS

1. ReemaThareja, "Object Oriented Programming with C++",Third Edition, Oxford University Press,New Delhi,2018 (UNIT 1)
2. Herbert Schildt, "Java: The Complete Reference", 12th Edition, McGraw Hill Education, New Delhi, 2021.(UNIT 2 to 5)

REFERENCE BOOKS

1. Buyya Rajkumar, Thamarai Selvi S. and Xing chen Chu, "Object Oriented Programming with Java Essentials and Applications",1st Edition, Tata McGraw Hill, New Delhi, 2009.
2. Deitel Paul and Deitel Harvey, "Java How to Program", 11th Edition, Pearson Education, New Delhi, 2018.
3. Cay S. Horstmann, "Core Java: Volume I Fundamentals", 11th Edition, Addison Wesley, New Delhi, 2019.

CO-PO MAPPING

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	2	1	1	2	-	-	-	-	-	-	-	3	2
2	3	2	1	2	1	-	-	-	-	-	-	-	3	2
3	3	2	1	2	2	-	-	-	-	-	-	-	3	2
4	3	2	1	2	2	-	-	-	-	-	-	-	3	2
5	3	2	1	3	2	-	-	-	-	-	-	-	3	2
Correlation levels:1 –low 2 – medium 3 – high "-"-no correlation														

COURSE DESIGNED BY	APPROVED BY
N.NASIYA NIWAZ BANU AP/AIML	Dr.S.Jothi Lakshmi / Head/ AIML
Name and Department	**Name and Department of BoS Chairman**

CODE: U23AL302 **DIGITAL PRINCIPLES AND COMPUTER ORGANIZATION** **Category : ESC**

L	T	P	C
3	0	2	4

SDG: 4

COURSEOBJECTIVE:

1. To analyze and design combinational circuits.
2. To analyze and design sequential circuits.
3. To understand the basic structure and operation of a digital computer.
4. To study the design of datapath unit, control unit for processor and to familiarize with the hazards.
5. To understand the concept of various memories and I/O interfacing.

UNIT 1 **COMBINATIONAL LOGIC** **9**

Combinational Circuits – Karnaugh Map - Analysis and Design Procedures – Binary Adder – Subtractor – Decimal Adder - Magnitude Comparator – Decoder – Encoder – Multiplexers - Demultiplexers

UNIT 2 **SYNCHRONOUS SEQUENTIAL LOGIC** **9**

Introduction to Sequential Circuits – Flip-Flops – operation and excitation tables, Triggering of FF, Analysis and design of clocked sequential circuits – Design – Moore/Mealy models, state minimization, state assignment, circuit implementation - Registers – Counters.

UNIT 3 **COMPUTER FUNDAMENTALS** **9**

Functional Units of a Digital Computer: Von Neumann Architecture – Operation and Operands of Computer Hardware Instruction – Instruction Set Architecture (ISA): Memory Location, Address and Operation – Instruction and Instruction Sequencing – Addressing Modes, Encoding ofMachine Instruction – Interaction between Assembly and High Level Language.

UNIT 4 **PROCESSOR** **9**

Instruction Execution – Building a Data Path – Designing a Control Unit – Hardwired Control, Microprogrammed Control – Pipelining – Data Hazard – Control Hazards.

UNIT 5 **MEMORY AND I/O** **9**

Memory Concepts and Hierarchy – Memory Management – Cache Memories: Mapping and Replacement Techniques – Virtual Memory – DMA – I/O – Accessing I/O: Parallel and Serial Interface – Interrupt I/O – Interconnection Standards: USB, SATA

COURSE OUTCOMES:

At the end of the course, students would

CO1: Design various combinational digital circuits using logic gates. [U]
CO2: Design sequential circuits and analyze the design procedures. [U]
CO3: State the fundamentals of computer systems and analyze the execution of an instruction. [U]
CO4: Analyze different types of control design and identify hazards. [A]
CO5: Identify the characteristics of various memory systems and I/O communication. [A]

TOTAL:45 PERIODS

PRACTICAL EXERCISES:

1. Verification of Boolean theorems using logic gates.
2. Design and implementation of combinational circuits using gates for arbitrary functions.
3. Implementation of 4-bit binary adder/ subtractor circuits.
4. Implementation of code converters.
5. Implementation of BCD adder, encoder, and decoder circuits.
6. Implementation of functions using multiplexers.
7. Implementation of the synchronous counters.
8. Implementation of a universal shift register.
9. Simulator-based study of computer architecture.

TEXT BOOKS

1. M. Morris Mano, Michael D. Ciletti, *Digital Design: With an Introduction to the Verilog HDL, VHDL, and System Verilog*, Sixth Edition, Pearson Education, 2018.
2. David A. Patterson, John L. Hennessy, *Computer Organization and Design: The Hardware/Software Interface*, Sixth Edition, Morgan Kaufmann/Elsevier, 2020.

REFERENCE BOOKS

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Naraig Manjikian, *Computer Organization and Embedded Systems*, Sixth Edition, Tata McGraw-Hill, 2012.
2. William Stallings, *Computer Organization and Architecture – Designing for Performance*, Tenth Edition, Pearson Education, 2016.
3. M. Morris Mano, *Digital Logic and Computer Design*, Pearson Education, 2016.

CO-PO MAPPING

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3	3	3	2	-	-	-	-	-	-	-	3	2
2	3	3	3	3	1	-	-	-	-	-	-	-	3	2
3	3	3	3	3	2	-	-	-	-	-	-	-	3	2
4	3	3	3	3	2	-	-	-	-	-	-	-	3	2
5	3	3	3	3	2	-	-	-	-	-	-	-	3	2
Correlation levels:1 –low 2 – medium 3 – high "-"-no correlation														

CODE: U23IT405 **FOUNDATIONS OF DATA SCIENCE** **Category : PCC**

L	T	P	C
3	0	2	4

SDG: 4

COURSEOBJECTIVE:

1. To understand the data science fundamentals and process.
2. To learn to describe the data for the data science process.
3. To learn to describe the relationship between data.
4. To utilize the Python libraries for Data Wrangling.
5. To present and interpret data using visualization libraries in Python.

UNIT 1 INTRODUCTION 9

Data Science: What is Data Science -Benefits and uses - -Data Science Process: Overview – Defining research goals – Retrieving data – Data preparation - Exploratory Data analysis – building the model– Prerequisites for a Data Scientist-Tools and Skills required-presenting findings and Building applications– Basics of NumPy Array

UNIT 2 DESCRIBING DATA 9

Types of Data-Types of Variables –Describing Data with Tables and Graphs–Describing Data with Averages - Describing Variability - Normal Distributions and Standard (z) Scores, Basics – Pandas data frames. Case Study: Population (Sample Size Estimating the statistics of given population).

UNIT 3 DESCRIBING RELATIONSHIPS 9

Correlation –Scatter plots –correlation coefficient for quantitative data –computational formula for correlation coefficient – Regression –regression line –least squares regression line – Standard error ofestimate – interpretation ofr2 –multiple regression equations –regression towards the mean. Case Study: Prediction Regression Methodologies with example.

UNIT 4 PYTHON LIBRARIES FOR DATA WRANGLING 9

Python for Data Science –Python Libraries – Data Frame Manipulation with numpy and pandas – Exploration Data Analysis – Time Series Dataset – Clustering with Python – Dimensionality Reduction. Python integrated Development Environments (IDE) for Data Science.

UNIT 5 DATA VISUALIZATION 9

Importing Matplotlib – Line plots – Scatter plots – visualizing errors – density and contour plots – Histograms – legends – colors – subplots – text and annotation – customization – three-dimensional plotting-Geographic Data with Basemap-Visualization with Seaborn. Case Study: Graph of Sine And Cosine function.

COURSE OUTCOMES:

At the end of the course, students would

CO1: Define the data science process. [U]
CO2: Understand different types of data descriptions for the data science process. [U]
CO3: Gain knowledge on relationships between data. [U]
CO4: Use the Python libraries for data wrangling. [A]

CO5: Apply visualization libraries in Python to interpret and explore data. [A]

TOTAL:45 PERIODS

PRACTICAL EXERCISES:

1. Download, install and explore the features of NumPy, SciPy, Jupyter, Stats models and Pandas packages.
2. Working with Numpy arrays
3. Working with Pandas data frames
4. Reading data from textfiles, Excel and the web and exploring various commands for doing descriptive analytics on the Iris data set.
5. Use the diabetes dataset from UCI and Pima Indians Diabetes dataset for performing the following:
   a. Univariate analysis: Frequency, Mean, Median, Mode, Variance, Standard Deviation, Skewness and Kurtosis.
   b. Bivariate analysis: Linear and logistic regression modeling
   c. Multiple Regression analysis.
   d. Also compare the results of the above analysis for the two data sets.
6. Apply and explore various plotting functions on UCI datasets.
   a. Normal curves
   b. Density and contour plots
   c. Correlation and scatter plots
   d. Histograms
   e. Three-dimensional plotting
7. Visualizing Geographic Data with Basemap.

TEXT BOOKS

1.David Cielen, Arno D. B. Meysman, and Mohamed Ali, "Introducing Data Science",ManningPublications, 2016. (Unit I)
2.RobertS.WitteandJohnS.Witte,"Statistics",EleventhEdition,WileyPublications,2017. (Units II and III)
3.JakeVanderPlas,"PythonDataScienceHandbook",O'Reilly,2016. (Units IVandV).

REFERENCE BOOKS

1. Allen B.Downey,"Think Stats: Exploratory Data Analysis in Python", GreenTea Press,2014.

CO-PO MAPPING

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	2	1	-	-	-	-	-	-	-	-	-	2	2
2	2	1	2	-	-	-	-	-	-	-	-	-	2	1
3	2	2	1	-	-	-	-	-	-	-	-	-	2	2
4	3	2	2	-	-	-	-	-	-	-	-	-	3	2
5	2	2	1	-	-	-	-	-	-	-	-	-	2	2
Correlation levels:1 –low 2 – medium 3 – high "-"-no correlation														

CODE: U23AL311 **Category: PCC**

SDG:4 & 8

DATA STRUCTURES LABORATORY

L	T	P	C
0	0	4	2

COURSE OBJECTIVE:

1. To introduce and learn about the concepts of linear data structures.
2. To introduce and learn about the concept of non-linear data structures.
3. To learn about the concept of the graph traversal structures.
4. To understand the concept of sorting and searching.
5. To get exposure on various algorithm design and analysis techniques.

LIST OF EXPERIMENTS

1. Program to implement Stack.
2. Program to implement Queue.
3. Singly linked list implementations.
4. Program to implement Infix to Postfix conversion using stack
5. Program to evaluate postfix evaluation using stack
6. Binary search tree implementations and its operations.
7. Breath first search implementation.
8. Depth first search implementation.
9. Selection sort implementation.
10. Graph representation and Traversal algorithms
11. Bubble sort implementation
12. Insertion sort implementation
13. Program to implement shell sort
14. Binary and Linear Search Implementations.
15. Mini Project.
    - Array & String Based (**Text Editor Features** → Implement undo/redo using stacks. **String Pattern Matching** → Naïve, KMP, Rabin-Karp comparison.)
    - Stack & Queue Based (Balanced Parentheses Checker → Stack-based validator, Infix to Postfix Converter → Evaluate postfix expressions, Job Scheduling Simulator → Implement Round Robin, FCFS, Priority (using Queues).
    - Linked List Based (**Music Playlist Manager** → Play next, previous, repeat (Doubly Linked List))
    - Tree & Graph Based (**Binary Search Tree Visualizer** → Insert, delete, traverse with visualization.)

COURSEOUTCOMES:

At the end of the course, students would

CO1: Design and implement linear data structures, such as lists, queues, and stacks, according to the needs of different applications.

CO2: Design and analyze tree structures and Heap.

CO3: Apply graph algorithms to solve problems and analyze their efficiency.

CO4: Critically analyze and implement various searching, sorting algorithms with its competence.

CO5: Develop the ability to design and implement efficient data structure-based solutions using arrays, strings, stacks, queues, linked lists, trees, and graphs for real-world applications.

TOTAL: 60 PERIODS

CO's-PO's&PSO'sMAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	2	1	-	-	-	1	-	2	3	2	3
CO2	3	2	3	2	2	-	-	-	2	-	2	2	1	2
CO3	3	3	2	2	3	-	-	-	2	-	1	2	2	3
CO4	3	3	2	2	1	-	-	-	1	-	2	3	1	2
CO5	3	3	2	2	1	-	-	-	1	-	2	3	2	1

Correlationlevels:1 –low 2 – medium 3 – high "-"-no correlation

CODE : U23AL312
SDG:4

JAVA PROGRAMMING LABORATORY

Category: PCC

L	T	P	C
0	0	4	2

COURSEOBJECTIVE:

1. TounderstandanddevelopprogramsusingJava,leveragingobject-orientedprogramming principles
2. To create and manage Java programs utilizing constructors, destructors, member functions, static members, and nested classes.
3. To use the concepts of classes, objects, inheritance, polymorphism, and function overloading in Java programs.
4. To handle exceptions and implement multithreading in Java for efficient and robust application development.
5. Toperformfileoperationsandimplementnetworkingusing Java,applyingrelevantclassesand Techniques for real-world applications.

LIST OFEXPERIMENTS

1. Develop simple Java programs using control statements and arrays
2. Demonstrate inheritance using Java programs
3. Develop Java applications using interfaces and packages
4. Demonstrate exception handling in Java
5. Develop multithreaded applications in Java
6. Develop programs in Java using java.io packages
7. Demonstrate string manipulation in Java
8. Develop applications in Java using collections classes
9. Design a GUI based simple application using AWT classes
10. Write a program to register students data using JDBC with MySQL Database
11. Mini Projects.
    a. **Student Record System** – Store, search, and update student details.
    b. **Library Management System** – Book issue/return and user management.
    c. **Simple Banking Application** – Deposit, withdraw, check balance.
    d. **Online Quiz System** – Multiple choice quiz with score calculation.
    e. **To-Do List Application** – Add, update, delete daily tasks.
    f. **Hotel Reservation System** – Room booking and availability check.
    g. **Currency Converter** – Convert between currencies using fixed rates.

COURSEOUTCOMES:

At the end of the course, students would

CO1: Explain the fundamental concepts of Object- Oriented Programming and Java, including key OOP principles and Java basics

CO2: Use appropriate Java constructs such as classes, objects, to represent and manage data.

CO3: Write Java programs incorporating control structures, arrays, inheritance, and polymorphism to solve complex problems.
CO4: Handle exceptions and implement exception handling, and multithreading in Java to develop efficient and robust applications.
CO5: Perform file operations and implement networking using Java to create practical, real-world applications.

TOTAL: 60 PERIODS

CO's-PO's&PSO'sMAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO12	PSO 1	PSO 2
CO1	2	1	1		2	-	-	-	-	1	-	-	3	-
CO2	2	1	1	1	2	-	-	-	-	1	-	-	3	-
CO3	2	1	1	1	2	-	-	-	-	1	-	-	3	-
CO4	2	1	1	1	2	-	-	-	-	1	-	-	3	-
CO5	2	1	1	1	2	-	-	-	-	1	-	-	3	-

Correlationlevels:1 –low 2 – medium 3 – high "-"-no correlation

SEMESTER IV					
U23MA410 **SDG:4**	**LINEAR ALGEBRA AND NUMBER THEORY (FOR CSE, IT,CYBER,AIML)**	**Category: BSC**			
		L	**T**	**P**	**C**
		3	**1**	**0**	**4**

COURSE OBJECTIVE:

- To understand the nature of the equation AX=B
- To understand postulates of vector spaces and linear transformations
- To comprehend the ideas behind inner product spaces.
- To gain knowledge on division algorithm and fundamental theorem of arithmetic
- To solve Diophantine equations

UNIT 1	**AX = B AND THE FOUR SUBSPACES**	**9 +3**

The Geometry of Linear equations: Linear combination – Dependence and Independence vectors – Basis and Dimension – Rank of a matrix – Elimination and Solving Ax=b in matrices: Gauss Elimination method – Gauss Jordan method – Inverse of a matrix using Gauss Jordan method

UNIT 2	**VECTOR SPACES**	**9 +3**

Vector spaces – Subspaces – Linear combination, span, linear independence and dependence – Null space, Column space and row space – Basis and dimension of a vector space – Rank and nullity. Application: Digital Image Enhancement Using Transformations

UNIT 3	**INNER PRODUCT SPACES**	**9 +3**

Inner product, length, angle and orthogonality – orthogonal sets – orthogonal projections – Inner product spaces – orthonormal basis; Gram-Schmidt process. Application: Designing the Movement of Robotic Arms

UNIT 4	**DIVISIBILITY THEORY AND CANONICAL DECOMPOSITIONS**	**9 +3**

Division algorithm — Base — b representations — Number patterns — Prime and composite numbers — GCD — Euclidean algorithm — Fundamental theorem of arithmetic — LCM.

UNIT 5	**DIOPHANTINE EQUATIONS AND CONGRUENCES**	**9 +3**

Linear Diophantine equations — Congruence?s — Linear Congruences — Applications: Divisibility tests — Modular exponentiation-Chinese remainder theorem — 2 x 2 linear systems.

COURSE OUTCOMES:

At the end of the course, students would

CO1: Determine the existence and uniqueness of solutions based on the properties of the matrix A and the vector b

CO2: Apply the concepts of basis and dimension to describe vector spaces and subspaces.

CO3: Apply the Gram-Schmidt process to orthogonalize sets of vectors.

CO4: Solve Linear Diophantine equations and apply the Fundamental Theorem of Arithmetic

CO5: Solve congruence andUtilize the Chinese Remainder Theorem for simultaneous congruences

TOTAL: 60 PERIODS

TEXT BOOKS:

1. Steven J. Leon., "Linear Algebra with Application" Ninth Edition, Pearson, 2015.
2. Gilbert Strang, Linear Algebra, 5th Edison, ANE Books, 2016.
3. Koshy .T-"Elementary Number Theory with Applications. Elsevier Publications, New Delhi,Second Edition, 2007.

REFERENCES:

1. Friedberg, A.H., Insel, A.J. and Spence, L., Linear Algebra‖, Prentice Hall of India, New Delhi, 2004.
2. David C.Lay., "Linear Algebra And Its Applications" 5th Edition, 2015.
3. Kumaresan, S., ―Linear Algebra – A Geometric Approach‖, Prentice – Hall of India, New Delhi, Reprint, 2010.
4. Bernard Kolman, Robert C. Busby, Sharan Cutler Ross, ―Discrete Mathematical Structures, sixth edition , Pearson Education Pvt Ltd., New Delhi, 2017.
5. Ralph.P.Grimaldi, ―Discrete and Combinatorial Mathematics: An Applied Introduction, Fifth Edition, Pearson Education Asia, New Delhi, Fifth Edition, 2019.

CO's-PO's & PSO's MAPPING

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2
CO1	3	3	3	2	-	-	-	-	-	-	-	2	-	-
CO2	3	3	3	2	-	-	-	-	-	-	-	2	-	-
CO3	3	3	3	2	-	-	-	-	-	-	-	2	-	-
CO4	3	3	3	2	-	-	-	-	-	-	-	2	-	-
CO5	3	3	3	2	-	-	-	-	-	-	-	2	-	-

Correlation levels: 1 – low 2 – medium 3 – high "-"- no correlation

U23AL401 **THEORY OF COMPUTATION** **Category : PCC**

L	T	P	C
3	0	0	3

COURSEOBJECTIVE:

1. To understand foundations of computation including automata theory
2. To construct models of regular expressions and languages
3. To design context-free grammar and pushdown automata
4. To understand Turing machines and their capability
5. To understand undecidability and NP class problems

UNIT 1 REGULAR EXPRESSIONS AND AUTOMATA THEORY 9

Need for automata theory - Introduction to formal proof – Finite Automata (FA) – Deterministic Finite Automata (DFA) – Non-deterministic Finite Automata (NFA) – Equivalence between NFA and DFA – Finite Automata with Epsilon transitions – Equivalence of NFA and DFA- Equivalenceof NFAs withandwithout ε-moves- ConversionofNFAinto DFA –Minimizationof DFAs.

UNIT 2 REGULAR EXPRESSIONS AND LANGUAGES 9

Regular expression – Regular Languages- Equivalence of Finite Automata and regularexpressions – Proving languages to be not regular (Pumping Lemma) – Closure properties of regular languages.

UNIT 3 PUSHDOWN AUTOMATA AND CONTEXT FREE GRAMMAR 9

Push Down Automata (PDA): Definition – Moves - Instantaneous descriptions -Languages of pushdown automata – Equivalence of pushdown automata and CFG-CFG to PDA-PDA to CFG – Deterministic Pushdown Automata.Types of Grammar - Chomsky‘s hierarchy of languages -Context-Free Grammar (CFG) and Languages – Derivations and Parse trees – Ambiguity in grammars and languages.

UNIT 4 NORMAL FORMS AND TURING MACHINES 9

Normal forms for CFG – Simplification of CFG- Chomsky Normal Form (CNF) and Greibach NormalForm (GNF) – Pumping lemmafor CFL – Closure properties of Context Free Languages – Turing Machine :Basic model – definition and representation – Instantaneous Description – Language acceptance by TM – TM as Computer of Integer functions – Programming techniques for Turing machines (subroutines).

UNIT 5 UNDECIDABILITY 9

Unsolvable Problems and Computable Functions –PCP-MPCP- Recursive and recursively enumerable languages – Properties - Universal Turing machine -Tractable and Intractable problems - P and NP completeness – Kruskal’s algorithm – Travelling Salesman Problem- 3-CNF SAT problems.

.

COURSE OUTCOMES:

At the end of the course, students would

CO1: Construct automata theory using Finite Automata
CO2: Write regular expressions for any pattern
CO3: Design context-free grammar and Pushdown Automata
CO4: Design Turing machine for computational functions
CO5: Differentiate between decidable and undecidable problems **TOTAL:45 PERIODS**

TEXT BOOKS

1. Hopcroft J.E., Motwani R. & Ullman J.D., "Introduction to Automata Theory, Languages and Computations", 3rd Edition, Pearson Education, 2008.
2. John C. Martin, "Introduction to Languages and the Theory of Computation", 4th Edition, Tata McGraw Hill, 2011

REFERENCE BOOKS

1. Harry R. Lewis and Christos H. Papadimitriou, "Elements of the Theory of Computation", 2nd Edition, Prentice Hall of India, 2015.
2. Peter Linz, "An Introduction to Formal Language and Automata", 6th Edition, Jones & Bartlett, 2016.
3. K. L. P. Mishra and N. Chandrasekaran, "Theory of Computer Science: Automata, Languages and Computation", 3rd Edition, Prentice Hall of India, 2006.

CO-PO MAPPING

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	2	1	2	1	3	-	1	-	-	-	1	3	3
2	2	2	3	3	3	3	-	1	-	-	-	1	3	3
3	2	2	3	3	3	3	-	1	-	-	-	1	3	3
4	2	3	3	2	1	3	-	1	-	-	-	1	3	3
5	2	3	3	2	1	3	-	1	-	-	-	1	3	3
Correlation levels:1 –low 2 – medium 3 – high "-"-no correlation														

CODE U23AL402 **ARTIFICIAL INTELLIGENCE** **Category : PCC**

L	T	P	C
3	0	0	3

SDG: 4

COURSEOBJECTIVE:

1. Learn the basic AI approaches
2. Develop problem solving agents
3. Perform logical and probabilistic reasoning

UNIT 1 **INTELLIGENTAGENTS** **9**

Introduction to AI – Agents and Environments – concept of rationality – nature of environments – structure of agents. Problem solving agents – search algorithms – uninformed search strategies.

UNIT 2 **PROBLEMSOLVING** **9**

Heuristic search strategies – heuristic functions. Local search and optimization problems – local search in continuous space – search with non-deterministic actions – search in partially observable environments – online search agents and unknown environments.

UNIT 3 **GAMEPLAYINGAND CSP** **9**

Game theory – optimal decisions in games – alpha-beta search – monte-carlo tree search – stochastic games – partially observable games. Constraint satisfaction problems – constraint propagation – backtracking search for CSP – local search for CSP – structure of CSP.

UNIT 4 **LOGICALREASONING 9**

Knowledge-based agents – propositional logic – propositional theorem proving – propositional model checking – agents based on propositional logic. First-order logic – syntax and semantics – knowledge representation and engineering – inferences in first-order logic – forward chaining – backward chaining – resolution

UNIT 5 **PROBABILISTICREASONING 9**

Acting under uncertainty – Bayesian inference – naïve Bayes models. Probabilistic reasoning – Bayesian networks – exact inference in BN – approximate inference in BN – causal networks.

COURSE OUTCOMES:

At the end of the course, students would

CO1: Explain intelligent agent frameworks

CO2: Apply problem solving techniques

CO3: Apply game playing and CSP techniques

CO4: :Perform logical reasoning

CO5: Perform probabilistic reasoning under uncertainty

TOTAL:45 PERIODS

TEXT BOOKS

1. StuartRussellandPeterNorvig,“ArtificialIntelligence –AModernApproach”,Fourth Edition, Pearson Education, 2021.

REFERENCE BOOKS

1. DanW.Patterson,“IntroductiontoAIandES”,PearsonEducation,2007
2. KevinNight,ElaineRich,andNairB.,“ArtificialIntelligence”,McGrawHill,2008
3. PatrickH.Winston,"ArtificialIntelligence",ThirdEdition,PearsonEducation,2006
4. DeepakKhemani,“ArtificialIntelligence”,TataMcGrawHillEducation,2013
5. http://nptel.ac.in/

CO-PO MAPPING

CO	PO												PSO	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
1	2	2	1	2	1	3	-	1	-	-	-	1	3	3
2	2	2	3	3	3	3	-	1	-	-	-	1	3	3
3	2	2	3	3	3	3	-	1	-	-	-	1	3	3
4	2	3	3	2	1	3	-	1	-	-	-	1	3	3
5	2	3	3	2	1	3	-	1	-	-	-	1	3	3
Correlation levels:1 –low 2 – medium 3 – high “-“-no correlation														

CODE U23AL403 **MACHINE LEARNING** **Category : PCC**

L	T	P	C
3	0	0	3

SDG: 4

COURSEOBJECTIVE:

1. To understand the basic concepts of machine learning.
2. To understand and build supervised learning models.
3. To understand and build unsupervised learning models.
4. To evaluate the algorithms based on corresponding metrics identified.

+

UNIT 1 **INTRODUCTION TO MACHINE LEARNING** **8**

FReview of Linear Algebra for machine learning; Introduction and motivation for machine learning; Examples of machine learning applications, Vapnik- Chervonenkis (VC) dimension, Probably Approximately Correct (PAC) learning, Hypothesis spaces, Inductive bias, Generalization, Bias variance trade-off.

UNIT 2 **SUPERVISED LEARNING** **11**

Linear Regression Models: Least squares, single & multiple variables, Bayesian linear regression, gradient descent, Linear Classification Models: Discriminant function – Perceptron algorithm, Probabilistic discriminative model - Logistic regression, Probabilistic generative model – Naive Bayes, Maximum margin classifier – Support vector machine, Decision Tree, Random Forests

UNIT 3 **ENSEMBLE TECHNIQUES AND UNSUPERVISED LEARNING** **9**

Combining multiple learners: Model combination schemes, Voting, Ensemble Learning - bagging, boosting, stacking, Unsupervised learning: K-means, Instance Based Learning: KNN, Gaussian mixture models and Expectation maximization.

UNIT 4 **NEURAL NETWORKS** **9**

Multilayer perceptron, activation functions, network training – gradient descent optimization – stochastic gradient descent, error back propagation, from shallow networks to deep networks –Unit saturation (aka the vanishing gradient problem) – ReLU, hyper parameter tuning, batch normalization, regularization, dropout.

UNIT 5 **DESIGN AND ANALYSIS OF MACHINE LEARNING EXPERIMENTS** **8**

Guidelines for machine learning experiments, Cross Validation (CV) and resampling – K-fold CV, bootstrapping, measuring classifier performance, assessing a single classification algorithm and comparing two classification algorithms – *t* test, McNemar's test, K-fold CV paired *t* test

COURSE OUTCOMES:

At the end of the course, students would

CO1: Explain the basic concepts of machine learning.
CO2: Construct supervised learning models.
CO3: Construct unsupervised learning algorithms.

CO4: Evaluate and compare different models.

TOTAL:45 PERIODS

TEXT BOOKS

1. 1. EthemAlpaydin,"IntroductiontoMachineLearning",MITPress,FourthEdition,2020.
2. StephenMarsland,"MachineLearning:AnAlgorithmicPerspective,"SecondEdition", CRC Press, 2014.

REFERENCE BOOKS

1. 1ChristopherM.Bishop,"PatternRecognitionandMachineLearning",Springer,2006.
2. TomMitchell,"MachineLearning",McGrawHill,3rdEdition,1997.
3. MehryarMohri,AfshinRostamizadeh,AmeetTalwalkar,"FoundationsofMachine Learning", Second Edition, MIT Press, ~~2012~~, 2018.
4. IanGoodfellow,YoshuaBengio,AaronCourville,"DeepLearning",MITPress,2016
5. SebastainRaschka,VahidMirjalili,"PythonMachineLearning",Packtpublishing3rd Edition, 2019.

CO-PO MAPPING

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	2	2	1	2	1	3	-	1	-	-	-	1	3	3
2	2	2	3	2	1	3	-	1	-	-	-	1	3	3
3	2	2	3	2	1	3	-	1	-	-	-	1	3	3
4	2	3	3	2	3	3	-	1	-	-	-	1	3	3
5	2	2	3	2	2	3	-	1	-	-	-	1	3	3
Correlation levels:1 –low 2 – medium 3 – high "-"-no correlation														

CODE U23AL404 **OPERATING SYSTEMS** **Category : PCC**

L	T	P	C
3	0	0	3

SDG: 4

COURSEOBJECTIVE:

1. To understand the basics and functions of operating systems.
2. To study processes, threads and scheduling algorithms.
3. To impart the concept of process synchronization and handling deadlocks.
4. To analyze various memory management schemes.
5. To be familiar with I/O management and file systems

UNIT 1 OPERATING SYSTEM OVERVIEW 7

Introduction – Computer System Organization – Computer System Architecture – Operations – Resource Management – Security and Protection – Virtualization – Computing Environments. Operating Systems Structures: Services – User and OS Interface – System Calls –System program– Operating system Structure – Building and Booting OS.

UNIT 2 PROCESS AND THREAD MANAGEMENT BASICS 8

Process Concept, Process Scheduling, Operations on Processes, Interprocess Communication – IPC in Shared Memory and Message Passing Systems. Threads: Overview - Multicore Programming - Multithreading Models. CPU Scheduling: Scheduling Criteria – Scheduling Algorithms.

UNIT 3 PROCESS SYNCHRONIZATION 10

Critical Section Problem – Mutex Locks – Semaphores – Monitors. Deadlocks: Deadlock Characterization – Methods for handling deadlocks – Deadlock Prevention and Avoidance – Deadlock Detection – Recovery from Deadlock.

UNIT 4 MEMORY MANAGEMENT 10

Main Memory – Background – Contiguous Memory Allocation – Paging – Segmentation – Structure of the page table – Swapping. Virtual Memory: Background – Demand Paging – Page Replacement – Thrashing.

UNIT 5 STORAGE MANAGEMENT10

Mass Storage Structure – Overview – HDD Scheduling – File System: File Concept – Access Methods – Directory Structure – Protection – File System Implementation – File System Structure-File System Operations – Directory Implementation – Allocation Methods – Free Space Management – Case study: Linux System, Mobile OS – iOS and Android.

COURSE OUTCOMES:

At the end of the course, students would

CO1: Understand various operating system structure, services and system calls [U]
CO2: Demonstrate various process scheduling algorithms and describe multithreading models [U]
CO3: Apply different methods for process synchronization and for handling deadlocks [A]
CO4:Categorize memory management strategies and demonstrate various page replacement [AN]
CO5: Distinguish the features of file systems and apply various disk scheduling algorithms [AN]

TOTAL:45 PERIODS

PRACTICAL EXERCISES:

1. Study of Basic LINUX commands and its uses
2. Implementation of UNIX System calls used in Process Management: fork, exec, getpid, exit, wait, close, stat.
3. Shell programming using operators and decision making statements for pattern generation, simulating arithmetic calculator and printing number series.
4. Write C programs to implement the various CPU Scheduling Algorithms
5. Illustrate the inter process communication strategy
6. Implement mutual exclusion by Semaphore
7. Write C programs to avoid Deadlock using Banker's Algorithm
8. Write a C program to Implement Deadlock Detection Algorithm
9. Write C program to implement Threading
10. Write C programs to implement the various Page Replacement Algorithms
11. Write C programs to implement the following Memory Allocation Methods
    a. First Fit b. Worst Fit c. Best Fit
12. Implement the following File Allocation Strategies using C programs
    a. Sequential b. Indexed c. Linked

TEXT BOOKS

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”‖, 10th Edition, John Wiley and Sons Inc., 2018.
2. Andrew S Tanenbaum, "Modern Operating Systems", Pearson, 5th Edition, 2022 New Delhi.

REFERENCE BOOKS

1.Ramaz Elmasri, A. Gil Carrick, David Levine, “Operating Systems – A Spiral Approach”, Tata McGraw Hill Edition, 2010.
2. William Stallings, "Operating Systems: Internals and Design Principles", 7th Edition, Prentice Hall, 2018.
3. Achyut S.Godbole, Atul Kahate, “Operating Systems”, McGraw Hill Education, 2016. Contact

CO-PO MAPPING

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	1	2	2	-	-	-	-	3	2	3	1	3	1

2	2	3	3	1	1	-	-	-	2	1	1	2	3	3
3	1	3	2	2	1	-	-	-	2	2	1	1	3	1
4	1	3	3	3	-	-	-	-	1	2	1	2	3	1
5	3	1	2	1	1	-	-	-	3	2	3	2	3	3
Correlation levels:1 –low 2 – medium 3 – high "-"-no correlation														

CODE U23AL405 **DATABASE DESIGN AND MANAGEMENT** **Category : PCC**

L	T	P	C
3	0	2	4

SDG: 4

COURSEOBJECTIVE:

10. To understand the objective of a database management system
11. To facilitate the creation of data structures and SQL queries
12. To understand the internal storage structures using different file and indexing techniques
13. To learn the basics of transaction processing
14. To gain knowledge on concurrency control techniques

UNIT 1 DATA MODELS AND RELATIONAL MODE 8

Introduction–Database System Applications–Purpose of database systems – View of data – Database Languages – Relational Databases– Database Architecture – Database Users and administrators - Relational Model – Structure of Relational Databases – Database Schema – Keys – Schema Diagrams – Relational Query Languages - Relational Operations- Relational Algebra

UNIT 2 SQL AND DATABASE DESIGN 10

Database Design - E-R model- Constraints – ER diagrams – Reduction to Relational Schema – ER design issues. SQL: Basic structure – Operations –Aggregate Functions –Sub queries - Nested Sub queries - Intermediate SQL: Joins – views– Index – Integrity Constraints– SQL data types and schemas – Authorization.

UNIT 3 RELATIONAL DATABASE DESIGN 9

Features of good relational designs- Functional dependency theory - Decomposition using functional dependencies–Algorithms for decomposition. Normal Forms: 1NF, 2NF, 3NF, BCNF, 4NF, 5NF–Data Storage: RAID – Tertiary storage - File Organization – Organization of Records in Files – Data dictionary storage.

UNIT 4 INDEXING, HASHING AND TRANSACTIONS 9

Ordered indices– B trees - B+ Tree index files–Multiple key access - Static and Dynamic Hashing – Bitmap indices. Overview of Query Processing- Transaction concept–Transaction model–Storage structure–Transaction atomicity and durability – Isolation – Serializability.

UNIT 5 CONCURRENCY CONTROL AND RECOVERY SYSTEM 9

Lock-based Protocols - Deadlock Handling – Multiple Granularity – Timestamp and Validation Based Protocols - Failure classification – Storage – Recovery and atomicity – Algorithm – Buffer management – Failure with loss of nonvolatile storage

COURSE OUTCOMES:

At the end of the course, students would

CO1: Outline the features, architecture and applications of database system [A]

CO2: Design an ER model and use relational database with SQL statements [A]

CO3: Design relational database using normalization methods [A]

CO4: Apply indexing and hashing techniques in relational database, and perform transaction processing [A]

CO5: Apply the concepts of concurrency control and recovery in a relational database [A]

TOTAL:45 PERIODS

TEXT BOOKS

. 1.Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Seventh Edition, McGraw Hill, 2020.

. 2.Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson Education, 2017.

. **REFERENCE BOOKS**

. 1.Carlos Coronel and Steven Morris, Database System Design and Implementation, cennage learning, 11th edition, 2013.

. 2.Date C.J., Kannan A. and Swamynathan S., "An Introduction to Database Systems", 8th Edition, Pearson Education, New Delhi, 2006.

CO-PO MAPPING

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	2	1	2	2	-	-	-	1	1	1	2	2	2	1
2	2	1	-	1	1	-	-	-	2	1	1	2	2	1	-
3	2	2	1	2	2	1	1	-	1	2	1	3	2	2	1
4	3	2	2	1	2	-	-	-	1	1	2	2	3	2	2
5	2	2	1	2	2	-	-	-	1	1	1	2	2	2	1
Correlation levels:1 –low 2 – medium 3 – high "-"-no correlation															

CODE U23AL411 **ARTIFICIAL INTELLIGENCE LABORATORY** **Category: PCC**

SDG:4 & 8

L	T	P	C
0	0	4	2

COURSE OBJECTIVE:

6. To learn to implement search strategies.
7. To build a knowledge base in Prolog game playing techniques.
8. To build CSP techniques.
9. To develop systems with logical reasoning
10. To develop systems with probabilistic reasoning

LIST OFEXPERIMENTS

16. Implement basic search strategies – 8-Puzzle, 8 - Queens problem, Cryptarithmetic.
17. Memory bounded A* algorithms
18. Implement Minimax algorithm for game playing (Alpha-Beta pruning)
19. Solve constraint satisfaction problems
20. Implement propositional model checking algorithms
21. Implement forward chaining, backward chaining, and resolution strategies
22. Build naïve Bayes models
23. Implement Bayesian networks and perform inferences

9. Mini-Project

COURSEOUTCOMES:

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

CO1: Design and implement search strategies
CO2: Implement game playing and CSP techniques
CO3: Develop logical reasoning systems
CO4: Develop probabilistic reasoning systems
CO5: Develop real time projects

TOTAL: 60 PERIODS

CO's-PO's&PSO'sMAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3	3	3	3	-	-	-	-	3	1	3	2	2	3
CO2	2	2	3	2	2	-	-	-	1	2	3	3	2	1
CO3	3	3	2	1	1	-	-	-	1	1	1	3	2	3

CO4	1	3	3	3	1	-	-	-	1	1	3	2	3	1
CO5	3	2	1	1	1	-	-	-	2	2	3	1	3	1
Correlationlevels:1 –low 2 – medium 3 – high “-“-no correlation														

CODE U23AL412 **MACHINE LEARNING LABORATORY** **Category: PCC**

SDG:4

L	T	P	C
0	0	4	2

COURSE OBJECTIVE:

11. To learn to implement uninformed and informed search techniques.
12. To build a knowledge base in Prolog and process queries to perform inference.
13. To build supervised learning models.
14. To explore the regression models.
15. To learn to compare and evaluate the performance of different models

LIST OFEXPERIMENTS

24. BFS & DFS algorithm implementation
25. A* algorithm implementation
26. Hill Climbing implementation
27. Develop a small KB using Prolog and answer simple queries.
28. Inference through Prolog/Python.
29. Write a program to implement the naïve Bayesian classifier for credit card analysis and compute the accuracy with a few test data sets.
30. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
31. Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.
32. Evaluate the performance of Linear regression, logistic regression, naïve Bayes and SVM based prediction models for heart disease diagnosis.

COURSEOUTCOMES:

At the end of the course, students would

CO1: Implement uninformed and informed search techniques

CO2: Build a knowledge base in Prolog and process queries to perform inference

CO3: Develop supervised learning models

CO4: Develop regression models

CO5: Compare and evaluate the performance of different models

TOTAL: 60 PERIODS

CO's-PO's&PSO'sMAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3	3	3	3	-	-	-	-	3	1	3	2	2	3

CO2	2	2	3	2	2	-	-	-	1	2	3	3	2	1
CO3	3	3	2	1	1	-	-	-	1	1	1	3	2	3
CO4	1	3	3	3	1	-	-	-	1	1	3	2	3	1
CO5	3	2	1	1	1	-	-	-	2	2	3	1	3	1
Correlationlevels:1 –low 2 – medium 3 – high "-"-no correlation														