



JAI SHRIRAM ENGINEERING COLLEGE, TIRUPPUR – 638 660

(An Autonomous Institution)

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai
Recognized by UGC & Accredited by NAAC and NBA (CSE and ECE)



REGULATION 2024

B.TECH ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

CHOICE BASED CREDIT SYSTEM

CURRICULUM FOR SEMESTER I TO VIII

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B.TECH ARTIFICIAL INTELLIGENCE AND DATA SCIENCE
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CURRICULUM FOR SEMESTERS I TO VIII

SEMESTER – I

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
1.	24UIP001	Induction Program	-	-	-	-	0
THEORY							
2.	24UHS101	Professional English-I	HSM	3	0	0	3
3.	24UMA101	Matrices and Calculus	BS	3	1	0	4
4.	24UPH101	Engineering Physics	BS	3	0	0	3
5.	24UCY101	Engineering Chemistry	BS	3	0	0	3
6.	24UGE101	Problem Solving and Python Programming	ES	3	0	0	3
7.	24UHS102	தமிழ்மரபு / Heritage of Tamils	HSM	1	0	0	1
PRACTICAL							
8.	24UGE111	Problem Solving and Python Programming Laboratory	ES	0	0	4	2
9.	24UBS111	Physics and Chemistry Laboratory	BS	0	0	4	2
10.	24UHS111	English Laboratory	EE	0	0	2	1
Total Credits				16	1	10	22

SEMESTER – II

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
THEORY							
1.	24UHS201	Professional English-II	HSM	2	0	0	2
2.	24UMA201	Statistics and Numerical Methods	BS	3	1	0	4
3.	24UGE201	Environmental Science and Sustainability	BS	3	0	0	3
4.	24UCS201	Programming in C	ES	3	0	0	3
5.	24UHS202	தமிழ்மரபும் தொழில்நுட்பமும் / Tamils and Technology	HSM	1	0	0	1
THEORY CUM PRACTICAL							
6.	24UECI221	Digital Principles and Design	ES	3	0	2	4
PRACTICAL							
7.	24UGE211	Engineering Fundamentals Laboratory	ES	0	0	4	2
8.	24UCS211	Programming in C Laboratory	ES	0	0	4	2
9.	24UHS211	Communication Laboratory	EE	0	0	4	2
Total Credits				15	1	14	23

SEMESTER – III

S. NO .	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
THEORY							
1.	24UMA302	Discrete Mathematics	BS	3	1	0	4
2.	24UAD301	Artificial Intelligence	PC	3	0	0	3
3.	24UAD302	Data Structures	PC	3	0	0	3
4.	24UAD303	Data Science	PC	3	0	0	3
5.	24UCS302	Object Oriented Programming	PC	3	0	0	3
PRACTICAL							
6.	24UAD311	Artificial Intelligence Laboratory	PC	0	0	4	2
7.	24UAD312	Data Structures Laboratory	PC	0	0	4	2
8.	24UAD313	Data Science Laboratory	PC	0	0	4	2
9.	24UCS312	Object Oriented Programming Laboratory	PC	0	0	4	2
Total Credits				15	1	16	24

SEMESTER – IV

S. NO .	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
THEORY							
1.	24UMA401	Probability and Statistics	BS	3	1	0	4
2.	24UAD401	Machine Learning	PC	3	0	0	3
3.	24UAD402	Database Management Systems	PC	3	0	0	3
4.	24UAD403	Operating Systems	PC	3	0	0	3
5.	24UCS403	Design and Analysis of Algorithms	PC	3	0	0	3
PRACTICAL							
6.	24UAD411	Machine Learning Laboratory	PC	0	0	4	2
7.	24UAD412	Database Management Systems Laboratory	PC	0	0	4	2
8.	24UAD413	Operating Systems Laboratory	PC	0	0	4	2
9.	24UCS413	Algorithms Laboratory	PC	0	0	4	2
Total Credits				15	1	16	24

SEMESTER – V

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
THEORY							
1.	24UAD501	Deep Learning	PC	3	0	0	3
2.	24UGE501	Human Values and Ethics	HSM	3	0	0	3
3.	24UCS501	Computer Networks	PC	3	0	0	3
4.		Open Elective I	OE	3	0	0	3
5.		Professional Elective I	PE	-	-	-	3
6.		Mandatory Course-I	MC	3	0	0	NC
THEORY CUM PRACTICAL							
7.	24UADI501	Data Exploration and Visualization	PC	3	0	2	4
PRACTICAL							
8.	24UAD511	Deep Learning Laboratory	PC	0	0	4	2
9.	24UCS511	Computer Networks Laboratory	PC	0	0	4	2
Total Credits				21	0	10	23

SEMESTER – VI

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
THEORY							
1.	24UAD601	Big Data Analytics	PC	3	0	0	3
2.		Professional Elective II	PE	-	-	-	3
3.		Professional Elective III	PE	-	-	-	3
4.		Professional Elective IV	PE	-	-	-	3
5.		Open Elective – II	OE	3	0	0	3
6.		Mandatory Course-II	MC	3	0	0	NC
THEORY CUM PRACTICAL							
7.	24UADI601	Natural Language Processing	PC	3	0	2	4
PRACTICAL							
8.	24UAD611	Big Data Analytics Laboratory	PC	0	0	4	2
9.	24UAD612	Mini Project	EE	0	0	4	2
Total Credits				21	0	10	23

SEMESTER – VII

S. NO .	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
THEORY							
1.	24UMG701	Principles of Management	HSM	3	0	0	3
2.		Professional Elective V	PE	-	-	-	3
3.		Professional Elective VI	PE	-	-	-	3
4.		Open Elective – III	OE	3	0	0	3
PRACTICAL							
5.	24UAD711	Summer Internship	EE	0	0	0	2
Total Credits				12	0	0	14

SEMESTER – VIII

S. NO .	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
PRACTICAL							
1.	24UAD811	Project Work/Internship	EE	0	0	20	10
Total Credits				0	0	20	10

Total Credits for the entire Programme: 163

PROFESSIONAL ELECTIVES

S. NO.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
PROFESSIONAL ELECTIVE I							
1.	24UADP501	App Development	PE	2	0	2	3
2.	24UADP502	Reinforcement Learning	PE	3	0	0	3
3.	24UADP503	Ethics and AI	PE	2	0	2	3
4.	24UADP504	Computer Vision	PE	2	0	2	3
5.	24UADP505	Web Technologies	PE	2	0	2	3
PROFESSIONAL ELECTIVE II							
1.	24UADP601	Software Testing and Automation	PE	2	0	2	3
2.	24UADP602	DevOps	PE	2	0	2	3
3.	24UADP603	R Programming	PE	2	0	2	3
4.	24UADP604	Augmented Reality/Virtual Reality	PE	2	0	2	3
5.	24UADP605	Crypto currency & Block chain Technologies	PE	2	0	2	3
PROFESSIONAL ELECTIVE III							
1.	24UADP606	Cloud Computing	PE	2	0	2	3
2.	24UADP607	Full Stack Development	PE	2	0	2	3
3.	24UADP608	Network Security	PE	2	0	2	3
4.	24UADP609	Storage Technologies	PE	3	0	0	3
5.	24UADP610	Text and speech Analysis	PE	2	0	2	3
PROFESSIONAL ELECTIVE IV							
1.	24UADP611	Cloud Services Management	PE	2	0	2	3
2.	24UADP612	Business Analytics	PE	2	0	2	3
3.	24UADP613	Health care Analytics	PE	3	0	0	3
4.	24UADP614	Parallel and Distributed computing	PE	3	0	0	3
5.	24UADP615	Digital Marketing	PE	2	0	2	3
PROFESSIONAL ELECTIVE V							
1.	24UADP701	Advanced Machine Learning	PE	2	0	2	3
2.	24UADP702	Bio Inspired AI	PE	2	0	2	3
3.	24UADP703	Object Detection and Face Recognition	PE	2	0	2	3
4.	24UADP704	Knowledge Engineering	PE	2	0	2	3
5.	24UADP705	Information Security	PE	3	0	0	3

6.	24UADP706	Robotics	PE	2	0	2	3
PROFESSIONAL ELECTIVE VI							
1.	24UADP707	Ethical Hacking	PE	2	0	2	3
2.	24UADP708	Social Network Security	PE	3	0	0	3
3.	24UADP709	Multimedia and Animation	PE	2	0	2	3
4.	24UADP710	Data Warehousing	PE	2	0	2	3
5.	24UADP711	Image and Video Analytics	PE	2	0	2	3
6.	24UADP712	Expert Systems	PE	2	0	2	3

MANDATORY COURSES I

S. No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
1.	24UMC801	Introduction to Women and Gender Studies	MC	3	0	0	0
2.	24UMC802	Automotive Safety	MC	3	0	0	0
3.	24UMC803	State, Nation Building and Politics in India	MC	3	0	0	0
4.	24UMC804	Disaster Risk Reduction and Management	MC	3	0	0	0
5.	24UMC805	Film Appreciation	MC	3	0	0	0
6.	24UMC806	Elements of Literature	MC	3	0	0	0
7.	24UMC807	Inclusive Work Culture	MC	3	0	0	0
8.	24UMC808	Quality Systems	MC	3	0	0	0
9.	24UMC809	Industrial Practices and Requirements	MC	3	0	0	0

MANDATORY COURSES II

S. No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
1.	24UMC901	Well Being with Traditional Practices - Yoga, Ayurveda and Siddha	MC	3	0	0	0
2.	24UMC902	History of Science and Technology in India	MC	3	0	0	0
3.	24UMC903	Political and Economic Thought for a Human Society	MC	3	0	0	0
4.	24UMC904	Industrial Safety	MC	3	0	0	0
5.	24UMC905	Quantitative and verbal proficiency	MC	3	0	0	0
6.	24UMC906	Industrial Hydraulic Circuits	MC	3	0	0	0
7.	24UMC907	Electrical Safety	MC	3	0	0	0

S. No.	COURSE CODE	COURSE TITLE	CATEGORY	L	T	P	C
1.	24UCEO01	Augmented Reality /Virtual Reality	OE	3	0	0	3
2.	24UCEO02	Remote Sensing Concepts	OE	3	0	0	3
3.	24UCEO03	Geographical Information System	OE	3	0	0	3
4.	24UCEO04	Fire Safety Engineering	OE	3	0	0	3
5.	24UCSO01	Java Programming	OE	3	0	0	3
6.	24UCSO02	UI & UX Design	OE	3	0	0	3
7.	24UCSO03	Cloud Computing	OE	3	0	0	3
8.	24UCSO04	Data Science	OE	3	0	0	3
9.	24UEEO01	Renewable Energy Technologies	OE	3	0	0	3
10.	24UEEO02	Hybrid Electric Vehicles	OE	3	0	0	3
11.	24UEEO03	PLC and SCADA	OE	3	0	0	3
12.	24UEEO04	Energy Conservation & Management	OE	3	0	0	3
13.	24UEEO05	Fundamentals of Electronic Devices	OE	3	0	0	3
14.	24UEEO06	Batteries and Management System	OE	3	0	0	3
15.	24UEEO07	Sensors and Actuators	OE	3	0	0	3
16.	24UEEO08	Electrical, Electronic & Magnetic Materials	OE	3	0	0	3
17.	24UECO01	Basics of Communication Technologies	OE	3	0	0	3
18.	24UECO02	Image Processing	OE	3	0	0	3
19.	24UECO03	Basics of IoT	OE	3	0	0	3
20.	24UECO04	Introduction to PLC Programming	OE	3	0	0	3
21.	24UECO05	Sensors for Engineering Applications	OE	3	0	0	3
22.	24UECO06	Industry 4.0 and Industrial IoT	OE	3	0	0	3
23.	24UFTO01	Basics of Textile Technology	OE	3	0	0	3
24.	24UFTO02	Fundamentals of Fashion Design	OE	3	0	0	3
25.	24UFTO03	Garment Manufacturing Technology	OE	3	0	0	3
26.	24UFTO04	Retail Management	OE	3	0	0	3
27.	24UFTO05	Industrial Engineering for Garment Industry	OE	3	0	0	3
28.	24UFTO06	Fashion Branding and Advertisement	OE	3	0	0	3
29.	24UMEO01	Fundamentals of Robotics	OE	3	0	0	3
30.	24UMEO02	Nano Technology	OE	3	0	0	3
31.	24UMEO03	Reverse Engineering	OE	3	0	0	3
32.	24UMEO04	Industrial Safety	OE	3	0	0	3
33.	24UMEO05	Introduction to Additive Manufacturing	OE	3	0	0	3
34.	24UMEO06	Energy Conservation in Industries	OE	3	0	0	3
35.	24UITO01	Digital Image Processing and Its Applications	OE	3	0	0	3
36.	24UITO02	Fundamentals of Databases	OE	3	0	0	3
37.	24UITO03	Internet Programming	OE	3	0	0	3

38.	24UITO04	Fundamentals of Internet of Things	OE	3	0	0	3
39.	24UITO05	Fundamentals of Blockchain	OE	3	0	0	3

CREDITS SUMMARY

S. No	Course Components	Credits per Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1.	HSM	4	3			3		3		13
2.	BS	12	7	4	4					27
3.	ES	5	11							16
4.	PC			20	20	14	9			63
5.	PE					3	9	6		18
6.	OE					3	3	3		9
7.	EE	1	2				2	2	10	17
8.	MC					√	√			√
Total Credits		22	23	24	24	23	23	14	10	163

Total Credits for the entire Programme: 163

COMPARISON OF CREDIT SUMMARY

S. No	Course Components	AICTE Recommendation		Anna University Curriculum R2021		JSREC Autonomous Curriculum R2024	
		Credits	% Credits	Credits	% Credits	Credits	% Credits
1	Humanities, Social Science and Management (HSM)	15	9%	12	7%	13	8%
2	Basic Sciences (BS)	23	14%	29	18%	27	17%
3	Engineering Sciences (ES)	22	13%	14	9%	16	10%
4	Professional Core (PC)	54	33%	62	38%	63	39%
5	Professional Electives (PE)	18	11%	18	11%	18	11%
6	Open Electives (OE)	15	9%	12	7%	9	6%
7	Employment Enhancement Course (EE)	16	10%	16	10%	17	10%
8	Mandatory (Non-Credit Course (MC)	-	-	-	-	√	√
TOTAL CREDITS		163	100%	163	100%	163	100%



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REGULATION 2024

B.TECH ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

CHOICE BASED CREDIT SYSTEM

SYLLABUS FOR SEMESTER I

24UHS101	PROFESSIONAL ENGLISH I (Common to all Branches)	L	T	P	C
		3	0	0	3

Prerequisites:

- Basic Knowledge in Language usage

COURSE OBJECTIVES

- To improve the communicative competence of learners
- To learn to use basic grammatical structures in suitable contexts
- To acquire lexical competence and use them appropriately in a sentence and understand their meaning in a text
- To help learners use language effectively in professional contexts
- To develop learners' ability to read and write complex texts, summaries, articles, blogs, definitions, essays and user manuals

UNIT-I	INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION	9
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Reading - Reading brochures (technical context), telephone messages / social media messages relevant to technical contexts and emails. Writing - Writing emails / letters introducing oneself. Grammar - Present Tense (simple and progressive); Question types: Wh/ Yes or No/ and Tags. Vocabulary - Synonyms; One word substitution; Abbreviations & Acronyms (as used in technical contexts).

UNIT-II	NARRATION AND SUMMATION	9
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Reading - Reading biographies, travelogues, newspaper reports, Excerpts from literature, and travel & technical blogs. Writing - Guided writing-- Paragraph writing Short Report on an event (field trip etc.) Grammar -Past tense (simple); Subject-Verb Agreement; and Prepositions. Vocabulary - Word forms (prefixes& suffixes); Synonyms and Antonyms. Phrasal verbs.

UNIT-III	DESCRIPTION OF A PROCESS / PRODUCT	9
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Reading - Reading advertisements, gadget reviews; user manuals. Writing - Writing definitions; instructions; and Product /Process description. Grammar - Imperatives; Adjectives; Degrees of comparison; Present & Past Perfect Tenses. Vocabulary - Compound Nouns, Homonyms; and Homophones, discourse markers (connectives & sequence words).

UNIT-IV	CLASSIFICATION AND RECOMMENDATIONS	9
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Reading - Newspaper articles; Journal reports -and Non Verbal Communication (tables, pie charts etc.,). Writing - Note-making / Note-taking (*Study skills to be taught, not tested); Writing recommendations; Transferring information from non verbal (chart, graph etc, to verbal mode) Grammar - Articles; Pronouns - Possessive & Relative pronouns. Vocabulary - Collocations; Fixed / Semi fixed expressions.


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UNIT-V	EXPRESSION	9
Reading – Reading editorials; and Opinion Blogs; Writing – Essay Writing (Descriptive or narrative). Grammar – Future Tenses, Punctuation; Negation (Statements & Questions); and Simple, 27 Compound & Complex Sentences. Vocabulary - Cause & Effect Expressions – Content vs Function words.		

L: 45	T: 00	P: 00	Total : 45 Periods
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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.SujathaPriyadarshini, 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 Lakshminarayanan, Scitech Publications (India) Pvt. Ltd.
3. English For Technical Communication (With CD) By AyshaViswamohan, Mcgraw Hill Education, ISBN : 0070264244.
4. Effective Communication Skill, Kulbhusan Kumar, RS Salaria, Khanna Publishing House.
5. Learning to Communicate – Dr. V. Chellammal, Allied Publishing House, New Delhi, 2003.

WEB RESOURCES

- https://www.lisedunetwork.com/the-fundamentals-of-communication/#google_vignette
- <http://hdl.handle.net/10603/58170>
- <https://www.vedantu.com/english/narration>
- <https://asana.com/resources/product-development-process>
- <https://onlinelibrary.wiley.com/doi/10.1155/2019/8043905>

COURSE OUTCOMES

At the end of the course students should be able to

- CO1:To use appropriate words in a professional context
CO2:To gain understanding of basic grammatical structures and use them in right context
CO3:To read and infer the denotative and connotative meanings of technical texts
CO4:To read and interpret information presented in tables, charts and other graphic forms
CO5:To write definitions, descriptions, narrations and essays on various topics

24UMA101	MATRICES AND CALCULUS (Common to All Branches)	L	T	P	C
		3	1	0	4

Prerequisites:

- Knowledge in Basic Calculus

COURSE OBJECTIVES

- To develop the use of matrix algebra techniques that is needed by engineers for practical applications.
- To familiarize the students with differential calculus.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To make the students understand various techniques of integration.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications.

UNIT-I	MATRICES	9 + 3
Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigenvalues and Eigenvectors – Cayley - Hamilton theorem – Diagonalization of matrices by orthogonal transformation – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms – Applications: Stretching of an elastic membrane.		

UNIT-II	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-III	FUNCTIONS OF SEVERAL VARIABLES	9 + 3
Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Applications : Maxima and minima of functions of two variables and Lagrange's method of undetermined multipliers.		

UNIT-IV	INTEGRAL CALCULUS	9 + 3
Definite and Indefinite integrals - Substitution rule - Techniques of Integration: Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals - Applications: Hydrostatic force and pressure, moments and centres of mass.		

UNIT-V	MULTIPLE INTEGRALS	9 + 3
Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals – Applications: Moments and centres of mass, moment of inertia.		


HEAD OF THE DEPARTMENT
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TEXT BOOKS

1. Kreyszig.E, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
2. Grewal.B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2018.
3. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 8th Edition, New Delhi, 2015. [For Units II & IV - Sections 1.1, 2.2, 2.3, 2.5, 2.7 (Tangents problems only), 2.8, 3.1 to 3.6, 3.11, 4.1, 4.3, 5.1 (Area problems only), 5.2, 5.3, 5.4 (excluding net change theorem), 5.5, 7.1 - 7.4 and 7.8].

REFERENCES

1. Anton. H, Bivens. I and Davis. S, " Calculus ", Wiley, 10th Edition, 2016
2. Bali. N., Goyal. M. and Watkins. C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.), New Delhi, 7th Edition, 2009.
3. Jain. R.K. and Iyengar. S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 5th Edition, 2016.
4. Narayanan. S. and Manicavachagom Pillai. T. K., "Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2009.
5. Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2016.
6. Srimantha Pal and Bhunia. S.C, "Engineering Mathematics "Oxford University Press, 2015.
7. Thomas. G. B., Hass. J, and Weir. M.D, "Thomas Calculus ", 14th Edition, Pearson India, 2018.

WEB RESOURCES

- <http://explained.ai/matrix-calculus/index.html>
- <https://www.comp.nus.edu.sg/~cs5240/lecture/matrix-differentiation.pdf>
- <https://github.com/LynnHo/Matrix-Calculus>
- <https://nptel.ac.in/>

COURSE OUTCOMES

At the end of the course students should be able to

- CO1: Use the matrix algebra methods for solving practical problems.
 CO2: Apply differential calculus tools in solving various application problems.
 CO3: Able to use differential calculus ideas on several variable functions.
 CO4: Apply different methods of integration in solving practical problems.
 CO5: Apply multiple integral ideas in solving areas, volumes and other practical problems.

24UPH101	ENGINEERING PHYSICS (Common to All Branches)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To make the students effectively achieve an understanding of mechanics.
- To enable the students to gain knowledge of electromagnetic waves and its applications.
- To introduce the basics of oscillations, optics and lasers.
- Equipping the students to successfully understand the importance of quantum physics.
- To motivate the students towards the applications of quantum mechanics.

UNIT-I	MECHANICS	9
Multiparticle dynamics: Center of mass (CM) – CM of continuous bodies – motion of the CM – kinetic energy of system of particles, Rotation of rigid bodies: Rotational kinematics – rotational kinetic energy and moment of inertia - theorems of M.I –moment of inertia of continuous bodies – M.I of a diatomic molecule - torque – rotational dynamics of rigid bodies – conservation of angular momentum – rotational energy state of a rigid diatomic molecule - gyroscope - torsional pendulum – double pendulum –Introduction to nonlinear oscillations.		

UNIT-II	ELECTROMAGNETIC WAVES	9
The Maxwell's equations - wave equation; Plane electromagnetic waves in vacuum, Conditions on the wave field - properties of electromagnetic waves: speed, amplitude, phase, orientation and waves in matter - polarization - Producing electromagnetic waves - Energy and momentum in EM waves: Intensity, waves from localized sources, momentum and radiation pressure - Cell-phone reception. Reflection and transmission of electromagnetic waves from a non-conducting medium-vacuum interface for normal incidence.		

UNIT-III	OSCILLATIONS, OPTICS AND LASERS	9
Simple harmonic motion - resonance –analogy between electrical and mechanical oscillating systems - waves on a string - standing waves - traveling waves - Energy transfer of a wave - sound waves - Doppler effect. Reflection and refraction of light waves - total internal reflection - interference –Michelson interferometer –Theory of air wedge and experiment. Theory of laser - characteristics - Spontaneous and stimulated emission - Einstein's coefficients - population inversion - Nd-YAG laser, CO2 laser, semiconductor laser –Basic applications of lasers in industry.		

UNIT-IV	BASIC QUANTUM MECHANICS	9
Photons and light waves - Electrons and matter waves –Compton effect - The Schrodinger equation (Time dependent and time independent forms) - meaning of wave function - Normalization –Free particle - particle in a infinite potential well: 1D,2D and 3D Boxes- Normalization, probabilities and the correspondence principle.		

UNIT-V	APPLIED QUANTUM MECHANICS	9
The harmonic oscillator(qualitative)- Barrier penetration and quantum tunneling(qualitative)- Tunneling microscope - Resonant diode - Finite potential wells (qualitative)- Bloch's theorem for particles in a periodic potential –Basics of Kronig-Penney model and origin of energy bands.		

L:45	T: 00	P: 00	Total : 45 Periods
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 TIRUPUR -638 660, Tamilnadu.

TEXT BOOKS

1. D.Kleppner and R.Kolenkow. An Introduction to Mechanics. McGraw Hill Education (Indian Edition), 2017.
2. E.M.Purcell and D.J.Morin, Electricity and Magnetism, Cambridge Univ.Press, 2013.
3. Arthur Beiser, ShobhitMahajan, S. RaiChoudhury, Concepts of Modern Physics, McGraw- Hill (Indian Edition), 2017.

REFERENCES

1. R.Wolfson. Essential University Physics. Volume 1 & 2. Pearson Education (Indian Edition), 2009.
2. Paul A. Tipler, Physic – Volume 1 & 2, CBS, (Indian Edition), 2004.
3. K.Thyagarajan and A.Ghatak. Lasers: Fundamentals and Applications, Laxmi Publications, (Indian Edition), 2019.
4. D.Halliday, R.Resnick and J.Walker. Principles of Physics, Wiley (Indian Edition), 2015.
5. N.Garcia, A.Damask and S.Schwarz. Physics for Computer Science Students. Springer- Verlag, 2012.

WEB RESOURCES

- <https://www.youtube.com/watch?v=caitynfev64>
- <https://youtu.be/SqhWxOjBb74>
- <https://youtu.be/F11MHPDd5D8>
- <https://youtu.be/NGGSR0r3Tlc>
- <https://youtu.be/b-w4TSkhlhE>

COURSE OUTCOMES

At the end of the course, students should be able to

CO1:Understand the importance of mechanics.

CO2:Express their knowledge in electromagnetic waves.

CO3:Demonstrate a strong foundational knowledge in oscillations, optics and lasers.

CO4:Understand the importance of quantum physics.

CO5:Compare and apply quantum mechanical principles towards the formation of energy bands.


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24UCY101	ENGINEERING CHEMISTRY (Common to all Branches)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To inculcate sound understanding of water quality parameters and water treatment techniques.
- To impart knowledge on the basic principles and preparatory methods of nanomaterials.
- To introduce the basic concepts and applications of phase rule and composites
- To facilitate the understanding of different types of fuels, their preparation, properties and combustion characteristics.
- To familiarize the students with the operating principles, working processes and applications of energy conversion and storage devices.

UNIT-I	WATER AND ITS TREATMENT	9
Water: Sources and impurities, Water quality parameters: Definition and significance of- color, odour, turbidity, pH, hardness, alkalinity, TDS, COD and BOD, fluoride and arsenic. Municipal water treatment: primary treatment and disinfection (UV, Ozonation, break-point chlorination). Desalination of brackishwater: Reverse Osmosis. Boiler troubles: Scale and sludge, Boiler corrosion, Caustic embrittlement, Priming & foaming. Treatment of boiler feed water: Internal treatment (Phosphate, Colloidal, Sodiumaluminate and Calgon conditioning) and External treatment—Ion exchange demineralization and Zeolite process.		

UNIT-II	NANO CHEMISTRY	9
Basics: Distinction between molecules, nanomaterials and bulk materials; Size-dependent properties (optical, electrical, mechanical and magnetic); Types of nanomaterials: Definition, properties and uses of – nanoparticle, nanocluster, nanorod, nanowire and nanotube. Preparation of nanomaterials: sol-gel, solvothermal, laser ablation, chemical vapour deposition, electrochemical deposition and electro spinning. Applications of nanomaterials in medicine, agriculture, energy, electronics and catalysis.		

UNIT-III	PHASE RULE AND COMPOSITES	9
Phase rule: Introduction, definition of terms with examples. One component system - water system; Reduced phase rule; Construction of a simple eutectic phase diagram - Thermal analysis; Two component system: lead-silver system - Pattinson process. Composites: Introduction: Definition & Need for composites; Constitution: Matrix materials (Polymer matrix, metal matrix and ceramic matrix) and Reinforcement (fiber, particulates, flakes and whiskers). Properties and applications of: Metal matrix composites (MMC), Ceramic matrix composites and Polymer matrix composites. Hybrid composites - definition and examples.		

UNIT-IV	FUELS AND COMBUSTION	9
Fuels: Introduction: Classification of fuels; Coal and coke: Analysis of coal (proximate and ultimate), Carbonization, Manufacture of metallurgical coke (Otto Hoffmann method). Petroleum and Diesel: Manufacture of synthetic petrol (Bergius process), Knocking - octane number, diesel oil- cetane number; Power alcohol and biodiesel. Combustion of fuels: Introduction: Calorific value - higher and lower calorific values, Theoretical calculation of calorific value; Ignition temperature: spontaneous ignition temperature, Explosive range; Flue gas analysis - ORSAT Method. CO ₂ emission and carbon footprint.		


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UNIT-V	ENERGY SOURCES AND STORAGE DEVICES	9
Stability of nucleus: mass defect (problems), binding energy; Nuclear energy: light water nuclear power plant, breeder reactor. Solar energy conversion: Principle, working and applications of solar cells; Recent developments in solar cell materials. Wind energy; Geothermal energy; Batteries: Types of batteries, Primary battery - dry cell, Secondary battery - lead acid battery and lithium-ion- battery; Electric vehicles - working principles; Fuel cells: H ₂ -O ₂ fuel cell, microbial fuelcell; Supercapacitors: Storage principle, types and examples.		

L:45	T: 00	P: 00	Total : 45 Periods
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TEXT BOOKS
1. P. C. Jain and Monica Jain, "Engineering Chemistry", 17th Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2018. 2. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2008. 3. S.S. Dara, "A text book of Engineering Chemistry", S. Chand Publishing, 12th Edition, 2018.
REFERENCES
1. B. S. Murty, P. Shankar, Baldev Raj, B. B. Rath and James Murday, "Text book of nanoscience and nanotechnology", Universities Press-IIM Series in Metallurgy and Materials Science, 2018. 2. O.G. Palanna, "Engineering Chemistry" McGraw Hill Education (India) Private Limited, 2nd Edition, 2017. 3. Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014. 4. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, Second Edition, 2019. 5. O.V. Roussak and H.D. Gesser, Applied Chemistry-A Text Book for Engineers and Technologists, Springer Science Business Media, New York, 2nd Edition, 2013.
WEB RESOURCES
• https://testbook.com/ias-preparation/water-treatment • https://onlinelibrary.wiley.com/doi/full/10.1002/nano.202300038 • https://www.pratapsir.com/2023/01/notes-on-phase-rule_21.html • https://en.wikipedia.org/wiki/Fuel
COURSE OUTCOMES
At the end of the course students should be able
CO1: To infer the quality of water from quality parameter data and propose suitable treatment methodologies to treat water.
CO2: To identify and apply basic concepts of nano science and nanotechnology in designing the synthesis of nano materials for engineering and technology applications.
CO3: To apply the knowledge of phase rule and composites for material selection requirements.
CO4: To recommend suitable fuels for engineering processes and applications.
CO5: To recognize different forms of energy resources and apply them for suitable applications in energy sectors.


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24UGE101	PROBLEM SOLVING AND PYTHON PROGRAMMING (Common to All Branches)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To understand the basics of algorithmic problem solving.
- To learn to solve problems using Python conditionals and loops.
- To define Python functions and use function calls to solve problems.
- To use Python data structures - lists, tuples, and dictionaries to represent complex data.
- To do input/output with files in Python.

UNIT-I	COMPUTATIONAL THINKING AND PROBLEM SOLVING	9
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Fundamentals of Computing – Identification of Computational Problems -Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.

UNIT-II	DATA TYPES, EXPRESSIONS, STATEMENTS	9
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Python interpreter and interactive mode, debugging; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

UNIT-III	CONTROL FLOW, FUNCTIONS, STRINGS	9
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Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

UNIT-IV	LISTS, TUPLES, DICTIONARIES	9
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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; Illustrative programs: simple sorting, histogram, Students marks statement, Retail bill preparation.

UNIT-V	FILES, MODULES, PACKAGES	9
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Files and exceptions: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file, Voter's age validation, Marks range validation (0-100).

L:45	T:0	P:0	Total: 45 PERIODS
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TEXT BOOKS

1. Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 3rd Edition, O'Reilly Publishers, 2024.
2. Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and Programming", 1st Edition, BCS Learning & Development Limited, 2022.

REFERENCES

1. Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.
2. G Venkatesh and MadhavanMukund, "Computational Thinking: A Primer for Programmers and Data Scientists", 1st Edition, Notion Press, 2021.
3. John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data", Third Edition, MIT Press, 2021
4. Eric Matthes, "Python Crash Course, A Hands - on Project Based Introduction to Programming", 2nd Edition, No Starch Press, 2019.
5. Martin C. Brown, "Python: The Complete Reference", 4th Edition, Mc-Graw Hill, 2018.

WEB RESOURCES

- <https://www.python.org/>
- <https://nptel.ac.in/courses/106106145/>

COURSE OUTCOMES

Upon completion of the course, the students will be able to

- CO1: Develop algorithmic solutions to simple computational problems and and execute simple Python programs.
- CO2: Develop and execute Simple Python programs.
- CO3: Write simple Python programs using conditionals and loops for solving problems and decompose a Python program into functions.
- CO4: Represent compound data using Python lists, tuples, dictionaries etc.
- CO5: Read and write data from/to files in Python programs.


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24UHS102	HERITAGE OF TAMILS (Common to All Branches)	L	T	P	C
		1	0	0	1

COURSE OBJECTIVES

- Appreciate Tamil art, culture and literature.
- Learn the history and culture of Tamil language.
- Relate to various art forms and their relevance to development .
- Acknowledge the rich heritage and significant achievements of the Tamilians.
- Appreciate the contribution of Tamilians to nation building.

UNIT I	LANGUAGE AND LITERATURE	3
Language Families in India - Dravidian Languages – Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.		

UNIT II	HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE	3
Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.		

UNIT III	FOLK AND MARTIAL ARTS	3
Therukoothu, Karagattam, VilluPattu, KaniyanKoothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.		

UNIT IV	THINAI CONCEPT OF TAMILS	3
Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.		

UNIT V	CONTRIBUTION OF TAMILS TO INDIAN NATIONALEMENT AND INDIAN CULTURE	3
Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.		

L:15	T: 00	P: 00	Total : 15 Periods
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TEXT-CUM-REFERENCE BOOKS

- 1) தமிழகவரலாறு - மக்களும்பண்பாடும் - கே .கே .பிள்ளை (வெளியீடு: தமிழ்நாடுபாடநூல்மற்றும்கல்வியியல்பணிகள்கழகம்).
- 2) கணினித்தமிழ் - முனைவர்இல .சுந்தரம்.(விகடன்பிரசுரம்).
- 3) கீழடி - வைகைநதிக்கரையில்சங்ககாலநகரநாகரிகம் (தொல்லியல்துறைவெளியீடு)
- 4) பொருதை - ஆற்றங்கரைநாகரிகம்(தொல்லியல்துறைவெளியீடு)
- 5) Social Life of Tamils (Dr.K.K.Pillay) A Joint publication of TNTB & ESC and RMRL – (in print)
- 6) Social Life of the Tamils – The classical Period (Dr.S.Singaravelu) (Published by: International institute of Tamil Studies).
- 7) Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.k.D.Thirunavukkarasu) (Published by:Institute of Tamil Studies).
- 8) The Contribution of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: Institute of Tamil Studies).
- 9) Keeladi – Sangam City Civilization on the banks of banks of river Vaigai' (Jointly Published by: Department of archaeology & Tamil Nadu Text book and Educational Services Corporation, Tamil Nadu)
- 10) Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (published by: The Author).
- 11) Porunai Civilization (jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
- 12) Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

COURSE OUTCOMES

At the end of the course students should be able

- Understand the significance of Tamil as a classical language.
- Relate the art and culture in Tamil language.
- Explain the importance of music, dance and martial arts that were derived from Tamil Culture.
- Understand the poetic mode or theme of classical language.
- Relate the contribution of Tamils to Nation building.


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24UHS102	தமிழர்மரபு (Common to All Branches)	L	T	P	C
		1	0	0	1

அலகு I	மொழிமற்றும்இலக்கியம்	3
இந்தியமொழிக்குடும்பங்கள் - திராவிடமொழிகள் - தமிழ்ஒருசெம்மொழி - தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச்சார்பற்றதன்மை சங்க இலக்கியத்தில் பகிர்தல் அறம் - திருக்குறளில் மேலாண்மைக் கருத்துக்கள் - தமிழ்க்காப்பியங்கள்,தமிழகத்தில்சமண,பௌத்தசமயங்களின்தாக்கம் - பக்திஇலக்கியம் ,ஆழ்வார்கள்மற்றும்நாயன்மார்கள்-சிற்றிலக்கியங்கள் தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி - தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின்பங்களிப்பு.		

அலகுII	மரபு-பாறைஓவியங்கள்முதல்நவீனஓவியங்கள்வரை - சிற்பக்கலை	3
நடுகல்முதல்நவீனசிற்பங்கள்வரை - ஐம்பொன்சிலைகள் - பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப்பொருட்கள் , பொம்மைகள் - தேர்செய்யும்கலை - சுடுமண் சிற்பங்கள் - நாட்டுப்புறத் தெய்வங்கள் - குமரிமுனையில் திருவள்ளுவர்சிலை - இசைக்கருவிகள் - மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் - தமிழர்களின்சமூகபொருளாதாரவாழ்வில்கோவில்களின்பங்கு.		

அலகு III	நாட்டுப்புறக்கலைகள்மற்றும்வீரவிளையாட்டுகள்	3
தெருக்கூத்து,கரகாட்டம்,வில்லுப்பாட்டு,கணியான்கூத்து,ஓயிலாட்டம், தோல்வக்கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின்விளையாட்டுகள்		

அலகு IV	தமிழர்களின்திணைக்கோட்பாடுகள்	3
தமிழகத்தின்தாவரங்களும்,விலங்குகளும்தொல்காப்பியம்மற்றும்சங்கஇலக்கியத்தில் அகம்மற்றும்புறக்கோட்பாடுகள்-தமிழர்கள்போற்றியஅறக்கோட்பாடு சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் சங்ககால நகரங்களும் துறைமுகங்களும்- சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி - கடல் கடந்த நாடுகளில் சோழர்களின் வெற்றி		

அலகு v	இந்தியதேசியஇயக்கம்மற்றும்இந்தியபண்பாட்டிற்குத்தமிழர்க ளின்பங்களிப்பு	3
இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு -இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப்பண்பாட்டின் தாக்கம் - சுயமரியாதைஇயக்கம் - இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ்ப்புத்தகங்களின் அச்சுவரலாறு.		

L:15	T: 00	P: 00	Total : 15 Periods
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TEXT-CUM-REFERENCE BOOKS

1. தமிழகவரலாறு - மக்களும்பண்பாடும் - கே .கே .பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல்மற்றும்கல்வியியல்பணிகள்முகம்).
2. கணினித்தமிழ் -முனைவர்இல .சுந்தரம்.(விகடன்பிரசுரம்).
3. கீழடி - வைகைநதிக்கரையில்சங்ககாலநகரநாகரிகம் (தொல்லியல்துறை வெளியீடு)
4. பொருநை - ஆற்றங்கரைநாகரிகம்(தொல்லியல்துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A Joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils – The classical Period (Dr.S.Singaravelu) (Publishid by: International institute of Tamil Studies).
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.k.D.Thirunavukkarasu) (Published by:Institute of Tamil Studies).
8. The Contribution of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: Institute of Tamil Studies).
9. Keeladi – Sangam City Civilization on the banks of banks of river Vaigai' (Jointly Published by: Department of archaeology & Tamil Nadu Text book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (published by: The Author).
11. Porunai Civilization (jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilzation Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

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24UGE111	PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY (Common to All Branches)	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To understand the basics of algorithmic problem solving.
- To learn to solve problems using Python conditionals and loops.
- To define Python functions and use function calls to solve problems.
- To use Python data structures - lists, tuples, and dictionaries to represent complex data.
- To do input/output with files in Python.

S.No.	LIST OF EXERCISES:
1	Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same. (Electricity Billing, Retail shop billing, Sin series, weight of a motorbike, Weight of a steel bar, compute Electrical Current in Three Phase AC Circuited.)
2	Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points).
3	Scientific problems using Conditionals and Iterative loops.(Number series, Number Patterns, pyramid pattern)
4	Implementing real-time/technical applications using Lists, Tuples. (Items present in a library/Components of a car/Materials required for construction of a building –operations of list & tuples).
5	Implementing real-time/technical applications using Sets, Dictionaries. (Language, components of an automobile, Elements of a civil structure, etc.- operations of Sets & Dictionaries).
6	Implementing programs using Functions.(Factorial, largest number in a list, area of shape)
7	Implementing programs using Strings.(reverse,palindrome,charactercount,replacing characters).
8	Implementing programs using written modules and Python Standard Libraries (pandas, numpy. Matplotlib, scipy).
9	Implementing real-time / technical applications using File handling.(copy from one file to another, word count, longest word).
10	Implementing real-time / technical applications using Exception handling.(divide by zero error, voter's age validity, student mark range validation).
11	Exploring Pygame tool.
12	Developing a game activity using Pygame like bouncing ball, carrace etc.

L:00	P:60	T:00	Total: 60 PERIODS
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LIST OF EQUIPMENTS REQUIRED**HARDWARE REQUIREMENTS**

Standard PC

SOFTWARE REQUIREMENTS

1. Windows 7 or higher
2. Python latest version

COURSE OUTCOMES

Upon completion of the course, the students will be able to

CO1: Develop algorithmic solutions to simple computational problems

CO2: Develop and execute simple Python programs.

CO3: Implement programs in Python using conditionals and loops for solving problems.

CO4: Deploy functions to decompose a Python program.

CO5: Process compound data using Python data structures.

CO6: Utilize Python packages in developing software applications.



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24UBS111	PHYSICS AND CHEMISTRY LABORATORY (Common to All Branches)	L	T	P	C
		0	0	4	2

PHYSICS EXPERIMENTS (Any Seven Experiments)

COURSE OBJECTIVES

- To learn the proper use of various kinds of physics laboratory equipment.
- To learn how data can be collected, presented and interpreted in a clear and concise manner.
- To learn problem solving skills related to physics principles and interpretation of experimental data.
- To determine error in experimental measurements and techniques used to minimize such error.
- To make the student an active participant in each part of all lab exercises.

1. Torsion pendulum - Determination of rigidity modulus of wire and moment of inertia of regular and irregular objects.
2. Simple harmonic oscillations of cantilever.
3. Non-uniform bending - Determination of Young's modulus.
4. Uniform bending - Determination of Young's modulus.
5. Laser- Determination of the wave length of the laser using grating.
6. Air wedge - Determination of thickness of a thin sheet/wire.
7. a) Optical fibre -Determination of Numerical Aperture and acceptance angle.
b) Compact disc- Determination of width of the groove using laser.
8. Acoustic grating- Determination of velocity of ultrasonic waves in liquids.
9. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids.
10. Post office box -Determination of Band gap of a semiconductor.
11. Photoelectric effect.
12. Michelson Interferometer.
13. Melde's string experiment.
14. Experiment with lattice dynamics kit.

TEXT BOOKS

1. Marko Pinteric, Building Physics, Springer 2017.
2. D.S.Mathur. Elements of Properties of Matter. S Chand & Company, 2010.
3. Hugo Hens, Building Physics: Heat, Air and Moisture, Wiley, 2017.

REFERENCES

1. W.R.Stevens. Building Physics: Lighting. Pergamon Press, 2013.
2. Hugo Hens, Applied Building Physics, Wiley, 2016.
3. K.G.Budinski and M.K.Budinski. Engineering Materials: Properties and Selection. Pearson Education, 2016.
4. Peter A. Claisse, Civil Engineering Materials, Elsevier, 2016.


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COURSE OUTCOMES

Upon completion of the course, the students should be able to

CO1: Understand the functioning of various physics laboratory equipment.

CO2: Use graphical models to analyze laboratory data.

CO3: Use mathematical models as a medium for quantitative reasoning and describing physical reality.

CO4: Access, process and analyze scientific information.

CO5: Solve problems individually and collaboratively.

TOTAL: 30 PERIODS


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CHEMISTRY EXPERIMENTS (Any Seven Experiments to be conducted)

COURSE OBJECTIVES:

- To inculcate experimental skills to test basic understanding of water quality parameters, such as, acidity, alkalinity, hardness, DO, chloride and copper.
- To induce the students to familiarize with electroanalytical techniques such as, pH metry, potentiometry and conductometry in the determination of impurities in aqueous solutions.
- To demonstrate the analysis of metals and alloys.
- To demonstrate the synthesis of nanoparticles.

1. Preparation of Na_2CO_3 as a primary standard and estimation of acidity of a water sample using the primary standard
2. Determination of types and amount of alkalinity in a water sample. Split the first experiment into two
3. Determination of total, temporary & permanent hardness of water by EDTA method.
4. Determination of DO content of water sample by Winkler's method.
5. Determination of chloride content of water sample by Argentometric method.
6. Estimation of copper content of the given solution by Iodometry.
7. Estimation of TDS of a water sample by gravimetry.
8. Determination of strength of given hydrochloric acid using pH meter.
9. Determination of strength of acids in a mixture of acids using conductivity meter.
10. Conductometric titration of barium chloride against sodium sulphate (precipitation titration)
11. Estimation of iron content of the given solution using potentiometer.
12. Estimation of sodium /potassium present in water using a flame photometer.
13. Preparation of nanoparticles ($\text{TiO}_2/\text{ZnO}/\text{CuO}$) by Sol-Gel method.
14. Estimation of Nickel in steel
15. Proximate analysis of Coal

L: 00	T: 00	P: 60	Total : 60 Periods
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TEXT BOOKS

1. J. Mendham, R. C. Denney, J.D. Barnes, M. Thomas and B. Sivasankar, Vogel's Textbook of Quantitative Chemical Analysis (2009).

WEB RESOURCES

- <https://en.wikipedia.org/wiki/Titration>
- [https://en.wikipedia.org/wiki/Conductivity_\(electrolytic\)](https://en.wikipedia.org/wiki/Conductivity_(electrolytic)).


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COURSE OUTCOMES

At the end of the course students should be able

CO1:To analyse the quality of water samples with respect to their acidity, alkalinity, hardness and DO.

CO2:To determine the amount of metal ions through volumetric and spectroscopic techniques

CO3:To analyse and determine the composition of alloys.

CO4:To learn simple method of synthesis of nanoparticles.

CO5:To quantitatively analyse the impurities in solution by electroanalytical Techniques.

TOTAL: 30 PERIODS



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24UHS111	ENGLISH LABORATORY (Common to all Branches)	L	T	P	C
		0	0	2	1

Prerequisites:

- Basic Knowledge in Language usage

COURSE OBJECTIVES:

- To improve the communicative competence of learners
- To help learners use language effectively in academic /work contexts
- To develop various listening strategies to comprehend various types of audio materials like lectures, discussions, videos etc
- To build on students English language skills by engaging them in listening, speaking and grammar learning activities that are relevant to authentic contexts
- To use language efficiently in expressing their opinions via various media

UNIT-I	INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION	6
Listening for general information-specific details- conversation: Introduction to classmates - Audio / video (formal & informal); Telephone conversation; Listening to voicemail & messages; Listening and filling a form. Speaking - making telephone calls-Self Introduction; Introducing a friend; - 42 politeness strategies- making polite requests, making polite offers, replying to polite requests and offers- understanding basic instructions(filling out a bank application for example).		

UNIT-II	NARRATION AND SUMMATION	6
Listening - Listening to podcasts, anecdotes / stories / event narration; documentaries and interviews with celebrities. Speaking - Narrating personal experiences / events-Talking about current and temporary situations & permanent and regular situations* - describing experiences and feelings engaging in small talk- describing requirements and abilities.		

UNIT-III	DESCRIPTION OF A PROCESS / PRODUCT	6
Listening - Listen to product and process descriptions; a classroom lecture; and advertisements about products. Speaking – Picture description- describing locations in workplaces- Giving instruction to use the product- explaining uses and purposes- Presenting a product- describing shapes and sizes and weights- talking about quantities(large & small)-talking about precautions.		


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UNIT-IV	CLASSIFICATION AND RECOMMENDATIONS	6
Listening – Listening to TED Talks; Listening to lectures - and educational videos. Speaking – Small Talk; discussing and making plans-talking about tasks-talking about progress- talking about positions and directions of movement-talking about travel preparations- talking about transportation.		

UNIT-V	EXPRESSION	6
Listening – Listening to debates/ discussions; different viewpoints on an issue; and panel discussions. Speaking -making predictions- talking about a given topic-giving opinions-understanding a website-describing processes		

L: 00	T: 00	P: 30	Total : 30 Periods
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WEB RESOURCES

- https://www.lisedunetwork.com/the-fundamentals-of-communication/#google_vignette
- <http://hdl.handle.net/10603/58170>
- <https://www.vedantu.com/english/narration>
- <https://asana.com/resources/product-development-process>
- <https://onlinelibrary.wiley.com/doi/10.1155/2019/8043905>

COURSE OUTCOMES

At the end of the course students should be able to

CO1:To listen to and comprehend general as well as complex academic information

CO2:To listen to and understand different points of view in a discussion

CO3:To speak fluently and accurately in formal and informal communicative contexts

CO4:To describe products and processes and explain their uses and purposes clearly and accurately

CO5:To express their opinions effectively in both formal and informal discussions


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(An Autonomous Institution)

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Recognized by UGC & Accredited by NAAC and NBA (CSE and ECE)



REGULATION 2024

B.TECH ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

CHOICE BASED CREDIT SYSTEM

SYLLABUS FOR SEMESTER II

24UHS201	PROFESSIONAL ENGLISH II (Common to all Branches)	L	T	P	C
		2	0	0	2

Prerequisites:

- Basic Knowledge in Language usage

COURSE OBJECTIVES

- To engage learners in meaningful language activities to improve their reading and writing skills
- To learn various reading strategies and apply in comprehending documents in professional context
- To help learners understand the purpose, audience, contexts of different types of writing
- To develop analytical thinking skills for problem solving in communicative contexts
- To demonstrate an understanding of job applications and interviews for internship and placements

UNIT-I	MAKING COMPARISONS	6
Reading – Reading comprehension task :Reading strategies, Methods - skimming, scanning, paraphrasingvs summarizing, Reading advertisements, user manuals, brochures; Proforma invoices Writing – Professional emails, Email etiquette, Creative Writing-Content writing, blog writing , Grammar –Preposition & Prepositional phrases Vocabulary – Words on Engineering materials		

UNIT-II	EXPRESSING CAUSAL RELATIONS IN SPEAKING AND WRITING	6
Reading - Reading longer technical texts, Reading short articles& Journals Writing -Writing responses to complaints, Letters / emails of complaint, writing a travelogue, Agenda with Minutes of meeting(MoM), Cause and Effect Essays, Grammar - If conditional sentences, Active & Passive Voice transformations,		

UNIT-III	PROBLEM SOLVING	6
Reading - Case Studies, excerpts from literary texts, etc. Writing – Letter to the Editor, Sequence of Jumbled paragraph, Checklists, Hints Development - Problem solution essay / Argumentative Essay. Grammar – Error correction; Modals Vocabulary – Idioms and phrases.		

UNIT-IV	REPORTING OF EVENTS AND RESEARCH	6
Reading –Newspaper articles; Writing – Recommendations, Transcoding, Structure of Reports-Accident Report, Survey Report, Project Report Grammar – Reported Speech, Vocabulary – Conjunctions.		

UNIT-V	THE ABILITY TO PUT IDEAS OR INFORMATION COGENTLY	6
Reading – Company profiles, Statement of Purpose, (SOP), an excerpt of interview with professionals; Writing – Job / Internship application – Cover letter & Resume; Business communication letters, Grammar – Numerical adjectives, Relative Clauses, Vocabulary – Infinitive and Gerunds.		

L:30	T: 00	P: 00	Total : 30 Periods
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TEXT BOOKS
1. English for Engineers & Technologists (2020 edition) Orient Blackswan Private Ltd. Department of English, Anna University. 2. English for Science & Technology Cambridge University Press 2021. 3. Authored by Dr. VeenaSelvam, Dr.SujathaPriyadarshini, Dr.Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Jovani, Department of English, Anna University.
REFERENCES
1. Raman. Meenakshi, Sharma. Sangeeta (2019). Professional English. Oxford university press. New Delhi. 2. Improve Your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, NewDelhi. 3. Learning to Communicate – Dr. V. Chellammal. Allied Publishers, New Delhi, 2003. 4. Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd., 2001, New Delhi. 5. Developing Communication Skills by Krishna Mohan, MeeraBannerji- Macmillan India Ltd. 1990, Delhi.


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WEB RESOURCES

- <https://academicguides.waldenu.edu/writingcenter/grammar/comparisons#:~:text=Adjectives%20and%20adverbs%20can%20be,to%20hedge%20or%20boost%20language.>
- <https://www.linkedin.com/pulse/causality-expressed-natural-language-text-vivek-khetan>
- <https://www.sessionlab.com/blog/problem-solving-techniques/>

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Compare and contrast products and ideas in technical texts

CO2: Identify cause and effects in events, industrial processes through technical texts

CO3: Analyse problems in order to arrive at feasible solutions and communicate them orally and in the written format

CO4: Report events and the processes of technical and industrial nature

CO5: Present their opinions in a planned and logical manner, and draft effective resumes in context of job search



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24UMA201	STATISTICS AND NUMERICAL METHODS (Common to All Branches)	L	T	P	C
		3	1	0	4

Prerequisites:
Basic Knowledge in Scientific Calculator usage

COURSE OBJECTIVES

- This course aims at providing the necessary basic concepts of a few statistical and numerical methods and give procedures for solving numerically different kinds of problems occurring in engineering and technology.
- To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems?
- To introduce the basic concepts of solving algebraic and transcendental equations.
- To introduce the numerical techniques of interpolation in various intervals and numerical
- Techniques of differentiation and integration which plays an important role in engineering and technology disciplines.
- To acquaint the knowledge of various techniques and methods of solving ordinary differential equations.

UNIT-I	TESTING OF HYPOTHESIS	9 + 3
Sampling distributions - Tests for single mean, proportion and difference of means (Large and small samples) – Tests for single variance and equality of variances – Chi square test for goodness of fit – Independence of attributes. Application of chi square test.		

UNIT-II	DESIGN OF EXPERIMENTS	9 + 3
One way and two way classifications - Completely randomized design – Randomized block design – Latin square design - 22 factorial design. Application of Design of experiment SPSS software (Practical oriented).		

UNIT-III	SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS	9 + 3
Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method- Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel - Eigenvalues of a matrix by Power method and Jacobi's method for symmetric matrices.		

UNIT-IV	INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION	9 + 3
Lagrange's and Newton's divided difference interpolations – Newton's forward and backward difference interpolation – Approximation of derivatives using interpolation polynomials – Numerical single and double integrations using Trapezoidal and Simpson's 1/3 rules.		


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UNIT-V	NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS	9 + 3
Single step methods: Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge-Kutta method for solving first order differential equations - Multi step methods: Milne's and Adams - Bash forth predictor corrector methods for solving first order differential equations.		

L:45	T: 15	P: 00	Total : 60 Periods
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TEXT BOOKS

1. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.
2. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.

REFERENCES

1. Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016.
2. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2014.
3. Gerald. C.F. and Wheatley. P.O. "Applied Numerical Analysis" Pearson Education, Asia, New Delhi, 7th Edition, 2007.
4. Gupta S.C. and Kapoor V. K., "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, New Delhi, 12th Edition, 2020.
5. Spiegel. M.R., Schiller. J. and Srinivasan. R.A., "Schaum's Outlines on Probability and Statistics ", Tata McGraw Hill Edition, 4th Edition, 2012.
6. Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", 9th Edition, Pearson Education, Asia, 2010.

WEB RESOURCES

- <http://www.davidmlane.com/hyperstat/index.html>
- <http://www.robertniles.com/stats/>
- <http://webserv.jcu.edu/math/ISEP/ISEP.htm>
- <http://rt.uits.iu.edu/visualization/analytics/stats/spss-getting-started-windows.php>
- <http://www.ats.ucla.edu/stat/>

COURSE OUTCOMES

At the end of the course students should be able to


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- CO1: Apply the concept of testing of hypothesis for small and large samples in real life problems.
- CO2: Apply the basic concepts of classifications of design of experiments in the field of agriculture.
- CO3: Appreciate the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineering problems.
- CO4: Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications.
- CO5: Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.



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24UGE201	ENVIRONMENTAL SCIENCES AND SUSTAINABILITY (Common to B.E CSE, B. Tech AI&DS, B.Tech IT)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce the basic concepts of environment, ecosystems and biodiversity and emphasize on the biodiversity of India and its conservation.
- To impart knowledge on the causes, effects and control or prevention measures of environmental pollution and natural disasters.
- To facilitate the understanding of global and Indian scenario of renewable and non renewable resources, causes of their degradation and measures to preserve them.
- To familiarize the concept of sustainable development goals and appreciate the interdependence of economic and social aspects of sustainability, recognize and analyze climate changes, concept of carbon credit and the challenges of environmental management.
- To inculcate and embrace sustainability practices and develop a broader understanding on green materials, energy cycles and analyze the role of sustainable urbanization..

UNIT-I	ENVIRONMENT AND BIODIVERSITY	9
Definition, scope and importance of environment – need for public awareness. Eco-system and Energy flow– ecological succession. Types of biodiversity: genetic, species and ecosystem diversity– values of biodiversity, India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ.		

UNIT-II	ENVIRONMENTAL POLLUTION	9
Causes, Effects and Preventive measures of Water, Soil, Air and Noise Pollutions. Solid, Hazardous and E-Waste management. Case studies on Occupational Health and Safety Management system (OHSMS). Environmental protection, Environmental protection acts.		

UNIT-III	RENEWABLE SOURCES OF ENERGY	9
Energy management and conservation, New Energy Sources: Need of new sources. Different types new energy sources. Applications of- Hydrogen energy, Ocean energy resources, Tidal energy conversion. Concept, origin and power plants of geothermal energy.		

UNIT-IV	SUSTAINABILITY AND MANAGEMENT	9
Development , GDP ,Sustainability- concept, needs and challenges-economic, social and aspects of sustainability-from unsustainability to sustainability-millennium development goals, and protocols-Sustainable Development Goals-targets, indicators and intervention areas Climate change- Global, Regional and local environmental issues and possible solutions-case studies. Concept of Carbon Credit, Carbon Footprint. Environmental management in industry- A case study.		


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UNIT-V	SUSTAINABILITY PRACTICES FOR IT	9
Zero waste and R concept, Circular economy, ISO 14000 Series, Material Life cycle assessment, Environmental Impact Assessment. Sustainable habitat: Green computing-benefits and Strategies, Environmental and Cost Benefits of Green Cloud Computing, Green materials, Energy efficiency, Sustainable transports. Sustainable energy: Green Engineering: Sustainable urbanization- Socio economical and technological change.		

L: 45	T: 00	P: 00	Total : 45 Periods
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TEXT BOOKS

1. AnubhaKaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers, 2018.
2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2016.
3. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.
4. Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall.
5. Bradley. A.S; Adebayo, A.O., Maria, P. Engineering applications in sustainable design and development, Cengage learning.
6. Environment Impact Assessment Guidelines, Notification of Government of India, 2006.
7. Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publication, London, 1998.

REFERENCES

1. R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media.38 .edition 2010.
2. Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001.
3. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT. LTD, New Delhi, 2007.
4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, Third Edition, 2015.
5. ErachBharucha "Textbook of Environmental Studies for Undergraduate Courses" Orient BlackswanPvt. Ltd. 2013.

WEB RESOURCES

- <https://en.wikipedia.org/wiki/Biodiversity>
- <https://en.wikipedia.org/wiki/Pollution>
- <https://vikaspedia.in/energy/energy-basics/sources-of-energy>
- <https://blog.se.com/sustainability/2022/06/27/an-introduction-to-sustainability-management-objective-principles-advantage>.
- <https://www.arenasolutions.com/resources/glossary/sustainable-practices/>

COURSE OUTCOMES

At the end of the course students should be able

- CO1: To recognize and understand the functions of environment, ecosystems and biodiversity and their conservation.
- CO2: To identify the causes, effects of environmental pollution and natural disasters and contribute to the preventive measures in the society.
- CO3: To identify and apply the understanding of renewable and non-renewable resources and contribute to the sustainable measures to preserve them for future generations
- CO4: To recognize the different goals of sustainable development and apply them for suitable technological advancement and societal development.
- CO5: To demonstrate the knowledge of sustainability practices and identify green materials, energy cycles and the role of sustainable urbanization.



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24UCS201	PROGRAMMING IN C (Common to B. E CSE, B.TechAI&DS, B.Tech IT)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To understand the constructs of C Language and develop C Programs using basic programming constructs
- To develop C programs using arrays and strings
- To develop modular applications in C using functions
- To develop applications in C using pointers and structures
- To do input/output and file handling in C

UNIT-I	BASICS OF C PROGRAMMING	9
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Introduction to programming paradigms – Applications of C Language -Structure of C program - C programming: Data Types – Typedef - Constants – Enumeration Constants - Keywords – Operators: Precedence and Associativity - Expressions - Input/Output statements, Assignment statements – Decision making statements - Switch statement - Looping statements – Preprocessor directives - Compilation process- Sum of Digits-Prime Number-Quadratic Equation

UNIT-II	ARRAYS AND STRINGS	9
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Introduction to Arrays: Declaration, Initialization – One dimensional array –Two dimensional arrays - String operations: length, compare, concatenate, copy – Selection sort, linear and binary search.

UNIT-III	FUNCTIONS AND POINTERS	9
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Modular programming - Function prototype, function definition, function call, Built-in functions (string functions, math functions) – Recursion (Factorial and Fibonacci), Binary Search using recursive functions –Pointers – Pointer operators – Pointer arithmetic –Array of pointers – Parameter passing: Pass by value, Pass by reference.

UNIT-IV	STRUCTURES AND UNION	9
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Structure - Nested structures – Pointer and Structures – Array of structures – Self referential structures – Dynamic memory allocation - Union - Storage classes and Visibility.

UNIT-V	FILE PROCESSING	9
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Files – Types of file processing: Sequential access, Random access – Sequential access file - Random access file - Command line arguments.

L:45	T:0	P:0	Total: 45 PERIODS
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TEXT BOOKS

1. ReemaThareja, "Programming in C", Oxford University Press, Second Edition, 2016.
2. Kernighan, B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2015.

REFERENCES

1. Paul Deitel and Harvey Deitel, "C How to Program with an Introduction to C++", Eighth


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edition, Pearson Education, 2018.

2. Yashwant Kanetkar, Let us C, 17th Edition, BPB Publications, 2020.

3. Byron S. Gottfried, "Schaum's Outline of Theory and Problems of Programming with C", McGraw- Hill Education, 1996.

4. Pradip Dey, Manas Ghosh, "Computer Fundamentals and Programming in C", Second Edition, Oxford University Press, 2013.

6. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", 1st Edition, Pearson Education, 2013.

WEB RESOURCES

- https://onlinecourses.nptel.ac.in/noc22_cs40/preview
- <https://archive.nptel.ac.in/courses/106/105/106105171>

COURSE OUTCOMES

Upon completion of the course, the students will be able to

CO1: Develop simple applications in C using basic constructs

CO 2: Design and implement applications using arrays and strings.

CO3: Develop and implement modular applications in C using functions.

CO4: Develop applications in C using structures and pointers.

CO5: Design applications using sequential and random access file processing.



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24UHS202	TAMILS AND TECHNOLOGY (Common to All Branches)	L	T	P	C
		1	0	0	1

COURSE OBJECTIVES

- Appreciate weaving and ceramic technology.
- Learn the design and construction technology of ancient times.
- Understand the engineering principles of manufacturing technology.
- Introduce the methods of irrigation and agricultural technology.
- Learn the scientific tamil and tamil computing.

UNIT I	WEAVING AND CERAMIC TECHNOLOGY	3
Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.		

UNIT II	DESIGN AND CONSTRUCTION TECHNOLOGY	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 - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)-ThirumalaiNayakarMahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period		

UNIT III	MANUFACTURING TECHNOLOGY	3
Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting,steel -Copper and goldCoins as source of history - Minting of Coins – Beads making-industries Stone beads - Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram.		

UNIT IV	AGRICULTURE AND IRRIGATION TECHNOLOGY	3
Dam, Tank, ponds, Sluice, Significance of KumizhiThoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.		

UNIT V	SCIENTIFIC TAMIL & TAMIL COMPUTING	3
Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.		

L:15	T: 00	P: 00	Total : 15 Periods
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24UHS202	தமிழரும் தொழில்நுட்பமும் (Common to All Branches)	L	T	P	C
		1	0	0	1

அலகு I	தெசவு மற்றும்பாணைத்தொழில்நுட்பம்	3
சங்க காலத்தில் நெசவுத்தொழில்- பாணைத்தொழில் நுட்பம் கருப்பு சிவப்பு பாண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள்.		

அலகு II	வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்	3
சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம் சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள்&சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் - சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் கோவில்களும் மாமல்லபுரம் சிற்பங்களும், சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் நாயக்கர் காலக் கோயில்கள் மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் செட்டிநாட்டு வீடுகள் பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ - சாரோசெனிக் கட்டிடக் கலை.		

அலகு III	உற்பத்தி தொழில்நுட்பம்	3
கப்பல் கட்டும் கலை உலோகவியல் - இரும்பு தொழிற்சாலை - இரும்பை உருக்குதல், எஃகு வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் - நாணயங்கள் அச்சடித்தல் மணி உருவாக்கும் தொழிற்சாலைகள் மணிகள் துண்டுகள் - கல்மணிகள், கண்ணாடி சுடுமண் மணிகள் சங்கு மணிகள் எலும்புத் தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்		

அலகு IV	வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில்நுட்பம்	3
அணை, ஏரி, குளங்கள், மதகு - சோழர் காலக் குழுதித் தூம்பின் முக்கியத்துவம் கால்நடை பராமரிப்பு கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மீன்வளம் முத்து மற்றும் முத்துக்குளித்தல் -பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம்.		

அலகு V	அறிவியல் தமிழ் மற்றும் கணித்தமிழ்	3
அறிவியல் தமிழின் வளர்ச்சி - கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்கள் மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக் கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் சொற்குவைத்திட்டம்		

L:15	T: 00	P: 00	Total : 15 Periods
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TEXT-CUM-REFERENCE BOOKS

1. தமிழகவரலாறு - மக்களும்பண்பாடும் - கே .கே .பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல்மற்றும் கல்வியியல்பணிகள்கழகம்).
2. கணினித்தமிழ் -முனைவர்இல .சுந்தரம்.(விகடன்பிரசுரம்).
3. கீழடி - வைகைநதிக்கரையில் சங்ககாலநகரநாகரிகம் (தொல்லியல்துறை வெளியீடு)
4. பொருறை - ஆற்றங்கரைநாகரிகம்(தொல்லியல்துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A Joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils – The classical Period (Dr.S.Singaravelu) (Published by: International institute of Tamil Studies).
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.k.D.Thirunavukkarasu) (Published by:Institute of Tamil Studies).
8. The Contribution of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: Institute of Tamil Studies).
9. Keeladi – Sangam City Civilization on the banks of banks of river Vaigai' (Jointly Published by: Department of archaeology & Tamil Nadu Text book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (published by: The Author).
11. Porunai Civilization (jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.


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24UECI221	DIGITAL PRINCIPLES AND DESIGN (For B.E CSE, B.Tech AI&DS, B.Tech IT)	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES

- To learn basic number systems, logic gates, and methods to simplify Boolean expressions..
- To understand and design combinational circuits like adders, multiplexers, decoders, and comparators.
- To study flip-flops, registers, counters, and how to design synchronous sequential circuits.
- To learn how asynchronous circuits work and how to design them without hazards.
- To understand memory devices and programmable logic components used in digital systems.

UNIT-I	DIGITAL FUNDAMENTALS	9
Number Systems – Decimal, Binary, Octal, Hexadecimal, 1's and 2's complements, Codes – Binary, BCD, Excess 3, Gray, Alphanumeric codes, Boolean theorems, Logic gates, Universal gates, Sum of products and product of sums, Min terms and Maxterms, Karnaugh map Minimization and Quine-McCluskey method of minimization.		

UNIT-II	COMBINATIONAL LOGIC	9
Design of Half and Full Adders, Half and Full Subtractors, Binary Parallel Adder – Carry look ahead Adder— Binary Multiplier — Magnitude Comparator — Decoders — Encoders — Multiplexers — Parity Generator and Checker, HDL models of Combinational circuit.		

UNIT-III	SYNCHRONOUS SEQUENTIAL LOGIC	9
Sequential Circuits — Storage Elements: Latches, Flip-Flops — Analysis of Clocked Sequential Circuits — State Reduction and Assignment — Design Procedure — Registers and Counters — HDL Models of Sequential Circuits.		

UNIT-IV	ASYNCHRONOUS SEQUENTIAL LOGIC	9
Analysis and Design of Asynchronous Sequential Circuits — Reduction of State and Flow Tables — Race-free State Assignment — Hazards.		

UNIT-V	MEMORY AND PROGRAMMABLE LOGIC	9
RAM — Memory Decoding — Error Detection and Correction — ROM — Programmable Logic Array — Programmable Array Logic — Sequential Programmable Devices.		


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PRACTICAL EXERCISES:

1. Design of adders and subtractors & code converters.
2. Design of Multiplexers & Demultiplexers.
3. Design of Encoders and Decoders.
4. Design of Magnitude Comparators
5. Design and implementation of counters using flip-flops
6. Design and implementation of shift registers.

LIST OF EQUIPMENTS

1. Digital Trainer kit
2. Logic gates (AND, OR, XOR)
3. IC chips (e.g., 7400 series)
4. Flip flops IC

L:45	T: 0	P: 30	Total : 75 Periods
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TEXT BOOKS

1. M. Morris Mano and Michael D. Ciletti, "Digital Design", 5th Edition, Pearson, 2014.
2. Charles H.Roth. "Fundamentals of Logic Design", 6th Edition, Thomson Learning, 2013

REFERENCES

1. Thomas L.Floyd, "Digital Fundamentals", 10th Edition, Pearson Education Inc, 2011.
2. S.Salivahanan and S.Arivazhagan, "Digital Electronics", 1st Edition, Vikas Publishing House Private Ltd, 2012.
3. Soumitra Kumar Mandal, "Digital Electronics", Mc Graw Hill Education Private Limited, 2016.

WEB RESOURCES

- https://www.youtube.com/watch?v=HiWwf3jZpql&list=PL4bg5GylbV_G1gl45Rd8NN9LxX_b9B9n&index=2

COURSE OUTCOMES

At the end of the course students should be able to

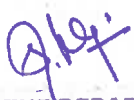
CO1: Use Boolean algebra and simplification procedures relevant to digital logic

CO2: Design various combinational digital circuits using logic gates

CO3: Analyse and design synchronous sequential circuits

CO4: Analyse and design asynchronous sequential circuits.

CO5: Build logic gates and use programmable devices.


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24UGE211	ENGINEERING FUNDAMENTALS LABORATORY (Common to All branches)	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES

- Drawing pipe line plan; laying and connecting various pipe fittings used in common household plumbing work; Sawing; planing; making joints in wood materials used in common household wood work.
- Wiring various electrical joints in common household electrical wire work.
- Welding various joints in steel plates using arc welding work; Machining various simple processes like turning, drilling, tapping in parts; Assembling simple mechanical assembly of common household equipments; Making a tray out of metal sheet using sheet metal work.
- Soldering and testing simple electronic circuits; Assembling and testing simple electronic components on PCB.
- Understand the components of computer system and OS.
- Familiarize office automation tools.

Part – A (Civil and Mechanical)

(Students will be offered any 10 experiments)

1.	Land documents reading and understanding
2.	Material identification and testing as per BIS & NBC
3.	Basic surveying and land area measurement
4.	Water analysis
5.	Basic vastu
6.	Make a Butt/Lap/Tee joint of MS plate using Arc welding and also make Lap joint using riveting
7.	Prepare T/L/Lap joint from the given wooden work piece and make a Box /Tray out of plywood using modern power tools
8.	Perform the simple turning, drilling, tapping using lathe
9.	Demonstration of basic foundry operations
10.	Making a square tray using sheet metal
11.	Study of various metals and alloys
12.	Hands on training to use measuring instruments
13.	Study of 3-D printer / Robotics architecture / Mechatronics system

Part – B (Electrical and Electronics)

Students will be offered any 07 experiments

1.	Study of electrical switches, fuses, indicators, circuit breakers, contactors and relays
2.	Wiring circuit for fluorescent lamp and Stair case wiring
3.	Wiring Circuit of ceiling fan
4.	Measurement of Earth Resistance
5.	House wiring with energy meter, RCCB and ELCB
6.	Study of electronic components resistor, diode, transistors etc.,
7.	Soldering and Assembly of Simple Circuits and trouble shooting


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8.	Measuring devices (multimeter, voltmeter, ammeter, megger)
Part- C (Computer Technologies)	
1.	Office automation tools - Word processing
2.	Office automation tools –Spread sheets
3.	Office automation tools - Presentation preparation
4.	Network topology configuration
5.	Network crimping & I/O outlet termination
6.	Types of operating systems and installation

L:0	T:0	P:60	Total:60 Periods
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LIST OF EQUIPMENTS REQUIRED

Plumbing Equipments

Welding Machine-Set up

Electrical and Electronics Kit

Hardware Requirements

- Standard PC

Software Requirements

- Windows 7 or higher
- Office automation tools (open source)

COURSE OUTCOMES:

Upon completion of this course, the students will be able to:

CO1: Draw pipe line plan; lay and connect various pipe fittings used in common household plumbing work; Saw; plan; make joints in wood materials used in common household wood work.

CO2: Wire various electrical joints in common household electrical wire work.

CO3: Weld various joints in steel plates using arc welding work; Machine various simple processes like turning, drilling, tapping in parts; Assemble simple mechanical assembly of common household equipments; Make a tray out of metal sheet using sheet metal work.

CO4: Solder and test simple electronic circuits; Assemble and test simple electronic components on PCB.

CO5: Install and configure various operating systems.

CO6: Apply office automation tools to create, edit, format, and manage professional documents

NLP

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24UCS211	PROGRAMMING IN C LABORATORY (Common to B. E CSE, B.Tech AI&DS and B.Tech IT)	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To develop programs in C using basic constructs.
- To develop programs in C using arrays.
- To develop applications in C using strings, pointers, functions.
- To develop applications in C using structures.
- To develop applications in C using file processing.

S.No.	LIST OF EXERCISES:
The lab instructor is expected to design problems based on the topics listed.	
1	I/O statements, operators, expressions
2	Decision-making constructs: if-else, goto, switch-case, break-continue
3	Loops: for, while, do-while
4	Arrays: 1D and 2D, Multi-dimensional arrays
5	Strings: operations
6	Functions: call, return, passing parameters by (value, reference), passing arrays to function.
7	Recursion
8	Pointers: Pointers to functions, Arrays, Strings, Pointers to Pointers, Array of Pointers
9	Structures: Nested Structures, Pointers to Structures, Arrays of Structures and Unions.
10	Files: reading and writing, file operations, Sequential Access ,Random Access

L:0	T:0	P:45	Total: 45 PERIODS
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LIST OF EQUIPMENTS REQUIRED

HARDWARE REQUIREMENTS

Standard PC

SOFTWARE REQUIREMENTS

1. Windows 7 or higher
2. Dev C++

COURSE OUTCOMES:

Upon completion of the course, the students will be able to

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


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24UHS211	COMMUNICATION LABORATORY (Common to all Branches)	L	T	P	C
		0	0	4	2

Prerequisites:

- Basic Knowledge in Language usage

COURSE OBJECTIVES:

- To identify varied group discussion skills and apply them to take part in effective discussions in a professional context.
- To analyse concepts and problems and make effective presentations explaining them clearly and precisely.
- To be able to communicate effectively through formal and informal writing.
- To be able to use appropriate language structures to write emails, reports and essays
- To give instructions and recommendations that are clear and relevant to the context

UNIT-I	MAKING COMPARISONS	12
Speaking-Role Play Exercises Based on Workplace Contexts, - talking about competition discussing progress toward goals-talking about experiences- talking about events in life-discussing past events-Writing: writing emails (formal & semi-formal).		

UNIT-II	EXPRESSING CAUSAL RELATIONS IN SPEAKING AND WRITING	12
Speaking: discussing news stories-talking about frequency-talking about travel problems discussing travel procedures- talking about travel problems- making arrangements-describing arrangements-discussing plans and decisions- discussing purposes and reasons- understanding common technology terms-Writing: - writing different types of emails.		

UNIT-III	PROBLEM SOLVING	12
Speaking: discussing predictions-describing the climate-discussing forecasts and scenarios-talking about purchasing-discussing advantages and disadvantages- making comparisons-discussing likes and dislikes- discussing feelings about experiences-discussing imaginary scenarios Writing: short essays and reports-formal/semi-formal letters.		

UNIT-IV	REPORTING OF EVENTS AND RESEARCH	12
Speaking: discussing the natural environment-describing systems-describing position and movement- explaining rules - (example- discussing rental arrangements) - understanding technical instructions-Writing: writing instructions-writing a short article.		


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UNIT-V	THE ABILITY TO PUT IDEAS OR INFORMATION COGENTLY	12
Speaking: describing things relatively-describing clothing-discussing safety issues (making recommendations) talking about electrical devices-describing controlling actions- Writing: job application (Cover letter + Curriculum vitae)-writing recommendations		

L:0	T:0	P:60	Total: 60 PERIODS
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WEB RESOURCES
• https://academicguides.waldenu.edu/writingcenter/grammar/comparisons#:~:text=Adjectives%20and%20adverbs%20can%20be,to%20hedge%20or%20boost%20language. • https://www.linkedin.com/pulse/causality-expressed-natural-language-text-vivek-khetan • https://www.sessionlab.com/blog/problem-solving-techniques/
COURSE OUTCOMES
At the end of the course students should be able to
CO1: Speak effectively in group discussions held in formal/semi formal contexts.
CO2:Discuss, analyse and present concepts and problems from various perspectives to arrive at suitable solutions
CO3: Write emails, letters and effective job applications.
CO4:Write critical reports to convey data and information with clarity and precision
CO5:Give appropriate instructions and recommendations for safe execution of tasks


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REGULATION 2024

B.TECH ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

CHOICE BASED CREDIT SYSTEM

SYLLABUS FOR SEMESTER III

24UMA302	DISCRETE MATHEMATICS (Common to B.E CSE & B.Tech IT & AI & DS Branches)	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES :

- To extend student's logical and mathematical maturity and ability to deal with abstraction
- To introduce most of the basic terminologies used in computer science courses and application of ideas to solve practical problems.
- To introduce most of the basic terminologies used in computer science courses and application of ideas to solve practical problems.
- To understand the basic concepts of combinatorics and graph theory.
- To familiarize the applications of algebraic structures.
- To understand the concepts and significance of lattices and boolean algebra which are widely used in computer science and engineering

UNIT-I	LOGIC AND PROOFS	9 + 3
Propositional logic – Propositional equivalences - Predicates and quantifiers – Rules of inference - Introduction to proofs – Proof methods and strategy (Method of Contradiction and Contra positive).		

UNIT-II	COMBINATORICS	9 + 3
Mathematical induction – Strong induction and well ordering – The basics of counting – The pigeonhole principle – Recurrence relations – Solving linear recurrence relations – Generating functions – Inclusion and exclusion principle and its applications.		

UNIT-III	GRAPHS	9 + 3
Graphs and graph models – Graph terminology and special types of graphs – Matrix representation of graphs and graph isomorphism – Connectivity – Euler and Hamilton paths.		

UNIT-IV	ALGEBRAIC STRUCTURES	9 + 3
Algebraic systems – Semi groups and monoids - Groups – Subgroups – Homomorphism's – Normal subgroup and cosets – Lagrange's theorem – Definitions and examples of Rings and Fields (Basic definitions and examples).		

UNIT-V	LATTICES AND BOOLEAN ALGEBRA	9 + 3
Partial ordering – Posets – Lattices as posets – Properties of lattices - Lattices as algebraic systems – Sub lattices – Direct product and homomorphism – Some special lattices – Boolean algebra – Boolean Homomorphism.		

L:45	T:15	T: 60 PERIODS
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TEXT BOOKS

- Rosen. K.H., "Discrete Mathematics and its Applications", 7th Edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2017.
- 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.

REFERENCES

- Grimaldi. R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", 5 th Edition, Pearson Education Asia, Delhi, 2013.
- Koshy. T. "Discrete Mathematics with Applications", Elsevier Publications, 2006.
- Lipschutz. S. and Mark Lipson., "Discrete Mathematics", Schaum's Outlines, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 3rd Edition, 2010,

COURSE OUTCOMES

At the end of the course students should be able to

CO1: Have knowledge of the concepts needed to test the logic of a program.

CO2: Have an understanding in identifying structures on many levels.

CO3: Be aware of a class of functions which transform a finite set into another finite set which relates to input and output functions in computer science.

CO4: Be aware of the counting principles.

CO5: Be exposed to concepts and properties of algebraic structures such as groups, rings and fields.


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24UAD301	ARTIFICIAL INTELLIGENCE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- Learn the basic AI approaches
- Develop problem solving agents
- Perform logical and probabilistic reasoning

UNIT-I	INTELLIGENT AGENTS	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-II	PROBLEM SOLVING	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		

UNIT-III	GAME PLAYING AND 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-IV	LOGICAL REASONING	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-V	PROBABILISTIC REASONING	9
Acting under uncertainty – Bayesian inference – naïve Bayes models. Probabilistic reasoning – Bayesian networks – exact inference in BN – approximate inference in BN – causal networks-AI applications-NLP(Natural Language Processing)		


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TEXT BOOKS

1. Stuart Russell and Peter Norvig, "Artificial Intelligence – A Modern Approach", Fourth Edition, Pearson Education, 2021

REFERENCES

1. Dan W. Patterson, "Introduction to AI and ES", Pearson Education, 2007
2. Kevin Night, Elaine Rich, and Nair B., "Artificial Intelligence", McGraw Hill, Third Edition 2017
3. Patrick H. Winston, "Artificial Intelligence", Third Edition, Pearson Education, 2006
4. Deepak Khemani, "Artificial Intelligence", Tata McGraw Hill Education, 2013.

COURSE OUTCOMES

At the end of the course students should be able to:

- 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

24UAD302	DATA STRUCTURES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To understand the concepts of ADTs
- To design linear data structures – lists, stacks, and queues
- To understand sorting, searching and hashing algorithms
- To apply Tree structures
- To apply Graph structures

UNIT-I	ABSTRACT DATA TYPES	7
Abstract Data Types (ADTs) – ADTs and classes – classes in Python – namespaces – shallow and deep copying-Introduction to analysis of algorithms – asymptotic notations –recursion – analyzing recursive algorithms.		

UNIT-II	LINEAR STRUCTURES	11
List ADT – array-based implementations – linked list implementations – singly linked lists – circularly linked lists – doubly linked lists – applications of lists:Polynomial Manipulation– Stack ADT – Queue ADT – double ended queues		

UNIT-III	SORTING AND SEARCHING	9
Bubble sort – selection sort – insertion sort – merge sort – quick sort – linear search – binary search – hashing – hash functions – collision handling – load factors, rehashing, and efficiency		

UNIT-IV	TREE STRUCTURES	9
Tree ADT – Binary Tree ADT – tree traversals – binary search trees – AVL trees – heaps – multi- way search trees		

UNIT-V	GRAPH STRUCTURES	9
Graph ADT – representations of graph – graph traversals – DAG – topological ordering – shortest paths – minimum spanning trees		

L: 45	T: 0	P: 0	Total: 45 Periods
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TEXT BOOKS

1. Michael T. Goodrich, Roberto Tamassia, and Michael H. Goldwasser, "Data Structures and Algorithms in Python" (An Indian Adaptation), Wiley, 2021.
2. Lee, Kent D., Hubbard, Steve, "Data Structures and Algorithms with Python" Springer Edition 2015.
3. Narasimha Karuma chi, "Data Structures and Algorithmic Thinking with Python" Careermonk, 2015.

REFERENCES

1. Rance D. Necaie, "Data Structures and Algorithms Using Python", John Wiley & Sons, 2011.
2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, "Introduction to Algorithms", Fourth Edition, PHI Learning, 2022.
3. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", Fourth Edition, Pearson Education, 2014
4. Aho, Hopcroft, and Ullman, "Data Structures and Algorithms", Pearson Education India, 2002.

COURSE OUTCOMES

- CO1: Explain abstract data types
- CO2: Design, implement, and analyse linear data structures, such as lists, queues, and stacks, according to the needs of different applications
- CO3: Design, implement, and analyse efficient tree structures to meet requirements such as searching, indexing, and sorting
- CO4: Model problems as tree problems and implement efficient tree algorithms to solve them
- CO5: Model problems as graph problems and implement efficient graph algorithms to solve them

24UAD303	DATA SCIENCE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To understand the techniques and processes of data science
- To apply descriptive data analytics
- To visualize data for various applications
- To understand inferential data analytics
- To analysis and build predictive models from data.

UNIT-I	INTRODUCTION TO DATA SCIENCE	8
Need for data science – benefits and uses – facets of data – data science process – setting the research goal – retrieving data – cleansing, integrating, and transforming data – exploratory data analysis – build the models – presenting and building applications.		

UNIT-II	DESCRIPTIVE ANALYTICS	10
Frequency distributions – Outliers –interpreting distributions – graphs – averages - describing variability – inter quartile range – variability for qualitative and ranked data - Normal distributions – z scores –correlation – scatter plots – regression – regression line – least squares regression line – standard error of estimate – interpretation of r^2 – multiple regression equations – regression toward the mean.		

UNIT-III	INFERENTIAL STATISTICS	9
Populations – samples – random sampling – Sampling distribution- standard error of the mean - Hypothesis testing – z-test – z-test procedure –decision rule – calculations – decisions – interpretations - one-tailed and two-tailed tests – Estimation – point estimate -estimating parameters – confidence interval – level of confidence – effect of sample size.		

UNIT-IV	ANALYSIS OF VARIANCE	9
t-test for one sample – sampling distribution of t – t-test procedure – t-test for two independent samples – p-value – statistical significance – t-test for two related samples. F-test – ANOVA – Two-factor experiments – three f-tests – two-factor ANOVA –Introduction to chi-square tests.		

UNIT-V	PREDICTIVE ANALYTICS	9
Linear least squares – implementation – goodness of fit – testing a linear model – weighted re sampling. Regression using Stats Models – nonlinear relationships – logistic regression - Time series analysis – moving averages – missing values – serial correlation – autocorrelation. Introduction to survival analysis-Case Study in Survival Analysis		

TEXT BOOKS

1. David Cielen, Arno D. B. Meysman, and Mohamed Ali, "Introducing Data Science", Manning Publications, 2016. (First two chapters for Unit I).
2. Robert S. Witte and John S. Witte, "Statistics", Eleventh Edition, Wiley Publications, 2017.
3. Jake VanderPlas, "Python Data Science Handbook", O'Reilly, 2016.

REFERENCES

1. Allen B. Downey, "Think Stats: Exploratory Data Analysis in Python", Green Tea Press, 2014.
2. Sanjeev J. Wagh, Manisha S. Bhende, Anuradha D. Thakare, "Fundamentals of Data Science", CRC Press, 2022.
3. Chirag Shah, "A Hands-On Introduction to Data Science", Cambridge University Press, 2020.
4. Vineet Raina, Srinath Krishnamurthy, "Building an Effective Data Science Practice: A Framework to Bootstrap and Manage a Successful Data Science Practice", Apress, 2021.

COURSE OUTCOMES

At the end of the course students should be able to:

CO1: Explain the data analytics pipeline

CO2: Describe and visualize data

CO3 : Perform statistical inferences from data

CO4 : Analyze the variance in the data

CO5 : Build models for predictive analytics

24UCS302	OBJECT ORIENTED PROGRAMMING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand Object Oriented Programming concepts and basics of Java programming language.
- To know the principles of packages, inheritance and interfaces.
- To develop a java application with exceptions and threads.
- To define the use of I/O streams generics and Collection Framework.
- To design and build Graphical User Interface Application using JAVA FX.

UNIT I	INTRODUCTION TO OOP AND JAVA	9
Overview of OOP – Object oriented programming paradigms – Features of Object Oriented Programming –Overview of Java – Java Buzzwords – Data Types, Variables and Arrays – Operators – Control Statements – Programming Structures in Java – Defining classes in Java – Constructors-Methods –Access specifiers - Static members- Java Doc comments		

UNIT II	INHERITANCE, PACKAGES AND INTERFACES	9
Overloading Methods – Objects as Parameters – Returning Objects –Static, Nested and Inner Classes. Inheritance: Basics– Types of Inheritance -Super keyword -Method Overriding – Dynamic Method Dispatch –Abstract Classes – final with Inheritance. Packages and Interfaces: Packages – Packages and Member Access –Importing Packages – Interfaces.		

UNIT III	EXCEPTION HANDLING AND MULTI THREADING	9
Exception Handling basics – Multiple catch Clauses – Nested try Statements – Java's Built-in Exceptions – User defined Exception. Multithreaded Programming: Java Thread Model– Creating Multiple Threads – Priorities – Synchronization – Inter Thread Communication– Suspending –Resuming, and Stopping Threads –Multithreading a Thread and Wrappers – Auto boxing.		

UNIT IV	I/O, GENERICS , AND COLLECTION FRAMEWORK	9
I/O Basics – Reading and Writing Console I/O – Reading and Writing Files. Generic classes – Generic Methods – Bounded Types – Restrictions and Limitations. Basic Collection Framework Overview- Basics of List- Set-Queue-Strings: Basic String class, methods and String Buffer Class.		


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UNIT V	JAVAFX EVENT HANDLING, CONTROLS AND COMPONENTS	9
JAVAFX Events and Controls: Event Basics – Handling Key and Mouse Events. Controls: Checkbox, ToggleButton – RadioButtons – ListView – ComboBox – ChoiceBox – Text Controls – ScrollPane. Layouts – FlowPane – HBox and VBox – BorderPane – StackPane – GridPane. Menus – Basics – Menu – Menu bars – Menu Item		

L:45	T:0	P:0	Total: 45 Periods
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TEXT BOOKS

1. Herbert Schildt, "Java: The Complete Reference", 11 th Edition, McGraw Hill Education, New Delhi, 2019.
2. Herbert Schildt, "Introducing JavaFX 8 Programming", 1 st Edition, McGraw Hill Education, New Delhi, 2015

REFERENCES

1. Cay S. Horstmann, "Core Java Fundamentals", Volume 1, 11 th Edition, Prentice Hall, 2020

COURSE OUTCOMES

Upon completion of the course, the students will be able to

CO1: Apply the concepts of classes and objects to solve simple problems

CO2: Develop programs using inheritance, packages and interfaces

CO3: Make use of exception handling mechanisms and multithreaded model to solve real world problems

CO4: Build Java applications with I/O packages, Generics Concepts , Collections and Frameworks

CO5: Integrate the concepts of event handling and JavaFX components and controls for developing GUI based applications


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24UAD311	ARTIFICIAL INTELLIGENCE LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES

- To design and implement search strategies
- To implement game playing techniques
- To implement CSP techniques
- To develop systems with logical reasoning
- To develop systems with probabilistic reasoning

LIST OF EXPERIMENTS

1. Implement uninformed search strategies -BFS & DFS
2. Implement basic search strategies – 8-Puzzle, 8 – Queens problem, Cryptarithmic.
3. Implement A* algorithms.
4. Implement memory bounded A* algorithms
5. Implement Minimax algorithm for game playing (Alpha-Beta pruning)
6. Solve constraint satisfaction problems
7. Implement propositional model checking algorithms
8. Implement forward chaining and resolution strategies
9. Implement backward chaining
10. Build naive Bayes models
11. Implement Bayesian networks and perform inferences
12. Mini-Project

L: 0	T: 0	P: 60	Total: 60 Periods
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COURSE OUTCOMES

At the end of the course students should 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


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24UAD312	DATA STRUCTURES LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES

- To implement ADTs in Python
- To design and implement linear data structures – lists, stacks, and queues
- To implement sorting, searching and hashing algorithms
- To solve problems using tree structures
- To solve problems using graph structures

LIST OF EXPERIMENTS

1. Implement simple ADTs as Python classes
2. Implement recursive algorithms in Python
3. Implement List ADT using Python arrays
4. Linked list implementations of List
5. Implementation of Stack and Queue ADTs
6. Applications of List, Stack and Queue ADTs
7. Implementation of sorting and searching algorithms
8. Implementation of Hash tables
9. Implement smart city traffic management system. T
The city is modeled as a directed, weighted graph, where:
 - Intersections are nodes.
 - Road segments between intersections are directed edges.
 - Edge weights represent the estimated travel time (in minutes) along each road segment, updated in real-time.
 A driver wants to get from Intersection A (source) to Intersection Z (destination) as quickly as possible. Recommend the fastest route based on the current edge weights.
10. Implementation of Binary Search Trees
11. Implementation of Heaps
12. Graph representation and Traversal algorithms
13. Implementation of single source shortest path algorithm
14. Implementation of minimum spanning tree algorithms

L: 0	T: 0	P: 60	Total: 60 Periods
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COURSE OUTCOMES

CO1:Implement ADTs as Python classes

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

CO3:Design, implement, and analyse efficient tree structures to meet requirements such as searching, indexing, and sorting

CO4: Model problems as tree problems and implement efficient tree algorithms to solve them

CO5: Model problems as graph problems and implement efficient graph algorithms to solve them.


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24UAD313	DATA SCIENCE LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES

- To develop data analytic code in python
- To be able to use python libraries for handling data
- To develop analytical applications using python
- To perform data visualization using plots

LIST OF EXPERIMENTS

1. Working with Numpy arrays and Pandas data frames.
2. Implementation of data cleaning with any dataset.
3. Basic plots using Matplotlib.
4. Frequency distributions, Averages, Variability.
5. Normal curves, Correlation and scatter plots, Correlation coefficient.
6. Regression.
7. Z-test.
8. T-test.
9. ANOVA.
10. Building and validating linear models.
11. Building and validating logistic models.
12. Write a Python Program to implement and Validate Time Series Analysis in order to predict the future value with your own sample data

L:	T: 0	P: 60	Total: 60 Periods
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COURSE OUTCOMES

At the end of the course students should be able to:

CO1: Write python programs to handle data using Numpy and Pandas

CO2: Perform descriptive analytics

CO3: Perform basicplots using Matplotlib

CO4: Perform inferential data analytics

CO5: Build models of predictive analytics


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24UCS312	OBJECT ORIENTED PROGRAMMING LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

1. To build software development skills using java programming for real-world applications.
2. To understand and apply the concepts of classes, packages, interfaces, inheritance, exception handling and file processing.
3. To develop applications using generic programming and event handling

S.No	LIST OF EXPERIMENTS
1	Write a java program to create a class student with private data members and public methods to implement encapsulation.
2	Develop a java application with an Employee class with Emp_name, Emp_id, Address, Mail_id, Mobile_no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club funds. Generate pay slips for the employees with their gross and net salary.
3	Write a program to implement method overloading & overriding concepts.
4	Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named printArea (). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method printArea() that prints the area of the given shape.
5	Solve the above problem using an interface.
6	Implement exception handling and creation of user defined exceptions.
7	Write a java program that implements a multi-threaded application that has three threads. First thread generates a random integer every 1 second and if the value is even, the second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of the cube of the number.
8	Write a program to perform file operations.
9	Develop applications to demonstrate the features of generics classes.
10	Develop real world problems for event driven Programming.
11	Develop applications using JavaFX controls, layouts and menus.
12	Develop a mini project for any application using Java concepts.


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COURSE OUTCOMES:

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

CO1: Design and develop java programs using object oriented programming concepts

CO2: Develop simple applications using object oriented concepts such as package, exceptions.

CO3: Implement multithreading, and generics concepts

CO4: Create GUIs and event driven programming applications for real world problems

CO5: Implement and deploy web applications using Java



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REGULATION 2024

B.TECH ARTIFICIAL INTELLIGENCE AND DATA SCIENCE CHOICE

BASED CREDIT SYSTEM

SYLLABUS FOR SEMESTER IV

24UMA401	PROBABILITY AND STATISTICS	L	T	P	C
		3	1	0	4

COURSE OBJECTIVES :

- To provide necessary basic concepts in probability and random variables in applications such as signals, networks and AI tools in engineering
- To familiarize the students with discrete and continuous distributions.
- To introduce the basic concepts of two dimensional random variables.
- To acquaint the knowledge of estimation theory and non –parametric tests in their respective domains.
- To introduce the basic concepts of statistical quality control and how to apply in engineering problems.

UNIT-I	PROBABILITY AND RANDOM VARIABLES	9+3
Axioms of probability – Conditional probability – Baye's theorem - Discrete and continuous random variables – Moments – Moment generating functions –Functions of a random variable.		

UNIT-II	DISCRETE AND CONTINUOUS DISTRIBUTIONS	9+3
Discrete -Binomial, Poisson, Geometric distributions Continuous-Uniform, Exponential and Normal distributions.		

UNIT-III	TWO- DIMENSIONAL RANDOM VARIABLES	9+3
Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables – Central limit theorem (for independent and identical distributed random variables).		

UNIT-IV	ESTIMATION THEORY & NON- PARAMETRIC TESTS	9 + 3
Unbiased estimators - Efficiency - Consistency - Sufficiency - Robustness - Method of moments - Method of maximum Likelihood -Introduction - The Signed Rank test - Rank sum tests - The U test - The H test - Test of randomness - The Kolmogorov Tests.		

UNIT-V	STATISTICAL QUALITY CONTROL	9 + 3
Control charts for measurements ($\bar{X}$ and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits - Acceptance sampling.		

L: 45	T: 15	P: 0	Total: 60 Periods
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TEXT BOOKS

1. Johnson. R.A., Miller. I.R and Freund. J.E, "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 9th Edition, 2016.
2. Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata Mc Graw Hill, 4th Edition, 2007.
3. John E. Freund, "Mathematical Statistics", Prentice Hall, 5th Edition, 1992.

REFERENCES

1. Gupta. S.C. and Kapoor. V. K., "Fundamentals of Mathematical Statistics", Sultan Chand & Sons, New Delhi, 12th Edition, 2020.
2. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2014.
3. Ross. S.M., "Introduction to Probability and Statistics for Engineers and Scientists", 5th Edition, Elsevier, 2014.
4. Spiegel. M.R., Schiller. J. and Srinivasan. R.A., "Schaum's Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill Edition, 4th Edition, 2012.
5. Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia, 9th Edition, 2010.

COURSE OUTCOMES

At the end of the course students should be able to

- CO1: Understand the fundamental knowledge of the probability in signals, communications and in AI domain.
- CO2: Have knowledge of standard distributions which can describe real life phenomenon.
- CO3: Understand the basic concepts of one and two dimensional random variables and apply in engineering applications.
- CO4: Apply the basic concepts of estimation theory and Non –Parametric tests in their respective domains.
- CO5: Have acquire the knowledge of statistical quality control techniques used in engineering problems.


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24UAD401	MACHINE LEARNING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To understand the basic concepts of machine learning.
- To understand and build supervised learning models.
- To understand and build unsupervised learning models.
- To understand and build Neural networks.
- To evaluate the algorithms based on corresponding metrics identified

UNIT-I	INTRODUCTION TO MACHINE LEARNING	8
Review 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-II	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-III	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, Principal Component Analysis (PCA)		
UNIT-IV	NEURAL NETWORKS	9
Multilayer perceptron, activation functions, network training –error backpropagation, from shallow networks to deep networks –Unit saturation (aka the vanishing gradient problem) –ReLU, hyper parameter tuning, batch normalization, regularization, dropout.		
UNIT-V	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		

L: 45	T: 0	P: 0	Total: 45 Periods
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TEXT BOOKS

1. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Fourth Edition, 2020.
2. Stephen Marsland, "Machine Learning: An Algorithmic Perspective, "Second Edition", CRC Press, 2014.

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1. Christopher M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2006.
2. Tom Mitchell, "Machine Learning", McGraw Hill, 3rd Edition, 1997.
3. Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar, "Foundations of Machine Learning", Second Edition, MIT Press, 2012, 2018.
4. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2016
5. Sebastain Raschka, Vahid Mirjalili, "Python Machine Learning", Packet publishing, 3rd Edition, 2019.

COURSE OUTCOMES

At the end of the course students should be able to:

- CO1: Explain the basic concepts of machine learning
CO2: Build supervised learning models.
CO3: Construct unsupervised learning algorithms.
CO4: Construct Neural Networks.
CO5: Evaluate and compare different models


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24UAD402	DATABASE MANAGEMENT SYSTEMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To introduce database development life cycle and conceptual modeling
- To learn SQL for data definition, manipulation and querying a database
- To learn relational database design using conceptual mapping and normalization
- To learn transaction concepts and serializability of schedules
- To learn data model and querying in object-relational and No-SQL databases

UNIT-I	CONCEPTUAL DATA MODELING	8
Database environment – Database system development lifecycle – Requirements collection – Database design - Entity-Relationship model – Enhanced-ER model – UML class diagrams.		

UNIT-II	RELATIONAL MODEL AND SQL	10
Relational model concepts - Integrity constraints -- SQL Data manipulation – SQL Data definition – Views -- SQL programming.		

UNIT-III	RELATIONAL DATABASE DESIGN AND NORMALIZATION	10
ER and EER-to-Relational mapping – Update anomalies – Functional dependencies – Inference rules – Minimal cover – Properties of relational decomposition – Normalization (upto BCNF)		

UNIT-IV	TRANSACTION MANAGEMENT	8
Transaction concepts – properties – Schedules – Serializability – Concurrency Control – Two phase locking techniques		

UNIT-V	OBJECT RELATIONAL AND NO-SQL DATABASES	9
Mapping EER to ODB schema – Object identifier – reference types – row types – UDTs – Sub types and Super types – user-defined routines– Collectiontypes –Object QueryLanguage; No-SQL: CAP theorem – Document-based: MongoDB data model and CRUD operations; Column-based: Hbase data model and CRUD operations.		

L: 45	T: 0	P: 0	Total: 45 Periods
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TEXT BOOKS

1. Thomas M. Connolly, Carolyn E. Begg, Database Systems – A Practical Approach to Design, Implementation, and Management, Sixth Edition, Global Edition, Pearson Education, 2015.
2. Ramez Elmasri, Shamkant B. Navathe, Fundamentals of Database Systems, 7th Edition, Pearson, 2017.

REFERENCES

1. Toby Teorey, Sam Lightstone, Tom Nadeau, H. V. Jagadish, "DATABASE MODELING AND DESIGN - Logical Design", Fifth Edition, Morgan Kaufmann Publishers, 2011.
2. Carlos Coronel, Steven Morris, and Peter Rob, Database Systems: Design, Implementation, and Management, Ninth Edition, Cengage learning, 2012
3. Abraham Silberschatz, Henry F Korth, S Sudharshan, "Database System Concepts", 7th Edition, Tata Mc Graw Hill, 2020.
4. Hector Garcia-Molina, Jeffrey D Ullman, Jennifer Widom, "Database Systems: The Complete Book", 2nd edition, Pearson.

COURSE OUTCOMES

At the end of the course students should be able to:

- CO1: Elaborate the database development life cycle and apply conceptual modeling
- CO2: Apply SQL and programming in SQL to create, manipulate and query the database
- CO3: Apply the conceptual-to-relational mapping and normalization to design relational database
- CO4: Determine the serializability of any non-serial schedule using concurrency techniques
- CO5: Apply the data model and querying in Object-relational and No-SQL databases


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24UAD403	OPERATING SYSTEMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To understand the basics and functions of operating system
- To understand Processes and Threads
- To analyze Scheduling algorithms and process synchronization and understand the concept of Deadlocks.
- To analyze various memory management schemes.
- To be familiar with I/O management and File systems and basics of virtual machines and Mobile OS like iOS and Android.

UNIT-I	UNIT I INTRODUCTION	7
Computer System- Elements and organization; Operating System Overview- Objectives and Functions - Evolution of Operating System; Operating System Structures – Operating System Services - User Operating System Interface - System Calls – System Programs - Design and Implementation - Structuring methods.		

UNIT-II	PROCESS MANAGEMENT	11
Processes -Process Concept- Process Scheduling -Operations on Processes - Inter-process Communication; CPU Scheduling - Scheduling criteria - Scheduling algorithms: Threads - Multi thread Models – Threading issues; Process Synchronization - The critical-section problem - Synchronization hardware – Semaphores – Mutex - Classical problems of synchronization - Monitors; Deadlock - Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.		

UNIT-III	MEMORY MANAGEMENT	10
Main Memory - Swapping - Contiguous Memory Allocation – Paging - Structure of the Page Table - Segmentation, Segmentation with paging; Virtual Memory - Demand Paging – Copy on Write - Page Replacement - Allocation of Frames –Thrashing.		

UNIT-IV	STORAGE MANAGEMENT	10
Mass Storage system – Disk Structure - Disk Scheduling and Management; File-System Interface - File concept - Access methods - Directory Structure - Directory organization - File system mounting - File Sharing and Protection; File System Implementation - File System Structure - Directory implementation - Allocation Methods - Free Space Management; I/O Systems – I/O Hardware, Application I/O interface, Kernel I/O subsystem.		


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UNIT-V	VIRTUAL MACHINES AND MOBILE OS	7
Virtual Machines – History, Benefits and Features, Building Blocks, Types of Virtual Machines and their Implementations, Virtualization and Operating-System Components; Mobile OS - iOS and Android.		

L: 45	T: 0	P: 0	Total: 45 Periods
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TEXT BOOKS

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 9th Edition, John Wiley and Sons Inc., 2018.
2. Andrew S Tanenbaum, "Modern Operating Systems", Pearson, 4th Edition, New Delhi, 2016.

REFERENCES

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.

COURSE OUTCOMES

At the end of the course students should be able to:

- CO1: Analyze various scheduling algorithms and process synchronization
CO2: Explain deadlock, prevention and avoidance algorithms.
CO3: Compare and contrast various memory management schemes
CO4: Explain the functionality of file systems I/O systems, and Virtualization
CO5: Compare iOS and Android Operating Systems


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24UCS403	DESIGN AND ANALYSIS OF ALGORITHMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To critically analyze the efficiency of alternative algorithmic solutions for the same problem
- To illustrate brute force and divide and conquer design techniques.
- To explain dynamic programming and greedy techniques for solving various problems.
- To apply iterative improvement technique to solve optimization problems
- To examine the limitations of algorithmic power and handling it in different problems.

UNIT-I	INTRODUCTION	8
Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving – Important Problem Types– Fundamentals of the Analysis of Algorithm Efficiency – Analysis Framework – Asymptotic Notations and their properties – Empirical analysis - Mathematical analysis of Recursive and Non recursive algorithms – Visualization.		
UNIT-II	BRUTE FORCE AND DIVIDE AND CONQUER	10
Brute Force – String Matching - Exhaustive Search - Traveling Salesman Problem – Knapsack Problem - Assignment problem. Divide and Conquer Methodology – Multiplication of Large Integers– Closest-Pair and Convex - Hull Problems. Decrease and Conquer: - Topological Sorting – Transform and Conquer: Presorting – Heaps and Heap Sort.		
UNIT-III	DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE	10
Dynamic programming – Principle of optimality - Coin changing problem – Warshall's and Floyd's algorithms – Optimal Binary Search Trees - Multi stage graph - Knapsack Problem and Memory functions. Greedy Technique-- Dijkstra's algorithm - Huffman Trees and codes- 0/1 Knapsack problem – Activity Selection Problem		
UNIT-IV	ITERATIVE IMPROVEMENT	8
The Simplex Method-The Maximum-Flow Problem – Maximum Matching in Bipartite Graphs- The Stable marriage Problem.		
UNIT-V	LIMITATIONS OF ALGORITHM POWER	9
Lower - Bound Arguments - P, NP, NP- Complete and NP Hard Problems. Backtracking – N Queen problem - Hamiltonian Circuit Problem – Subset Sum Problem. Branch and Bound – LIFO Search and FIFO search - Assignment problem – Knapsack Problem – Traveling Salesman Problem - Approximation Algorithms for NP-Hard Problems– Traveling Salesman problem– Knapsack problem.		


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TEXT BOOKS

1. Anany Levitin, Introduction to the Design and Analysis of Algorithms, Third Edition, Pearson Education, 2012.

REFERENCES

1. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Computer Algorithms/ C++, Second Edition, Universities Press, 2019.
2. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, Introduction to Algorithms, Third Edition, PHI Learning Private Limited, 2012
3. S. Sridhar, Design and Analysis of Algorithms, Oxford university press, 2014.
4. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, Data Structures and Algorithms, Pearson Education, Reprint 2006.

COURSE OUTCOMES

At the end of the course students should be able to:

- CO1: Analyze the efficiency of recursive and non-recursive algorithms mathematically
- CO2: Analyze the efficiency of brute force, divide and conquer, decrease and conquer, Transform and conquer algorithmic techniques
- CO3: Implement and analyze the problems using dynamic programming and greedy algorithmic techniques.
- CO4: Solve the problems using iterative improvement techniques for optimization
- CO5: Compute the limitations of algorithmic power and solve the problems using backtracking and branch and bound techniques

24UAD411	MACHINE LEARNING LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES

- To understand the data sets and apply suitable algorithms for selecting the appropriate features for analysis.
- To learn to implement supervised machine learning algorithms on standard datasets and evaluate the performance.
- To experiment the unsupervised machine learning algorithms on standard datasets and evaluate the performance.
- To build the graph based learning models for standard data sets.
- To compare the performance of different ML algorithms and select the suitable one based on the application.

LIST OF EXPERIMENTS

1. For a given set of training data examples stored in a .CSV file, implement and demonstrate the **Candidate-Elimination algorithm** to output a description of the set of all hypotheses consistent with the training examples.
2. 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
3. Build an Artificial Neural Network by implementing the **Backpropagation algorithm** and test the same using appropriate data sets.
4. Write a program to implement the **naïve Bayesian classifier** for a sample training data set stored as a .CSV file and compute the accuracy with a few test data sets.
5. Implement naïve Bayesian Classifier model to classify a set of documents and measure the accuracy, precision, and recall.
6. Write a program to construct a **Bayesian network** to diagnose CORONA infection using standard WHO Data Set
7. Implement naïve baye's theorem to classify the English text.
8. Apply EM algorithm to cluster a set of data stored in a .CSV file.
9. Use the same data set (used in experiment no. 8) for clustering using the k-Means algorithm. Compare the results of these two algorithms.
10. Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions.
11. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select an appropriate data set for your experiment and draw graphs
12. Carry out the performance analysis of classification algorithms on a specific dataset.

L: 0	T: 0	P: 60	Total: 60 Periods
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COURSE OUTCOMES

At the end of the course students should be able to:

CO1: Apply suitable algorithms for selecting the appropriate features for analysis.

CO2: Implement supervised machine learning algorithms on standard datasets and evaluate the performance

CO3: Apply unsupervised machine learning algorithms on standard datasets and evaluate the performance

CO4: Build the graph based learning models for standard data sets

CO5: Assess and compare the performance of different ML algorithms and select the suitable one based on the application


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24UAD412	DATABASE MANAGEMENT SYSTEMS LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES

- To understand the database development life cycle
- To learn database design using conceptual modeling, Normalization
- To implement database using Data definition, Querying using SQL manipulation and SQL programming
- To implement database applications using IDE/RAD tools
- To learn querying Object-relational database

LIST OF EXPERIMENTS

1. Database Development Life cycle:
 - a) Problem definition and Requirement analysis
 - b) Scope and Constraints
2. Database design using Conceptual modeling (ER-EER) – top-down approach Mapping conceptual to relational database and validate using Normalization
3. Implement the database using SQL Data definition- Create a database table, add constraints (primary key, unique, check, Not null), insert rows, update and delete rows using SQL DDL and DML commands.
4. Create a set of tables, add foreign key constraints and incorporate referential integrity.
5. Query the database tables using different 'where' clause conditions and also implement aggregate functions.
6. Join
 - a) Query the database tables and explore sub queries and simple join operations.
 - b) Query the database tables and explore natural, equi and outer joins.
7. Querying/Managing the database using SQL Programming - Stored Procedures/Functions - Constraints and security using Triggers
8. Database design using Normalization – bottom-up approach
9. Develop database applications using IDE/RAD tools (Eg, NetBeans, Visual Studio)
10. Database design using EER-to-ODB mapping / UML class diagrams
11. Object features of SQL-UDTs and sub-types, Tables using UDTs, Inheritance, Method definition
12. Querying the Object-relational database using Object Query language

L: 0	T: 0	P: 60	Total: 60 Periods
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COURSE OUTCOMES

At the end of the course students should be able to:

- CO1: Understand the database development life cycle
- CO2: Design relational database using conceptual-to-relational mapping, Normalization
- CO3: Apply SQL for creation, manipulation and retrieval of data
- CO4: Develop a database applications for real-time problems
- CO5: Design and query object-relational database

24UAD413	OPERATING SYSTEMS LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES

- To understand the basics of Unix command and shell programming.
- To implement various CPU scheduling algorithms.
- To implement Deadlock Avoidance and Deadlock Detection Algorithm
- To implement Page Replacement Algorithms
- To implement various memory allocation methods.
- To be familiar with File Organization and File Allocation Strategies.

LIST OF EXPERIMENTS

1. Illustrate UNIX commands and Shell Programming
2. Process Management using System Calls : Fork, Exec, Getpid, Exit, Wait, Close
3. Write C programs to implement the various CPU Scheduling Algorithms.
4. Illustrate the inter process communication strategy
5. Implement mutual exclusion by Semaphores
6. Write a C program to avoid Deadlock using Banker's Algorithm
7. Write a C program to Implement Deadlock Detection Algorithm
8. Write C program to implement Threading
9. Implement the paging Technique using C program
10. Write C programs to implement the following Memory Allocation Methods a.First Fit b. Worst Fit c. Best Fit
11. Develop a memory management module for a multitasking operating system. The system uses virtual memory, and the module needs to handle page faults efficiently by implementing a page replacement algorithm. Assume the system has a physical memory that can hold only 3 pages at a time. A particular process generates the following sequence of page references String: 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2 Implement and show the behaviour of different page replacement algorithms
12. Write C programs to implement the various Page Replacement Algorithms
13. Write C programs to Implement the various File Organization Techniques
14. Write C programs for the implementation of various disk scheduling algorithms

L: 0	T: 0	P: 60	Total: 60 Periods
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COURSE OUTCOME

At the end of the course students should be able to:

- CO1 : Define and implement UNIX Commands.
- CO2 : Analyze the performance of various CPU Scheduling Algorithms.
- CO3 : Compare and contrast various Memory Allocation Methods.
- CO4 : Implement File Organization and File Allocation Strategies
- CO5 : Implement various Disk Scheduling Algorithm


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24UCS413	ALGORITHMS LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES

- To critically analyze the efficiency of alternative algorithmic solutions for the same problem
- To illustrate brute force and divide and conquer design techniques.
- To explain dynamic programming and greedy techniques for solving various problems.
- To apply iterative improvement technique to solve optimization problems
- To examine the limitations of algorithmic power and handling it in different problems

LIST OF EXPERIMENTS

1. Implement recursive and non-recursive algorithms and study the order of growth from $\log_2 n$ to $n!$
2. Divide and Conquer - Strassen's Matrix Multiplication
3. Decrease and Conquer - Topological Sorting
4. Transform and Conquer - Heap Sort
5. Dynamic programming - Coin change Problem
6. Implement Warshall's and Floyd's algorithms
7. Implement Knapsack Problem
8. Develop a system for a smart city. A user wants to drive from location A to Location F, The city has multiple connected roads with different travel times due to traffic conditions. The models needs to determine the shortest travel time (in minutes) between these points using dijkstra's algorithms
9. Implement Huffman trees using Greedy techniques.
10. Iterative improvement - Simplex Method
11. Backtracking – N-Queen problem, Subset Sum Problem
12. Branch and Bound - Assignment problem, Traveling Salesman Problem

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COURSE OUTCOMES

- At the end of the course students should be able to:
- CO1: Analyze the efficiency of recursive and non-recursive algorithms mathematically
- CO2: Analyze the efficiency of brute force, divide and conquer, decrease and conquer, Transform and conquer algorithmic techniques
- CO3: Implement and analyze the problems using dynamic programming and greedy algorithmic techniques
- CO4: Solve the problems using iterative improvement techniques for optimization
- CO5: Compute the limitations of algorithmic power and solve the problems using backtracking and branch and bound techniques


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JAI SHRIRAM ENGINEERING COLLEGE, TIRUPPUR – 638 660

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REGULATION 2024

B.TECH ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

CHOICE BASED CREDIT SYSTEM

SYLLABUS FOR SEMESTER V

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24UAD501	DEEP LEARNING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To understand the principles of deep neural networks
- To understand CNN and RNN architectures of deep neural networks
- To comprehend advanced deep learning models
- To learn the evaluation metrics for deep learning models

UNIT-I	DEEP NETWORKS BASICS	9
Linear Algebra: Scalars -- Vectors -- Matrices and tensors; Probability Distributions -- Gradient-based Optimization -- Machine Learning Basics: Capacity -- Overfitting and underfitting -- Hyper parameters and validation sets -- Estimators -- Bias and variance -- Stochastic gradient descent -- Challenges motivating deep learning; Deep Networks: Deep feed forward networks; Regularization -- Optimization.		

UNIT-II	CONVOLUTIONAL NEURAL NETWORKS	9
Convolution Operation -- Sparse Interactions -- Parameter Sharing -- Equivariance -- Pooling -- Convolution Variants: Strided -- Tiled -- Transposed and dilated convolutions; CNN Learning: Nonlinearity Functions -- Loss Functions -- Regularization -- Optimizers -- Gradient Computation.		

UNIT-III	RECURRENT NEURAL NETWORKS	9
Unfolding Graphs -- RNN Design Patterns: Acceptor -- Encoder -- Transducer; Gradient Computation -- Sequence Modeling Conditioned on Contexts -- Bidirectional RNN -- Sequence to Sequence RNN -- Deep Recurrent Networks -- Recursive Neural Networks -- Long Term Dependencies; Leaky Units: Skip connections and dropouts; Gated Architecture: LSTM.		

UNIT-IV	MODEL EVALUATION	9
Performance metrics -- Baseline Models -- Hyperparameters: Manual Hyperparameter -- Automatic Hyperparameter -- Grid search -- Random search -- Debugging strategies.		

UNIT-V	AUTO ENCODERS AND GENERATIVE MODELS	9
Autoencoders: Undercomplete autoencoders -- Regularized autoencoders -- Stochastic encoders and decoders -- Learning with autoencoders; Deep Generative Models: Variational autoencoders -- Generative adversarial networks.		

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BOS/CHAIRMAN.....*[Signature]*.....

TEXT BOOKS

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2016.
2. Andrew Glassner, "Deep Learning: A Visual Approach", No Starch Press, 2021.

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1. Salman Khan, Hossein Rahmani, Syed Afaq Ali Shah, Mohammed Bennamoun, "A Guide to Convolutional Neural Networks for Computer Vision", Synthesis Lectures on Computer Vision, Morgan & Claypool publishers, 2018.
2. Yoav Goldberg, "Neural Network Methods for Natural Language Processing", Synthesis Lectures on Human Language Technologies, Morgan & Claypool publishers, 2017.
3. Francois Chollet, "Deep Learning with Python", Manning Publications Co, 2025.
4. Charu C. Aggarwal, "Neural Networks and Deep Learning: A Textbook", Springer International Publishing, 2023.
5. Josh Patterson, Adam Gibson, "Deep Learning: A Practitioner's Approach", O'Reilly Media, 2017.

COURSE OUTCOMES

At the end of the course students should be able to:

CO1: Understand the basics in deep neural networks

CO2: Apply Convolution Neural Network for image processing

CO3: Apply Recurrent Neural Network and its variants for text analysis

CO4: Apply model evaluation for various applications

CO5: Design auto encoders and generative models for suitable applications

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BOS/CHAIRMAN.....**[Signature]**.....

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24UGE501	HUMAN VALUES AND ETHICS	L	T	P	C
		3	0	0	3

Prerequisites:
Nil

COURSE OBJECTIVES:
• To create awareness about values and ethics enshrined in the Constitution of India • To sensitize students about the democratic values to be upheld in the modern society. • To inculcate respect for all people irrespective of their religion or other affiliations. • To instill the scientific temper in the students' minds and develop their critical thinking. • To promote sense of responsibility and understanding of the duties of citizen.

UNIT-I	DEMOCRATIC VALUES	9
Understanding Democratic values: Equality, Liberty, Fraternity, Freedom, Justice, Pluralism, Tolerance, Respect for All, Freedom of Expression, Citizen Participation in Governance – World Democracies: French Revolution, American Independence, Indian Freedom Movement. Reading Text: Excerpts from John Stuart Mills' On Liberty		

UNIT-II	SECULAR VALUES	9
Understanding Secular values – Interpretation of secularism in Indian context - Disassociation of state from religion – Acceptance of all faiths – Encouraging non-discriminatory practices. Reading Text: Excerpt from Secularism in India: Concept and Practice by Ram Puniyani		

UNIT-III	SCIENTIFIC VALUES	9
Scientific thinking and method: Inductive and Deductive thinking, Proposing and testing Hypothesis, Validating facts using evidence based approach – Skepticism and Empiricism – Rationalism and Scientific Temper. Reading Text: Excerpt from The Scientific Temper by Antony Michaelis R		

UNIT-IV	SOCIAL ETHICS	9
Application of ethical reasoning to social problems – Gender bias and issues – Gender violence – Social discrimination – Constitutional protection and policies – Inclusive practices. Reading Text: Excerpt from 21 Lessons for the 21st Century by Yuval Noah Harari		

UNIT-V	SCIENTIFIC ETHICS	9
Transparency and Fairness in scientific pursuits – Scientific inventions for the betterment of society - Unfair application of scientific inventions – Role and Responsibility of Scientist in the modern society. Reading Text: Excerpt from American Prometheus: The Triumph and Tragedy of J.Robert Oppenheimer by Kai Bird and Martin J. Sherwin.		

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TEXT BOOK

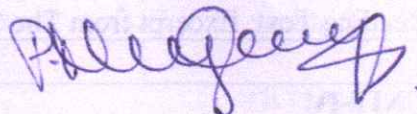
1. Mike W. Martin and Roland Schinzinger, —Ethics in Engineeringl, Tata McGraw Hill, New Delhi, 2003.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, —Engineering Ethicsl, Prentice Hall of India, New Delhi, 2004.

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1. Charles B. Fleddermann, —Engineering Ethicsl, Pearson Prentice Hall, New Jersey, 2004.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, —Engineering Ethics – Concepts and Casesl, Cengage Learning, 2009.
3. John R Boatright, —Ethics and the Conduct of Businessl, Pearson Education, New Delhi, 2003
4. Edmund G Seebauer and Robert L Barry, —Fundamentals of Ethics for Scientists and Engineersl, Oxford University Press, Oxford, 2001.
5. Laura P. Hartman and Joe Desjardins, —Business Ethics: Decision Making for Personal Integrity and Social Responsibilityl Mc Graw Hill education, India Pvt. Ltd., New Delhi, 2013.
6. World Community Service Centre, Value Education, Vethathiri publications, Erode, 2011.

COURSEOUTCOMES

- CO1: Identify the importance of democratic, secular and scientific values in harmonious functioning of social life
- CO2: Practice democratic and scientific values in both their personal and professional life.
- CO3: Find rational solutions to social problems.
- CO4: Behave in an ethical manner in society
- CO5: Practice critical thinking and the pursuit of truth.

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24UCS501	COMPUTER NETWORKS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To understand the concept of layering in networks.
- To know the functions of protocols of each layer of TCP/IP protocol suite.
- To visualize the end-to-end flow of information.
- To learn the functions of network layer and the various routing protocols
- To familiarize the functions and protocols of the Transport layer

UNIT-I	INTRODUCTION AND APPLICATION LAYER	10
Data Communication - Networks – Network Types – Protocol Layering – TCP/IP Protocol suite – OSI Model – Introduction to Sockets - Application Layer protocols: HTTP – FTP – Email protocols (SMTP - POP3 - IMAP - MIME) – DNS		

UNIT-II	TRANSPORT LAYER	9
Introduction - Transport-Layer Protocols: UDP – TCP: Connection Management – Flow control - Congestion Control - Congestion avoidance (DECbit, RED) – SCTP – Quality of Service– TLS		

UNIT-III	NETWORK LAYER	7
Switching: Circuit Switching, Packet Switching – Internet protocol - IPV4 – IP Addressing – Subnetting - IPV6, ARP, RARP, ICMP, DHCP– NAT		

UNIT-IV	ROUTING	7
Routing and protocols: Unicast routing – DVR –RIP –Link State Routing – OSPF – Path-vector routing - BGP - Multicast Routing: DVMRP – PIM		

UNIT-V	DATALINK AND PHYSICAL LAYERS	12
Data Link Layer – Framing – Flow control – Error control – Data-Link Layer Protocols – HDLC – PPP - Media Access Control – Ethernet Basics – CSMA/CD –Wireless LAN (802.11)- Physical Layer: Data and Signals - Performance – Transmission media.		

L: 45	T: 0	P: 0	Total: 45 Periods
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TEXT BOOKS

1. James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet, Eighth Edition, Pearson Education, 2021
2. Behrouz A. Forouzan, Data Communications and Networking with TCP/IP

Protocol Suite, Sixth Edition TMH, 2022

REFERENCES

1. Larry L. Peterson, Bruce S. Davie, Computer Networks : A Systems Approach, Fifth Edition, Morgan Kaufmann Publishers Inc., 2012.
2. William Stallings, Data and Computer Communications, Tenth Edition, Pearson

COURSE OUTCOMES

At the end of the course students should be able to:

CO 1: Explain the basic layers and its functions in computer networks.

CO 2: Elaborate the basics of data flows from one node to another.

CO 3: Analyze routing algorithms.

CO 4: Describe protocols for various functions in the network.

CO 5: Analyze the working of various application layer protocols.

UNIT-I	INTRODUCTION AND APPLICATION LAYER	10
UNIT-II	TRANSPORT LAYER	9
UNIT-III	NETWORK LAYER	7
UNIT-IV	ROUTING	7
UNIT-V	DATALINK AND PHYSICAL LAYERS	12

L:45	T:0	P:0	Total: 45 Periods
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Prof. A. GOKULAVANI, B.Tech., M.E.,
Head of the Department
Computer Science and Engineering
Jai Shriram Engineering College
Avinashipalayam, Tirupur - 638 660.

24UECO03	BASICS OF IoT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To apprise students with basic knowledge of IoT that paves a platform to understand physical and logical design of IOT
- To teach a student how to analyse requirements of various communication models and protocols for cost-effective design of IoT applications on different IoT platforms.
- To introduce the technologies behind Internet of Things(IoT).
- To explain the students how to code for an IoT application using Arduino/Raspberry Pi open platform.
- To apply the concept of Internet of Things in real world scenario.

UNIT-I	INTRODUCTION TO INTERNET OF THINGS	9
Evolution of IoT and enabling technologies - Architectures: oneM2M, IoT World Forum (IoTWF), and alternative models - Simplified IoT architecture, core functional stack, and the roles of Fog, Edge, and Cloud computing.		

UNIT-II	COMPONENTS IN IoT	9
Functional blocks of an IoT ecosystem -Sensors: Types, actuators: Types and smart objects - Control units and communication modules (Bluetooth, Zigbee, Wi-Fi, GPS, and GSM).		

UNIT-III	IoT PROTOCOLS AND TECHNOLOGIES	9
IoT Access Technologies and Protocols: IPv6, 6LoWPAN, MQTT, and CoAP - RFID and Wireless Sensor Networks (WSN) - Embedded systems, Cloud computing, and Big Data Analytics - Software defined networks, network function virtualization.		

UNIT-IV	OPEN PLATFORMS AND PROGRAMMING	9
IoT deployment on Arduino and Raspberry Pi platforms - Architecture, programming, and system interfacing - Accessing and controlling GPIO (General Purpose Input/Output) pins and connecting to the cloud.		

UNIT-V	CASE STUDIES AND APPLICATIONS	9
Business models for IoT - Case studies and real-world implementations: Smart Cities and Smart Mobility, Industrial IoT (IIoT), Smart Health and Environment Monitoring, Home Automation and Smart Agriculture.		

L:45	T: 0	P: 0	Total :45 Periods
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24UECO03	BASICS OF IoT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To apprise students with basic knowledge of IoT that paves a platform to understand physical and logical design of IOT
- To teach a student how to analyse requirements of various communication models and protocols for cost-effective design of IoT applications on different IoT platforms.
- To introduce the technologies behind Internet of Things(IoT).
- To explain the students how to code for an IoT application using Arduino/Raspberry Pi open platform.
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UNIT-III	IoT PROTOCOLS AND TECHNOLOGIES	9
IoT Access Technologies and Protocols: IPv6, 6LoWPAN, MQTT, and CoAP - RFID and Wireless Sensor Networks (WSN) - Embedded systems, Cloud computing, and Big Data Analytics - Software defined networks, network function virtualization.		

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Business models for IoT - Case studies and real-world implementations: Smart Cities and Smart Mobility, Industrial IoT (IIoT), Smart Health and Environment Monitoring, Home Automation and Smart Agriculture.		

L:45	T: 0	P: 0	Total :45 Periods
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 Jai Shriram Engineering College

TEXT BOOKS

1. Robert Barton, Patrick Grossetete, David Hanes, Jerome Henry, Gonzalo Salgueiro, "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", CISCO Press, 2017.
2. Samuel Greengard, The Internet of Things, The MIT Press, 2015.

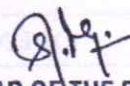
REFERENCES

1. Perry Lea, "Internet of things for architects", Packt, 2018.
2. Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things – Key applications and Protocols", Wiley, 2012
3. IOT (Internet of Things) Programming: A Simple and Fast Way of Learning, IOT Kindle Edition.
4. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet of Things", Springer, 2011.
5. ArshdeepBahga, Vijay Madiseti, "Internet of Things – A hands-on approach", Universities Press, 2015.
6. <https://www.arduino.cc/>https://www.ibm.com/smarterplanet/us/en/?ca=v_smarterplanet

COURSE OUTCOMES

At the end of the course students should be able to

- CO1: Explain the concept of IoT.
- CO2: Understand the communication models and various protocols for IoT.
- CO3: Design portable IoT using Arduino/Raspberry Pi /open platform
- CO4: Apply data analytics and use cloud offerings related to IoT.
- CO5: Analyze applications of IoT in real time scenario.


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24UADI501	DATA EXPLORATION AND VISUALIZATION	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES
- To outline an overview of exploratory data analysis. - To implement data visualization using Matplotlib. - To perform univariate , bivariate data exploration and analysis. - To use Data exploration and visualization techniques for multivariate and time series data. - To develop compelling visual narratives to communicate insights effectively.

UNIT-I	EXPLORATORY DATA ANALYSIS	9
EDA fundamentals – Understanding data science – Significance of EDA – Making sense of data – Comparing EDA with classical and Bayesian analysis – Software tools for EDA - Visual Aids for EDA- Data transformation techniques-merging database, reshaping and pivoting, Transformation techniques - Grouping Datasets - data aggregation – Pivot tables and cross-tabulations.		

UNIT-II	VISUALIZING USING MATPLOTLIB	9
Importing Matplotlib – Simple line plots – Simple scatter plots – visualizing errors – density and contour plots – Histograms – legends – colors – subplots – text and annotation – customization –three dimensional plotting - Geographic Data with Base map - Visualization with Seaborn.		

UNIT-III	UNIVARIATE AND BIVARIATE ANALYSIS	9
Introduction to Single variable: Distributions and Variables - Numerical Summaries of Level and Spread - Scaling and Standardizing – Inequality. Relationships between Two Variables - Percentage Tables - Analyzing Contingency Tables -Handling Several Batches – Scatter plots and Resistant Lines – Transformations.		

UNIT-IV	MULTIVARIATE AND TIME SERIES ANALYSIS	9
Introducing a Third Variable - Causal Explanations - Three-Variable Contingency Tables and Beyond - Longitudinal Data – Fundamentals of TSA – Characteristics of time series data -Smoothing Time Series – Data Cleaning –Time-based indexing - Re-sampling.		

UNIT-V	DATA VISUALIZATION TOOLS	9
Overview of Tableau and its applications, Installation and setup, connecting to data sources (Excel, CSV, databases), Understanding Tableau's interface; Data Preparation in Tableau Data Preparation and Transformation, Basic Visualization Techniques, Advanced DAX functions and calculations, Power BI Data Modeling		

L: 45	T: 0	P: 0	Total: 45 Periods
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TEXT BOOKS

1. Suresh Kumar Mukhiya, Usman Ahmed, "Hands-On Exploratory Data Analysis with Python", Packt Publishing, 2020. (Unit 1)
2. Jake Vander Plas, "Python Data Science Handbook: Essential Tools for Working with Data", O'Reilly, 1st Edition, 2022. (Unit 2)
3. Catherine Marsh, Jane Elliott, "Exploring Data: An Introduction to Data Analysis for Social Scientists", Wiley Publications, 2nd Edition, 2008. (Unit 3,4,5)

REFERENCES

1. Eric Pimpler, Data Visualization and Exploration with R, GeoSpatial Training service, 2017.
2. Claus O. Wilke, "Fundamentals of Data Visualization", O'Reilly publications, 2019.
3. Matthew O. Ward, Georges Grinstein, Daniel Keim, "Interactive Data Visualization: Foundations, Techniques, and Applications", 2nd Edition, CRC press, 2015.

COURSE OUTCOMES

At the end of the course students should be able to:

CO1: Understand the fundamentals of exploratory data analysis

CO2: Implement the data visualization using Matplotlib

CO3: Perform Univariate, Bivariate data exploration and analysis

CO4: Use Data exploration and visualization techniques for multivariate and time series data.

CO5: Implement data visualization techniques using Tableau and Power BI

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24UADI501	DATA EXPLORATION AND VISUALIZATION LAB	L	T	P	C
		3	0	2	4

COURSE OBJECTIVES

- To outline an overview of exploratory data analysis.
- To implement data visualization using Matplotlib.
- To perform univariate, bivariate data exploration and analysis.
- To use Data exploration and visualization techniques for multivariate and time series data.
- To develop compelling visual narratives to communicate insights effectively

LIST OF EXPERIMENTS

1. a. Install the data Analysis and Visualization tool: R/ Python /Tableau Public/ Power BI.
b. Generate a data quality report for customer data by identifying missing values, irregular cardinality and outliers to improve risk assessment and policy pricing.
2. Perform exploratory data analysis (EDA) on with datasets like email data set. Export all your emails as a dataset, import them inside a pandas data frame, visualize them and get different insights from the data.
3. Prepare an e-commerce customer purchase dataset for exploratory analysis by applying normalization, binning and sampling techniques.
4. Explore various variable and row filters in R for cleaning data. Apply various plot features in R on sample data sets and visualize.
5. Perform Time Series Analysis and apply the various visualization techniques.
6. Perform Data Analysis and representation on a Map using various Map data sets with Mouse Rollover effect, user interaction, etc..
7. Build cartographic visualization for multiple datasets involving various countries of the world; states and districts in India etc.
8. Perform EDA on Wine Quality Data Set.
9. Use a case study on a data set and apply the various EDA and visualization techniques and present an analysis report.

L: 0	T: 0	P: 30	Total: 30 Periods
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LIST OF SOFTWARE REQUIREMENTS

1. PYSCRIPTER/JUPITOR NOTEBOOK

COURSE OUTCOMES

At the end of the course students should be able to:

- CO1: Understand the fundamentals of exploratory data analysis
CO2: Implement the data visualization using Matplotlib
CO3: Perform Univariate, Bivariate data exploration and analysis
CO4: Use Data exploration and visualization techniques for multivariate and time series data.
CO5: Implement data visualization techniques using Tableau and Power BI

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24UAD511	DEEP LEARNING LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To understand the tools and techniques to implement deep neural networks
- To apply different deep learning architectures for solving problems
- To implement generative models for suitable applications
- To learn to build and validate different models

LIST OF EXPERIMENTS:

1. Solving XOR problem using DNN
2. Character recognition using CNN
3. Face recognition using CNN
4. Language modeling using RNN
5. Sentiment analysis using LSTM
6. Parts of speech tagging using Sequence to Sequence architecture
7. Machine Translation using Encoder-Decoder model
8. Image augmentation using GANs
9. Implement Generative Adversarial Networks to generate realistic images.
10. Mini-project on real world applications

L:0	P:45	T:0	Total: 45 Periods
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LIST OF SOFTWARE REQUIREMENTS

Anaconda, Jupyter Notebook

COURSE OUTCOMES

At the end of the course students should be able to:

CO1: Apply deep neural network for simple problems

CO2: Apply Convolution Neural Network for image processing

CO3: Apply Recurrent Neural Network and its variants for text analysis

CO4: Apply generative models for data augmentation

CO5: Develop real-world solutions using suitable deep neural networks

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24UCS511	COMPUTER NETWORKS LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES

- To Learn essential networking tools such as tcpdump, netstat, ifconfig, nslookup, and traceroute to capture, analyze, and monitor network traffic
- Design and implement practical applications using TCP sockets, including an Echo Client/Server and a simple Chat application
- To Implement a simulation of the Domain Name System (DNS) using UDP sockets
- To Simulate and analyze network protocols and algorithms, including ARP/RARP, routing algorithms

S.No.	LIST OF EXERCISES
1	Learn to use commands like tcpdump, netstat, ifconfig, nslookup and traceroute. Capture ping and trace route PDUs using a network protocol analyzer and examine
2	Write a HTTP web client program to download a webpage using TCP sockets
3	Applications using TCP sockets like :a) Echo client and echo server b) Chat
4	Simulation of DNS using UDP sockets
5	Use a tool like Wire shark to capture packets and examine the packets
6	Write a code simulating ARP protocols
7	Write a code simulating RARP protocols
8	Study of Network simulator (NS) and Simulation of Congestion Control Algorithms using NS.
9	Study of TCP/UDP performance using Simulation tool
10	Simulation of Distance Vector
11	Simulation of Link State Routing algorithm
12	Simulation of an error correction code (like CRC)
13	Develop a file transfer system to guarantee reliable delivery of data and handles network congestion and packet loss for a software company

L:0	P:60	T:0	Total: 60 Periods
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COURSE OUTCOMES

At the end of the course students should be able to:

- CO1: Analyze and Use Network Utilities
CO2: Implement Network Applications using Socket Programming
CO3: Simulate and Analyze Network Protocols
CO4: Evaluate TCP/UDP Performance through Simulation
CO5: Demonstrate Error Detection and Correction Techniques

Prof. A. GOKHANI, B.Tech., M.E.,
Head of the Department



JAI SHRIRAM ENGINEERING COLLEGE, TIRUPPUR – 638 660

(An Autonomous Institution)

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

Recognized by UGC & Accredited by NAAC and NBA (CSE and ECE)

REGULATION 2024

B.TECH ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

CHOICE BASED CREDIT SYSTEM

PROFESSIONAL ELECTIVE I

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24UADP501	APP DEVELOPMENT	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES

- To learn development of native applications with basic GUI Components
- To develop cross-platform applications with event handling
- To develop applications with location and data storage capabilities
- To develop web applications with database access

UNIT-I	FUNDAMENTALS OF MOBILE & WEB APPLICATION DEVELOPMENT	6
Basics of Web and Mobile application development, Native App, Hybrid App, Cross-platform App, What is Progressive Web App, Responsive Web design		

UNIT-II	NATIVE APP DEVELOPMENT USING JAVA	6
Native Web App, Benefits of Native App, Scenarios to create Native App, Tools for creating Native App, Cons of Native App, Popular Native App Development Frameworks, Java & Kotlin for Android, Swift & Objective-C for iOS, Basics of React Native, Native Components, JSX, State, Props		

UNIT-III	HYBRID APP DEVELOPMENT	6
Hybrid Web App, Benefits of Hybrid App, Criteria for creating Native App, Tools for creating Hybrid App, Cons of Hybrid App, Popular Hybrid App Development Frameworks, Ionic, Apache Cordova		

UNIT-IV	CROSS-PLATFORM APP DEVELOPMENT USING REACT-NATIVE	6
Introduction Cross-platform App, Benefits of Cross-platform App, Criteria for creating Cross-platform App, Tools for creating Cross-platform App, Cons of Cross-platform App, Popular Cross platform App Development Frameworks, Flutter – Installation, Architecture of Flutter-Application. Introduction to Dart Programming-Variables-Data Types-Keywods-Operators-Control flow &Loops-Functions.Widgets-Types of Layout Widgets. Introduction to Xamarin,		

UNIT-V	NON-FUNCTIONAL CHARACTERISTICS OF APP FRAMEWORKS	6
Comparison of different App frameworks, Build Performance, App Performance, Debugging capabilities, Time to Market, Maintainability, Ease of Development, UI/UX, Reusability		

L: 30	T: 0	P: 0	Total: 30 Periods
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TEXT BOOKS

1. Head First Android Development, Dawn Griffiths, O'Reilly, 1st edition
2. Apache Cordova in Action, Raymond K. Camden, Manning. 2015
3. 3. Full Stack React Native: Create beautiful mobile apps with JavaScript and React Native, Anthony Accomazzo, Houssein Djirdeh, Sophia Shoemaker, Devin Abbott, FullStack publishing

REFERENCES

1. Android Programming for Beginners, John Horton, Packt Publishing, 2nd Edition
2. Native Mobile Development by Shaun Lewis, Mike Dunn
3. Building Cross-Platform Mobile and Web Apps for Engineers and Scientists: An Active Learning Approach, Pawan Lingras, Matt Triff, Rucha Lingras
4. Apache Cordova 4 Programming, John M Wargo, 2015
5. React Native Cookbook, Daniel Ward, Packt Publishing, 2nd Edition

PRACTICAL EXERCISES: 30 PERIODS

1. Using react native, build a cross platform application for a BMI calculator.
2. Build a cross platform application for a simple expense manager which allows entering expenses and income on each day and displays category wise weekly income and expense.
3. Develop a cross platform application to convert units from imperial system to metric system (km to miles, kg to pounds etc.,)
4. Design and develop a cross platform application for day to day task (to-do) management.
5. Design an android application using Cordova for a user login screen with username, password, reset button and a submit button. Also, include header image and a label. Use layout managers.
6. Design and develop an android application using Apache Cordova to find and display the current location of the user.
7. Write programs using Java to create Android application having Databases
 - For a simple library application.
 - For displaying books available, books lend, book reservation. Assume that student information is available in a database which has been stored in a database server.

TOTAL:60 PERIODS**COURSE OUTCOMES**

At the end of the course students should be able to:

- CO1: Develop Native applications with GUI Components.
CO2: Develop hybrid applications with basic event handling.
CO3 Implement cross-platform applications with location and data storage capabilities.
CO4: Implement cross platform applications with basic GUI and event handling.
CO5: Develop web applications with cloud database access

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24UADP502	REINFORCEMENT LEARNING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To introduce a range of topics related to Reinforcement Learning and probability concepts.
- To gain knowledge on the Markov Decision Process.
- To understand the Q-Learning and SARSA methods.
- To know about the Deep Learning in Reinforcement Learning.
- To gain knowledge on Policy Gradient Methods.

UNIT-I	INTRODUCTION TO REINFORCEMENT LEARNING	9
Introduction to Reinforcement Learning (RL) - RL framework and application Immediate Reinforcement Learning - Bandit algorithm: Introduction, Upper Confidence Bound (UCB), PA algorithm, Bandit optimality - Value function - Based method - Policy gradient		

UNIT-II	MDP MODELS	9
Full RL introduction - Return, Values function - Introduction to MDP model - Bellman equation Optimization of bellman equation Cauchy sequence and green equation Banach fixed poin theorem - Convergence proof		

UNIT-III	FUNCTION APPROXIMATION	9
Approximation Value prediction and control Gradient Descent methods - Linear methods -Control with Function Approximation - Artificial Neural Network-based approximation - DQN and Fitted Q iterations- Policy Gradient Approach - Policy Gradient approach with functionapproximation		

UNIT-IV	DEEP REINFORCEMENT LEARNING	9
Dynamic Programming - Monte Carlo - Components - Control in Monte Carlo - LPI convergence, Value iteration, Policy iteration – Qlearning-SARSA - QLearning with deep networks - Double QLearning -Replay memory - Deep Neural Network Architectures for RL		

UNIT-V	HIERARCHICAL REINFORCEMENT LEARNING	9
Hierarchical reinforcement learning - Types of optimality - Semi MDP model Options - Learning with options - Hierarchical abstract machines - Partially observable Markov decision process		

L: 45	T: 0	P: 0	Total: 45 Periods
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TEXT BOOKS

1. Richard S. Sutton and Andrew G. Barto, "Reinforcement Learning: An Introduction", 2nd Edition, The MIT Press, 2020
2. Csaba Szepesvári, "Algorithms for Reinforcement Learning", 1st Edition, Morgan & Claypool, 2013

REFERENCES

1. Kevin Murphy, "Machine Learning - A Probabilistic Perspective", 1st Edition, MIT press, 2012
2. Christopher Bishop, "Pattern Recognition and Machine Learning", 1st Edition, Springer, 2006

COURSE OUTCOMES

At the end of the course students should be able to:

CO1: Understand different terminologies of RL and Concepts of Probability.

CO2: Illustrate the Markov Decision Process and Bellman Equation for learning.

CO3: Apply dynamic programming techniques to the Markov decision process and Monte Carlo methods

CO4: Implement Time difference learning for real-world problems.

CO5: Apply Approximation methods of learning and Q-learning technique

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24UADP503	ETHICS AND AI	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES

- Study the morality and ethics in AI
- Learn about the Ethical initiatives in the field of artificial intelligence
- Study about AI standards and Regulations
- Study about social and ethical issues of Robot Ethics
- Study about AI and Ethics- challenges and opportunities

UNIT-I	INTRODUCTION	6
Definition of morality and ethics in AI-Impact on society-Impact on human psychology-Impact on the legal system-Impact on the environment and the planet-Impact on trust		

UNIT-II	ETHICAL INITIATIVES IN AI	9
International ethical initiatives-Ethical harms and concerns-Case study: healthcare robots, Autonomous Vehicles , Warfare and weaponization.		

UNIT-III	AI STANDARDS AND REGULATION	9
Model Process for Addressing Ethical Concerns During System Design - Transparency of Autonomous Systems-Data Privacy Process- Algorithmic Bias Considerations - Ontological Standard for Ethically Driven Robotics and Automation Systems		

UNIT-IV	ROBOETHICS: SOCIAL AND ETHICAL IMPLICATION OF ROBOTICS	9
Robot-Roboethics- Ethics and Morality- Moral Theories-Ethics in Science and Technology - Ethical Issues in an ICT Society- Harmonization of Principles- Ethics and Professional Responsibility Roboethics Taxonomy.		

UNIT-V	AI AND ETHICS- CHALLENGES AND OPPORTUNITIES	9
Challenges - Opportunities- ethical issues in artificial intelligence- Societal Issues Concerning the Application of Artificial Intelligence in Medicine- decision-making role in industries-National and International Strategies on AI.		

L: 30	T: 0	P: 30	Total: 60 Periods
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TEXT BOOKS

1. y. Eleanor Bird, Jasmin Fox-Skelly, Nicola Jenner, Ruth Larbey, Emma Weitkamp and Alan Winfield , "The ethics of artificial intelligence: Issues and initiatives", EPRS | European Parliamentary Research Service Scientific Foresight Unit (STOA) PE 634.452 – March 2020
2. Patrick Lin, Keith Abney, George A Bekey, " Robot Ethics: The Ethical and Social Implications of Robotics", The MIT Press- January 2014.

REFERENCES

1. Towards a Code of Ethics for Artificial Intelligence (Artificial Intelligence: Foundations, Theory, and Algorithms) by Paula Boddington, November 2017
2. Mark Coeckelbergh, " AI Ethics", The MIT Press Essential Knowledge series, April 2020

LIST OF EXPERIMENTS

1. Recent case study of ethical initiatives in healthcare, autonomous vehicles and defense
2. Exploratory data analysis on a 2 variable linear regression model
3. Experiment the regression model without a bias and with bias
4. Classification of a dataset from UCI repository using a perceptron with and without bias
5. Case study on ontology where ethics is at stake
6. Identification on optimization in AI affecting ethics

COURSE OUTCOMES

At the end of the course students should be able to:

CO1: Learn about morality and ethics in AI

CO2: Acquire the knowledge of real time application ethics, issues and its challenges.

CO3: Understand the ethical harms and ethical initiatives in AI

CO4: Learn about AI standards and Regulations like AI Agent, Safe Design of Autonomous and Semi-Autonomous Systems

CO5: Understand the concepts of Robo ethics and Morality with professional responsibilities and Learn about the societal issues in AI with National and International Strategies on AI

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24UADP504	COMPUTER VISION	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES

- To understand the fundamental concepts related to Image formation and processing.
- To learn feature detection, matching and detection
- To become familiar with feature based alignment and motion estimation
- To develop skills on 3D reconstruction
- To understand image based rendering and recognition

UNIT-I	INTRODUCTION TO IMAGE FORMATION AND PROCESSING	6
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Computer Vision - Geometric primitives and transformations - Photometric image formation - The digital camera - Point operators - Linear filtering - More neighborhood operators - Fourier transforms - Pyramids and wavelets - Geometric transformations - Global optimization.

UNIT-II	FEATURE DETECTION, MATCHING AND SEGMENTATION	6
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Points and patches - Edges - Lines - Segmentation - Active contours - Split and merge - Mean shift and mode finding - Normalized cuts - Graph cuts and energy-based methods.

UNIT-III	FEATURE-BASED ALIGNMENT & MOTION ESTIMATION	6
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2D and 3D feature-based alignment - Pose estimation - Geometric intrinsic calibration - Triangulation - Two-frame structure from motion - Factorization - Bundle adjustment - Constrained structure and 109 motion - Translational alignment - Parametric motion - Spline-based motion - Optical flow - Layered motion.

UNIT-IV	3D RECONSTRUCTION	6
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Shape from X - Active rangefinding - Surface representations - Point-based representations Volumetric representations - Model-based reconstruction - Recovering texture maps and albedos.

UNIT-V	IMAGE-BASED RENDERING AND RECOGNITION	6
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View interpolation Layered depth images - Light fields and Lumigraphs - Environment mattes - Videobased rendering-Object detection - Face recognition - Instance recognition - Category recognition - Context and scene understanding- Recognition databases and test sets.

L: 30	T: 0	P: 30	Total: 60 Periods
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TEXT BOOKS

1. Richard Szeliski, "Computer Vision: Algorithms and Applications", Springer- Texts in Computer Science, Second Edition, 2022.
2. Computer Vision: A Modern Approach, D. A. Forsyth, J. Ponce, Person Education, Second Edition, 2015.

REFERENCES

1. Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, March 2004.
2. Christopher M. Bishop; Pattern Recognition and Machine Learning, Springer, 2006 3. E. R. Davies, Computer and Machine Vision, Fourth Edition, Academic Press, 2012

LIST OF EXPERIMENTS

1. OpenCV Installation and working with Python
2. Basic Image Processing - loading images, Cropping, Resizing, Thresholding, Contour analysis, Blob detection
3. Image Annotation - Drawing lines, text circle, rectangle, ellipse on images
4. Image Enhancement - Understanding Color spaces, color space conversion, Histogram equalization, Convolution, Image smoothing, Gradients, Edge Detection
5. Image Features and Image Alignment - Image transforms - Fourier, Hough, Extract ORB Image features, Feature matching, cloning, Feature matching based image alignment
6. Image segmentation using Graphcut / Grabcut
7. Camera Calibration with circular grid
8. Pose Estimation
9. 3D Reconstruction - Creating Depth map from stereo images
10. Object Detection and Tracking using Kalman Filter, Camshift

COURSE OUTCOMES

At the end of the course students should be able to:

CO1: To understand basic knowledge, theories and methods in image processing and computer vision.

CO2: To implement basic and some advanced image processing techniques in OpenCV

CO3: To apply 2D a feature-based based image alignment, segmentation and motion estimations.

CO4: To apply 3D image reconstruction techniques

CO5: To design and develop innovative image processing and computer vision applications.

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24UADP505	WEB TECHNOLOGIES	L	T	P	C
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COURSE OBJECTIVES

- To understand different Internet Technologies
- To learn java-specific web services architecture
- To Develop server side programs using Servlets and JSP
- To Construct simple web pages in PHP and to represent data in XML format
- To Develop web applications using frameworks

UNIT-I	WEBSITE BASICS, HTML 5, CSS 3, WEB 2.0	6
Web Essentials: Clients, Servers and Communication – The Internet – World wide web – HTTP Request Message – HTTP Response Message – Web Clients – Web Servers – HTML5 – Tables – Lists – Image – HTML5 control elements – Drag and Drop – Audio – Video controls - CSS3 – Inline, embedded and external style sheets – Rule cascading – Inheritance – Backgrounds – Border Images – Colors – Shadows – Text – Transformations – Transitions – Animations. Bootstrap Framework		

UNIT-II	CLIENT SIDE PROGRAMMING	6
Java Script: An introduction to JavaScript-JavaScript DOM Model-Exception Handling-Validation Built-in objects-Event Handling- DHTML with JavaScript- JSON introduction – Syntax – Function Files		

UNIT-III	SERVER SIDE PROGRAMMING	6
Servlets: Java Servlet Architecture- Servlet Life Cycle- Form GET and POST actions- Session Handling- Understanding Cookies- DATABASE CONNECTIVITY: JDBC.		

UNIT-IV	PHP and XML	6
An introduction to PHP: PHP- Using PHP- Variables- Program control- Built-in functions- Form Validation. XML: Basic XML- Document Type Definition- XML Schema, XML Parsers and Validation, XSL ,.		

UNIT-V	INTRODUCTION TO ANGULAR and WEB APPLICATIONS FRAMEWORKS	6
Introduction to AngularJS, MVC Architecture, Understanding ng attributes, Expressions and data binding, Conditional Directives, Style Directives, Controllers, Filters, Forms, Routers, Modules, Services; Web Applications Frameworks and Tools – Firebase- Docker- Node JS- React- Django UI& UX.		

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L: 30	T: 0	P: 30	Total: 60 Periods
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TEXT BOOKS

1. Deitel and Deitel and Nieto, Internet and World Wide Web - How to Program, Prentice Hall, 5th Edition, 2011.
2. Jeffrey C and Jackson, Web Technologies A Computer Science Perspective, Pearson Education, 2011.
3. Angular 6 for Enterprise-Ready Web Applications, Doguhan Uluca, 1st edition, Packt Publishing

REFERENCES

1. Stephen Wynkoop and John Burke "Running a Perfect Website", QUE, 2nd Edition, 1999.
2. Chris Bates, Web Programming – Building Intranet Applications, 3rd Edition, Wiley Publications, 2009.
3. Gopalan N.P. and Akilandeswari J., "Web Technology", Prentice Hall of India, 2011.
4. UttamK.Roy, "Web Technologies", Oxford University Press, 2011.
5. Angular: Up and Running: Learning Angular, Step by Step, Shyam Seshadri, 1st edition, O'Reilly

LIST OF EXPERIMENTS

1. Create a web page with the following using HTML. • To embed an image map in a web page. • To fix the hot spots. • Show all the related information when the hot spots are clicked.
2. Create a web page with all types of Cascading style sheets.
3. Client Side Scripts for Validating Web Form Controls using DHTML.
4. Installation of Apache Tomcat web server.
5. Write programs in Java using Servlets:
 - To invoke servlets from HTML forms. • Session Tracking.
6. Write programs in Java to create three-tier applications using JSP and Databases
 - For conducting on-line examination. • For displaying student mark list. Assume that student information is available in a database which has been stored in a database server.
7. Programs using XML – Schema – XSLT/XSL.

COURSE OUTCOMES

At the end of the course students should be able to:

CO1: Construct a basic website using HTML and Cascading Style Sheets

CO2: Build dynamic web page with validation using Java Script objects and by applying different event handling mechanisms.

CO3: Develop server side programs using Servlets and JSP

CO4: Construct simple web pages in PHP and to represent data in XML format

CO5: Develop interactive web applications.

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