

NANDHA COLLEGE OF TECHNOLOGY

(An Autonomous Institution Affiliated to Anna University Chennai)

Erode-52

www.nandhatech.org



REGULATIONS – 2025

CURRICULUM AND SYLLABUS

B.Tech. Information Technology

Chairman - Board of Studies
Information Technology
Nandha College of Technology (Autonomous)
Erode - 638 052.

VISION OF THE DEPARTMENT

To be a centre of excellence in the field of Information Technology with Global standards of Academic and Research for the need of Society and Industry.

MISSION OF THE DEPARTMENT

1. To provide value based Information Technology education and produce innovative, competent and high quality IT professionals for the growing demand of Society and Industry.
2. To facilitate the students for the constant up gradation of Technical expertise and perform research activities to solve the real world problems.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

Graduates will be able to

PEO1: Apply mathematical, scientific, and engineering fundamentals to analyze and solve problems in the field of Information Technology.

PEO2: Utilize modern Information Technology tools and technologies to meet societal needs while fulfilling professional and ethical responsibilities.

PEO3: Demonstrate effective problem-solving skills, communication ability, teamwork, leadership qualities, and ethical values for successful professional practice in the IT domain.

PEO4: Pursue higher education in reputed institutions, build successful careers in core IT industries, and engage in lifelong learning for continuous professional development.

PROGRAM OUTCOMES

1. **Engineering Knowledge:** Apply math, science, and engineering fundamentals to complex problems.
2. **Problem Analysis:** Identify and analyze complex problems using research and sustainability principles.
3. **Design Solutions:** Design systems and processes considering health, safety, cost, culture, and environment.
4. **Investigations:** Use experiments, modelling, and data analysis to reach valid conclusions.
5. **Engineering Tools:** Apply modern tools for modelling and problem-solving, recognizing their limits.
6. **Society & Environment:** Assess societal, legal, and environmental impacts of engineering solutions.
7. **Ethics:** Commit to ethics, human values, diversity, and legal compliance.
8. **Teamwork:** Work effectively as an individual and in multidisciplinary teams.

9. **Communication:** Communicate clearly in reports, presentations, and documentation across diverse groups.
10. **Management & Finance:** Apply management and economic principles in projects and teamwork.
11. **Lifelong Learning:** Engage in continuous learning, adapt to new technologies, and think critically.

PROGRAM SPECIFIC OUTCOMES

1. Design and develop efficient and reliable computing solutions for real time applications.
2. Acquire skills in pace with rapid advancements in the field of Information Technology for development of innovative solutions in real world problems.
3. Exhibit research aptitude, work effectively in multidisciplinary teams and uphold ethical practices.



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REGULATION – 2025

CURRICULUM AND SYLLABUS

SEMESTER – I

Semester-I							
S No.	Course Code	Course Name	Course Type	Periods / Week		Credits	Category
				L-T-P	TCP		
1.	MA25C01	Applied Calculus	T	3-1-0	4	4	BS
2.	EN25C01	English Essentials-I	T	2-0-0	2	2	HUM
3.	UC25H01	தமிழர் மரபு / Heritage of Tamils	T	1-0-0	1	1	HUM
4.	PH25C01	Applied Physics-I	LIT	2-0-2	4	3	BS
5.	CY25C01	Applied Chemistry-I	LIT	2-0-2	4	3	BS
6.	CS25C01	Computer Programming : C	LIT	2-0-2	4	3	ES(PC)
7.	CS25C03	Essentials of Computing	LIT	2-0-2	4	3	ES(PC) DIC
8.	ME25C04	Makerspace	L	0-0-4	4	2	SD
9.	UC25A01	Life Skills for Engineers-I	---	1-0-2	3	1	HUM
10.	UC25A02	Physical Education-I	---	0-0-4	4	1	HUM
11.		NCC/ NSS/ NSO/YRC	---	---	---	---	---
TOTAL				34	23		


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SEMESTER – II

S No.	Course Code	Course Name	Course Type	Periods / Week		Credits	Category
				L-T-P	TCP		
1.	MA25C02	Linear Algebra	T	3-1-0	4	4	BS
2.	UC25H02	தமிழர்களும் தொழில்நுட்பமும் / Tamils and Technology	T	1-0-0	1	1	HUM
3.	EE25C01	Basic Electrical and Electronics Engineering	T	3-0-0	3	3	ES(G)
4.	PH25C03	Applied Physics(CSIE)–II	T	2-1-0	3	3	BS
5.	IT25201	Foundations of Data Science using Python	LIT	3-0-2	5	4	ES(PC)
6.	IT25202	Digital Principles and System Design	LIT	3-0-2	5	4	ES(PC)
7.	EN25C02	English Essentials–II	LIT	1-0-2	3	2	HUM
8.	ME25C05	Re-Engineering for Innovation	L	0-0-4	4	2	SD
9.	UC25A03	Life Skills for Engineers–II	---	1-0-2	3	1	HUM
10.	UC25A04	Physical Education–II	---	0-0-4	4	1	HUM
11.		Foreign Language^	LIT	1-0-2	3	1	HUM
TOTAL					38	26	

^Deutsch/Japanese/Korean



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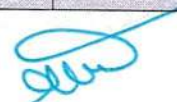
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SEMESTER – III

S No.	Course Code	Course Name	Course Type	Periods / Week		Credits	Category
				L-T-P	TCP		
1.	MA25C14	Discrete Mathematics	T	3-1-0	4	4	BS
2.	CW25201	Computer Organization and Architecture	T	3-1-0	4	4	ES(PC)
3.	CS25C08	Data Structures	LIT	3-0-4	7	5	ES(PC)
4.	CS25C07	Object Oriented Programming	LIT	3-0-4	7	5	ES(PC)
5.	IT25301	Web Technologies	LIT	3-0-2	5	4	ES(PC)
6.	SD25IT301	Skill Development Course-I	LIT	1-0-2	3	2	SD
7.	EN25C03	English Communication Skills Laboratory– I	L	0-0-2	2	1	HUM
TOTAL					32	25	

SEMESTER – IV

S No.	Course Code	Course Name	Course Type	Periods / Week		Credits	Category
				L-T-P	TCP		
1.	MA25C13	Probability and Statistics	T	3-1-0	4	4	BS
2.	IT25401	Standards in Information Technology	T	1-0-0	1	1	SD
3.	CS25C13	Database Management Systems	LIT	3-0-4	7	5	ES(PC)
4.	CS25C09	Java Programming	LIT	3-0-4	7	5	ES(PC)
5.	CS25C11	Operating Systems	LIT	3-0-2	5	4	ES(PC)
6.	SD25IT401	Skill Development Course-II	LIT	1-0-2	3	2	SD
7.	EN25C04	English Communication Skills Laboratory – II	L	0-0-2	2	1	HUM
TOTAL					29	22	



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SEMESTER – V

S No.	Course Code	Course Name	Course Type	Periods / Week		Credits	Category
				L-T-P	TCP		
1.		Programme Elective-I	T	3-0-0	3	3	ES(PE)
2.		Programme Elective-II	T	3-0-0	3	3	ES(PE)
3.	AD25I501	Machine Learning	LIT	3-0-2	5	4	ES(PC)
4.	CS25I501	Computer Networks	LIT	3-0-2	5	4	ES(PC)
5.	SD25C501	Skill Development Course- III	LIT	1-0-2	3	2	SD
6.	IT25C501	Industry Oriented Course-I	LIT	1-0-2	3	1	SD
7.	IT25T401	Theory of Computation	L	3-1-0	4	4	ES(PC)
8.	CS25T301	Object Oriented Software Engineering	L	3-0-0	3	3	ES(PC)
TOTAL				29	24		
For Honours Degree							
1.		Capstone Design Project – Level I	CDP	0-0-12	12	6	SD
OR							
1.		Honours Elective – I	T	3-0-0	3	3	---
2.		Honours Elective – II	T	3-0-0	3	3	---
For Minor Degree							
1.		Minor Elective – I	T	3-0-0	3	3	---
2.		Minor Elective – II	T	3-0-0	3	3	---



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SEMESTER – VI

S No.	Course Code	Course Name	Course Type	Periods / Week		Credits	Category
				L-T-P	TCP		
1.	IT25T601	Computer Vision	T	3-0-0	3	3	ES(PC)
2.		Programme Elective- III	T	3-0-0	3	3	ES(PE)
3.		Open Elective	T	3-0-0	3	3	--
4.	IT25I602	IOT Architecture and Protocols	LIT	2-0-2	4	3	ES(PC)
5.	IT25I601	UI/UX Design and Human Centered Design	LIT	2-0-2	4	3	ES(PC)
6.	IT25C601	Industry Oriented Course-II	LIT	1-0-2	3	1	SD
7.	CS25T501	Compiler Design	L	3-0-0	3	3	ES(PC)
8.	IT25L601	Full Stack Development Laboratory	L	0-0-4	4	2	ES(PC)
9.		Self-Learning Course	---	---	0	1	--
TOTAL					27	22	
For Honours Degree							
1.		Capstone Design Project – Level II	CDP	0-0-12	12	6	SD
OR							
1.		Honours Elective – III	T	3-0-0	3	3	---
2.		Honours Elective – IV	T	3-0-0	3	3	---
For Minor Degree							
1.		Minor Elective – III	T	3-0-0	3	3	---
2.		Minor Elective – IV	T	3-0-0	3	3	---


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SEMESTER – VII

S No.	Course Code	Course Name	Course Type	Periods / Week		Credits	Category
				L-T-P	TCP		
1.	GE25T701	Engineering Entrepreneurship Development	LIT	2-0-2	4	3	HUM
2.	CY25T401	Climate Change and Sustainability	T	2-0-0	2	2	HUM
3.		Programme Elective–IV	T	3-0-0	3	3	ES(PE)
4.		Programme Elective–V	T	3-0-0	3	3	ES(PE)
5.	IT25I701	Ethical Hacking & Penetration Testing	LIT	2-0-2	4	3	ES(PC)
6.	IT25C701	Summer Internship	---	---	---	1	SD
TOTAL				16	15		
For Honours Degree							
1.		Capstone Design Project – Level III	CDP	0-0-12	12	6	SD
OR							
1.		Honours Elective – V	T	3-0-0	3	3	---
2.		Honours Elective – VI	T	3-0-0	3	3	---
For Minor Degree							
1.		Minor Elective – V	T	3-0-0	3	3	---
2.		Minor Elective – VI	T	3-0-0	3	3	---

SEMESTER – VIII

S No.	Course Code	Course Name	Course Type	Periods / Week		Credits	Category
				L-T-P	TCP*		
1	IT25P801	Project Work / Internship cum Project Work	PW/ IPW	0-0-16	16	8	SD
TOTAL				16	8		

Total Credits of the Programme: 165

[Signature]
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Abbreviations:

HUM – Humanities (Languages, Management, Heritage, and others)
BS – Basic Science (Mathematics, Physics, Chemistry)
ES – Engineering Science (General (G), Programme Core (PC), Programme Elective (PE) & Emerging Technology (ET))
SD – Skill Development
PW – Project Work
SL – Self Learning
IPW – Internship cum Project Work
CDP – Capstone Design Project
DIC – Department Introductory Course
OE – Open Elective
T – Theory
L – Laboratory Course
LIT – Laboratory Integrated Theory
TCP – Total Contact Period(s)



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PROGRAMME ELECTIVE COURSES – STREAMS

Data Science and Analytics	Network and Security	Artificial Intelligence	Emerging Technologies	IT Services	Internet of Things and Smart Applications
Big Data Analytics	Principles of Cryptography and Cyber Security	Artificial Intelligence	Quantum Computing	Devops	Dynamic Paradigm for IoT
Information Retrieval Techniques	Digital Forensics & Malware Analysis	Generative AI	Drone Technologies	Vibe Coding	Smart IoT Architecture
Business Intelligence	IOT Security	Deep Learning	Block chain Technologies	C# and .Net Programming	Wearable Computing
Image and video Analytics	Security and Privacy in Cloud	Large Language Models	Augmented Reality/Virtual Reality	Spring Boot & Micro services	IoT in 5G Networks
Data Analytics using R	Software Defined Networks	Explainable AI	Robotic Process Automation	Mobile Application Development	IoT and Smart Cities



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SEMESTER – I



MA25C01	Applied Calculus	L	T	P	C
		3	1	0	4
Course Objectives: <ul style="list-style-type: none">• To provide technical competence of modelling engineering problems using calculus.• To apply the calculus concepts in solving engineering problems using analytical methods and computational tools.					
Differential Calculus: Functions, graph of functions, New functions from old functions, Limit of a function, Continuity, Limits at infinity, Derivative as a function, Maxima and Minima of functions of single variable, Mean value theorem, Effect of derivatives on the shape of a graph. Activities: Visualization of the functions, Maxima and Minima of a function using open-source software, Solving of Competitive Examination questions (Ex. GATE).					
Functions of Several Variables: Partial derivatives, Chain rule, Total derivative, Maxima and minima of functions of two variables, Method of Lagrange's Multipliers, Application problems in engineering. Activities: Partial Derivatives with two or three variables, Maxima and Minima of a function using open-source software, Solving of Competitive Examination questions (Ex. GATE).					
Integral Calculus: Fundamental theorem of Calculus, Indefinite integrals and the Net Change Theorem, Improper integrals, Arc Length, Area of Region, Area of surface of revolution. Activities: Definite and Indefinite Integrals, Determination of Area, Solving of Competitive Examination questions (Ex. GATE).					
Multiple Integrals: Iterated integrals and Fubini's theorem, Evaluation of double integrals, change of order of integration, change of variables between Cartesian and polar co-ordinates, evaluation of triple integrals-change of variables between Cartesian and cylindrical and spherical co-ordinates. Activities: Double integrals and triple integrals using open-source software, Solving of Competitive Examination questions (Ex. GATE).					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%.					
Assessment Methodology: Assignments (20%), Solution to application-oriented problems using software (20%), Solving of GATE questions (20%), Internal Examinations (40%).					
References: <ol style="list-style-type: none">1. Anton, H., Bivens, I. C., & Davis, S. (2021). Calculus: Early transcendentals. John Wiley & Sons.					



Chairman - Board of Studies
Science and Humanities

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2. Ron Larson and David C. Falvo, (2013), Calculus: an Applied Approach. Cengage Learning.
3. Stewart, J., Clegg, D., & Watson, S. (2019). Calculus: Early transcendentals.
4. Thomas, G. B., Jr., Weir, M. D., Hass, J., & Heil, C. (2018). Thomas' calculus: Early transcendentals. Pearson.
5. Singh, K. (2019). Engineering mathematics through applications. Bloomsbury Publishing.
6. Grewal, B. S. (2012). Higher engineering mathematics. Khanna Publishers.

E-resources:

1. [https://math.libretexts.org/Bookshelves/Calculus/Map%3ACalculus_Early_Transcendentals_\(Stewart\)/](https://math.libretexts.org/Bookshelves/Calculus/Map%3ACalculus_Early_Transcendentals_(Stewart)/)
2. <https://openstax.org/books/calculus-volume-1/>
3. <https://tutorial.math.lamar.edu/Classes/CalcII/CalcII.aspx>
4. SCILAB, <https://www.scilab.org/>

	Description of CO	PO	PSO
CO1	Explain the meaning of derivative, integral, and their geometric and physical interpretations.	---	---
CO2	Apply differentiation and integration techniques to compute maxima, minima, and area.	PO1(3)	PSO1(2) PSO2(2)
CO3	Analyze the behavior of single and multivariable functions using derivatives and partial derivatives.	PO2(3)	PSO1(2) PSO3(1)
CO4	Utilize modern computational software and online platforms to deepen understanding, perform complex calculations, and visualize mathematical concepts.	PO5(2) PO11(1)	PSO2(3) PSO3(1)



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EN25C01	English Essentials – I	L	T	P	C
		2	0	0	2
Course Objectives: <ul style="list-style-type: none">Enhance learners' listening and speaking skills to understand and deliver speeches effectivelyEquip students with the skills to write clear, coherent, and grammatically correct texts for various purposes.Strengthen the ability to comprehend, interpret, and analyse written English across diverse contexts.					
Speaking Skills: Self-Introduction (Tenses, Adjectives) Expressing opinions (Subject-Verb Agreement), Participating in Conversations (Speech Acts - agreeing & disagreeing – synonyms and antonyms) Suggested Activities: Self-Introduction, Just a Minute (JAM) Video recording, Situational role plays, Spell Bee, Word Substitution, Usage of Apps.					
Listening Skills: Listening to Simple Conversations (Understanding tone and intent), Short Speeches / Stories, Extracting information, Pronunciation, Listening to Various Accents. Suggested Activities: Listening and Repeating, Gap fill exercises, Note-taking					
Reading Skills: Reading Strategies – (Skimming, scanning, predicting) intensive reading - short passages and long passages on suggested themes (Sentence Patterns, Prefixes and suffixes, idioms and phrases). Activities: Reading - newspaper and digital articles, Cloze, Reading comprehension, note making and summarising,					
Writing Skills: Word Substitution, Sentence Formation, Hints Development (Guided Writing), Writing Different Types of Paragraphs - (Sentence Structure) – Letter Writing / Emails (Informal) Activities: Error Detection, Picture and poster description, Descriptive, Narrative and Comparative paragraphs, Brainstorming and Mind Mapping - Informal letters/ Emails					
Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%					
Assessment Methodology: Quiz (10%), Assignments (20%), Speaking Task (10%), Reading Task (10%), Writing Task (10%), Internal Examinations (40%).					
References: <ol style="list-style-type: none">Miller, K. Q., & Wahl, S. T. (2023). <i>Business and Professional Communication: KEYS for Workplace Excellence</i> (5th ed.). SAGE Publications.Kumar, Sanjay & Pushpalatha. (2018). <i>English Language and Communication Skills for Engineers</i>. India: Oxford University Press.Sharma, S., & Mishra, B. (2024). <i>Communication Skills for Engineers and Scientists</i> (2nd ed.). PHI Learning.					
E-resources: <ol style="list-style-type: none">Cambridge English – https://www.cambridgeenglish.org/learning-					


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english/grammar-and-vocabulary/

2. Perfect English Grammar – <https://www.perfect-english-grammar.com/>
3. British Council – Learn English - <https://learnenglish.britishcouncil.org/grammar>
4. Speechling – <https://speechling.com/>
5. mePro by Pearson – <https://mepro.pearson.com/>
6. TED Talks – <https://www.ted.com/>

	Description of CO	PO	PSO
CO1	Listen and comprehend spoken English, take and draft notes.	---	---
CO2	Apply vocabulary and grammar appropriately to communicate in written and spoken forms.	PO1(3)	PSO1(2) PSO3(3)
CO3	Analyze texts in different contexts using appropriate reading strategies.	PO2(2)	PSO2(1)
CO4	Communicate thoughts and ideas in real life situations.	PO9(2)	PSO3(2)
CO5	Develop communication skills relevant to engineering and technology.	PO11(1)	PSO3(3)



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UC25H01	தமிழர் மரபு	L	T	P	C
		1	0	0	1

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

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

நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்: தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஓயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

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

இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு: இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு, இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம், சுயமரியாதை இயக்கம் இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு, கல்வெட்டுகள், கையெழுத்துப்படிகள், தமிழ்ப் புத்தகங்களின் அச்ச வரலாறு.

References:

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


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UC25H01	Heritage of Tamils	L	T	P	C
		1	0	0	1
<p>Language and Literature: 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.</p>					
<p>Heritage - Rock art Paintings to Modern Art – Sculpture: 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.</p>					
<p>Folk and Martial Arts: Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils</p>					
<p>Thinai Concept of Tamils : 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.</p>					
<p>Contribution of Tamils to Indian National Movement and Indian Culture: 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.</p>					
<p>References:</p> <ol style="list-style-type: none"> 1. தமிழக வரலாறு - மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்). 2. கணினித் தமிழ் - முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்). 3. கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு) 4. பொருளை - ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு) 5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print) 6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies). 7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies). 8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.) 9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu) 10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author) 11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu) 12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book. 					

PH25C01	Applied Physics – I	L	T	P	C
		2	0	2	3
Course Objective(s): <ul style="list-style-type: none">To impart knowledge and expose the essentials of physics in various engineering applications.					
Properties of Matter: Elasticity, Cantilever, Young's modulus (non-uniform bending) Girders: Bridges and buildings, Viscosity: Stokes method, Surface tension: drop weight method, Thermal expansion, Thermal stress, Bimetallic strips, Expansion joints Practical: Non-Uniform bending, Young's modulus of the material, Torsional pendulum, Rigidity modulus of the wire and moment of inertia of the disc. Activities: Virtual demonstration of thermal stress.					
Oscillations: Simple Harmonic motion, Torsional pendulum, Couple per unit twist, Damped and Forced Oscillation Waves: Waves on a stretched string, Energy and Power, standing waves, Ultrasonics, piezo, electric method, Acoustic grating, Electromagnetic waves: Maxwell equation, Production of EM waves by dipole antenna, Propagation of EM waves in free space, wave equation, Cell phone reception Practical: Melde's string experiment – Frequency of an electrically vibrating metal tip. Activities: Virtual demonstration of propagation of EM waves					
Quantum Mechanics: Black body radiation, Photoelectric effect, de Broglie hypothesis, Schrodinger Wave equation, Particle in a box (infinite potential well - three-dimensional box), Barrier penetration and quantum tunnelling. Practical: Photo-electric effect, Determination of Planck's constant. Activities: Virtual demonstration of Scanning Transmission Electron Microscope					
Applied Optics: Interference: Air wedge, Michelson's Interferometer, Fiber optics: Structure of a fiber, Fiber Optic Communication System, Fiber Sensors (Virtual demo), Displacement, pressure sensor and Temperature sensor, Einstein Co-efficient, Nd:YAG laser, CO ₂ laser (construction, functioning and applications), dye laser Practical: Ruling width of Compact disc using Laser, Thickness of a thin sheet/wire using Air wedge Method. Activities: Demonstration of sensors and applications of Lasers					
Weightage: Continuous Assessment: 50%, End Semester Examinations: 50%					
Assessment Methodology: Quiz (5%), Assignments (20%), Flipped Class (5%), Practical (30%), Internal Examinations (40%)					



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References:

1. Young, H. D., & Freedman, R. A. (2020). University physics with modern physics. Pearson.
2. Gaur, R. K., & Gupta, S. L. (2022). Engineering physics. Dhanpat Rai Publications.
3. Mathur, D. S. (2010). Elements of properties of matter. S. Chand Publishing.
4. Griffiths, D. J. (2018). Introduction to quantum mechanics. Cambridge University Press.
5. Silfvast, W. T. (2008). Laser fundamentals. Cambridge University Press.

E-Resources:

1. Barrier penetration problem and Quantum tunnelling:
<https://archive.nptel.ac.in/courses/115/104/115104096/>
2. EM waves and wireless channelling:
https://onlinecourses.nptel.ac.in/noc24_ee31/preview
3. CO2 Laser: https://onlinecourses.nptel.ac.in/noc25_ph03/preview
4. Bimetallic Strips _ <https://www.youtube.com/watch?v=WZQ8lvxdzDk>
5. Cell phone Reception_ https://www.youtube.com/watch?v=1JZG9x_VOwA
6. Dipole Antenna_ <https://www.youtube.com/watch?v=4xF1Fq2wB1I>
7. Optical Sensors_ <https://auece.digimat.in/nptel/courses/video/108106173/L02.html>
8. Scanning Tunnelling Electron Microscope_
<https://www.youtube.com/watch?v=XNYZYbXNWQA>

	Description of CO	PO	PSO
CO1	Explain the physics concepts in various applications.	---	---
CO2	Apply the principles of wave optics and laser physics in practical systems.	PO1(3)	PSO1(2) PSO2(2)
CO3	Analyse the behaviour of materials under different conditions.	PO2(2)	PSO1(2) PSO3(1)
CO4	Conduct experiments in groups and interpret the data.	PO4(3) PO8(1)	PSO1(2) PSO2(2)



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CY25C01	Applied Chemistry – I	L 2	T 0	P 2	C 3
Course Objectives: <ul style="list-style-type: none"> • To provide students with a solid understanding of the chemical principles for engineering applications. • To introduce the chemical properties of materials and how these properties influence the selection and use of materials in engineering systems. • To impart practical applications of chemistry in commonly used engineering devices 					
Water Technology: Water quality parameters and standards. Industrial feed water, Remediation. Municipal water treatment. Desalination. Practical: Analysis of alkalinity, hardness and dissolved oxygen. Activity: Coagulation of water sample using Alum					
Nano-chemistry: Classification, Size, dependent properties. Preparation of nanomaterials, Top-down and Bottom-Up approaches, Applications (Flipped classroom). Practical: Preparation of nanoparticles by Sol-Gel method.					
Electrochemistry: Electrochemical cell, Electrode potential., Redox reaction. Conductivity of electrolytes, Factors. Practical: Conductometric titrations Activity: Electrochemical cell demonstration					
Corrosion & Control: Chemical and electrochemical corrosions, galvanic series, factors influencing corrosion, Electrochemical protection. Organic and Inorganic coating. Practical: <ul style="list-style-type: none"> • Corrosion study by weight loss and salt spray method. • Potentiometry/UV-visible spectrophotometer. Activities: Case Study on Corrosion in Pipelines and Electronics, Control measures for a corroded metal					
Batteries: Conventional, Contemporary and Emerging battery storage technologies, Primary & Secondary Batteries, Battery Pack, Battery Materials, Performance Parameters, Testing, Safety aspects. Practical: Measurement of EMF, Internal Resistance, Charge and Discharge Characteristics. Activities: Demonstration of battery pack in e-vehicles.					
Weightage: Continuous Assessment: 50%, End Semester Examinations: 50%					
Assessment Methodology: Quiz (5%), Assignments (20%), Flipped Class (5%), Practical (30%), Internal Examinations (40%)					
References:					

1. Jain, P. C., & Jain, M. (2015). Engineering Chemistry (17th ed.). Dhanpat Rai Publishing Company (P) Ltd.
2. Dara, S. S. (2004). A Textbook of Engineering Chemistry. Chand Publications.
3. Sachdeva, M. V. (2011). Basics of Nano Chemistry. Anmol Publications Pvt Ltd.
4. Friedrich, E. (2014). Engineering Chemistry. Medtech.

E-Resources:

1. Water and Wastewater Engineering (Prof. Ligy Philip, IIT Madras) – <https://nptel.ac.in/courses/105106202>.
2. Electrochemical Energy Systems (Prof. S. Mitra, IIT Madras) – <https://nptel.ac.in/courses/113106028>.
3. Corrosion (Prof. Kallol Mondal, IIT Kanpur) – <https://nptel.ac.in/courses/112104088>
4. Chemistry of Battery Systems (Prof. V. R. Marathe, IIT Madras) – <https://nptel.ac.in/courses/115106130>
5. Resource on all battery types, testing, and safety – <https://batteryuniversity.com/articles>

	Description of CO	PO	PSO
CO1	Understand the importance of chemistry applications with underlying mechanisms.	---	
CO2	Apply the chemistry concepts in widely used devices.	PO1(3)	PSO1(2) PSO2(2)
CO3	Analyse the effect of various chemical parameters on performance of engineering systems.	PO2(2)	PSO1(2) PSO2(1)
CO4	Perform experimentations as a group and interpret the results.	PO4(3) PO8(1)	PSO2(2) PSO3(2)
CO5	Communicate findings through case studies and reports	PO9(1)	PSO2(2) PSO3(3)

CS25C01	Computer Programming: C	L	T	P	C
		2	0	2	3
Course Objectives: <ul style="list-style-type: none">• To equip engineering students with the foundational knowledge and practical skills in 'C' programming to analyse and solve computational problems effectively.• To foster problem-solving, critical thinking, and modular programming skills essential for engineering domains.					
Introduction to C: Problem Solving, Problem Analysis Chart, Developing an Algorithm, Flowchart and Pseudocode, program structure, Compilation & Execution process, Interactive and Script mode, Comments, Indentation, Error messages, Primitive data types, Constants, Variables, Reserved words, Arithmetic, Relational, Logical, Bitwise, Assignment, Conditional operators, Input/Output Functions, Built-in Functions.					
Practical: Create Problem Analysis Charts, Flowcharts and Pseudocode for simple C programs (Minimum three).					
Control Structures: if, if-else, nested if, switch-case, while, do-while, for, nested loops, Jump statements.					
Practical: Usage of conditional logics in programs. (Minimum three)					
Functions: Function Declaration, Definition and Calling, Function Parameters and Return Types, Call by Value and Call by Reference, Recursive Functions, Scope and Lifetime of Variables, Header files and Modular Programming.					
Practical: Usage of functions in programs. (Minimum three)					
Strings & Pointers: One-dimensional and Multi-dimensional Arrays, Array operations and traversals, String Handling: String declaration, input/output, string library functions, Pointer arithmetic, Pointers and Arrays, Pointers to function, Dynamic memory allocation.					
Practical: Programs using pointers, dynamic memory, pointer arithmetic, string manipulations, array operations. (Minimum three)					
Structures & Unions: Defining and using structures, Array of structures, Pointers to structures, Unions and their uses, Enumerations.					
Practical: Program to use structures and unions					
File Operations: Open, read, write, close file operations, Binary vs Text files, File pointers, Error handling in file operations.					
Practical: Programs reading/writing data in text and binary files (Minimum three).					
Standard Libraries & Header Files: Using standard libraries like stdio.h, stdlib.h, string.h, math.h, Creating and using user-defined header files and libraries.					
Practical: Use of standard and user-defined libraries in solving problems. (Minimum three), Project (Minimum Two)					
Weightage: Continuous Assessment: 50%, End Semester Examinations: 50%					

Assessment Methodology: Quiz (5%), Project (15%), Assignment Programs (25%), Practical (25%), Internal Examinations (30%)

References:

1. Thareja, R. (2021). Programming in C . Oxford University Press.
2. Balagurusamy, E. (2019). Programming in ANSI C. McGraw Hill Education.
3. Kanetkar, Y. (2020). Let us C. BPB Publications.
4. Kalicharan, N. (2022). Learn to program with C: An introduction to programming using the C language. Apress.
5. Forouzan, B. A., & Afyouni, H. (2023). Computer science: A structured programming approach in C (4th ed.). Cengage.

E-resources:

1. Learn-C.org - <https://www.learn-c.org/>
2. GeeksforGeeks - C Programming - <https://www.geeksforgeeks.org/c-programming-language/>
3. GNU C Library Documentation - <https://www.gnu.org/software/libc/manual/>
4. "Introduction to C Programming", Swayam MOOC Course, https://onlinecourses.swayam2.ac.in/imb25_mg71/

CO	Description of CO	PO	PSO
CO1	Explain the potential usage of 'C' in engineering applications	---	---
CO2	To apply the concepts of 'C' in solving engineering problems and formulate new projects.	PO1 (2) PO5 (2)	PSO1(3) PSO3(1)
CO3	To interpret the data and effectively communicate in groups.	PO2 (3) PO8 (1) PO9 (1)	PSO2(3) PSO3(1)
CO4	Adapt new programming concepts and technologies in the profession.	PO11 (1)	PSO2(1), PSO3(3)


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CS25C03	Essentials of Computing	L	T	P	C
		2	0	2	3
Course Objectives: <ol style="list-style-type: none">1. To introduce the basic components and operations of computers.2. To develop problem-solving and computational thinking skills.3. To enable learners to design simple solutions using algorithms and flowcharts.4. To provide hands-on experience in visual programming and basic app development.					
Computers: Computer, Characteristics of Computers, History of Computers, Classification of Computers, Applications of Computers, Basic Organization of a Computer. Data Representation, Using spread sheets for basic operations on data and visualize the data.					
Practical: <ol style="list-style-type: none">1. Office Software for documentation and presentation2. Spread sheets for calculations and data. Visualization					
Computational Thinking: What is Computational Thinking, Decomposition, Abstraction, Real World Information to Computable Data, Number Systems, Conversions among Number systems, what is Logic, Boolean Logic, Applications of Propositional Logic.					
Activities: <ol style="list-style-type: none">1. Solving problems based on number systems and logics.2. Virtual Demonstration of Computational thinking					
Problem Solving Basics: Problem Definition, Logical Reasoning, Decomposition, Software Design Concept of an Algorithm, Algorithm Representation – Algorithm Discovery – Iterative Structures – Recursive Structures – Efficiency and Correctness - Implementation of Algorithms - Fundamental Algorithms: Exchanging the values of two variables, Counting, Summation of a set of numbers, Factorial computation, Generation of Fibonacci Sequence, Reversing the digits of an Integer, Base Conversion.					
Activities: Algorithm Development for simple mathematical problems					
Programming Languages: Program Development Life Cycle, Program Design Tools, Algorithms, Flowcharts, Pseudocodes, Role of Algorithms, Programming Languages, Programming Paradigms Traditional Programming Concepts, Procedural Units, Language Implementation, Declarative Programming.					
Activities: Flowchart design for simple mathematical problems					


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Scratch Programming: What is Scratch, Scratch Programming Environment, Paint Editor, Scratch Blocks, Arithmetic Operators and Functions, Use Motion Commands, Pen Commands and Easy Draw, Looks Palette, Sound Palette, Power of Repeat, Data Types, Variables, Getting Input from Users.

Making Decisions, Comparison Operators, Decision Structures, Logical Operators, Repetition, Loop Blocks, Stop Commands, Counters, Nested Loops, Recursion, String Processing, String Manipulation, Lists, Dynamic Lists, Numerical Lists, Searching and Sorting Lists.

Activities:

1. Creation of Functional Block for simple mathematical problems
2. Drawing and Painting operations
3. Scratch Animation for understanding Conditional and Loop statements.
4. Draw artistic, geometric patterns and create games.
5. Scratch Programs for applied scientific computing and data manipulations

App Development: Building Apps using problem, solving techniques on any app development platform, Modeling, incremental and iterative, reuse, modularization, algorithmic thinking, abstracting and modularizing, decomposition, testing and debugging.

Activities: Sample App Developments for societal problems.

Weightage: Continuous Assessment: 40%, End Semester Examinations: 60%

Assessment Methodology: Assignments (10%), Quiz (5%), Project based learning (20%), Flipped Classroom (5%), Review of GATE questions (10%) & Internal Assessment: 50%

References:

1. Thareja, R. (2020). Fundamentals of computers. Oxford University Press.
2. Rajaraman, V., & Adabala, N. (2014). Fundamentals of computers. PHI Learning.
3. Brookshear, J. G., & Brylow, D. (2015). Computer science: An overview. Pearson.
4. Dromey, R. G. (1982). How to solve it by computer. Prentice Hall International.
5. Marji, M. (2014). Learn to program with Scratch: A visual introduction to programming with games, art, science and math. No Starch Press.
6. Riley, D. D., & Hunt, K. A. (2014). Computational thinking for the modern problem solver. CRC Press.
7. Venkatesh, G., & Mukund, M. (2021). Computational thinking. Notion Press.


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E-Resources:

1. Brennan and Resnick's CT Framework 2012:
<https://scratched.gse.harvard.edu/ct/files/AERA2012.pdf>
2. CS50X 2025 Scratch YouTube lectures by Prof. David J Malan, Harvard University:
<https://www.youtube.com/watch?v=2WtPyqwTLKM>
3. <https://teachinglondoncomputing.org/resources/developing-computational-thinking/>
4. Scratch software: <https://scratch.mit.edu/>
5. MIT APP INVENTOR software: <https://appinventor.mit.edu/>
6. app.diagrams.net

CO	Description of CO	PO	PSO
CO1	Describe the basic components and functioning of computers, number systems, and data representation.	---	---
CO2	Apply computational thinking and problem-solving techniques to design simple algorithms for real-world problems	PO1(3)	PSO1(3)
CO3	Design and represent solutions using flowcharts, pseudocode, and basic visual programming tools.	PO2 (2)	PSO2(3) PSO3(1)
CO4	Demonstrate the ability to independently learn new computing tools and practices essential for life-long learning	PO11(1)	PSO2(1), PSO3(3)


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ME25C04	Makerspace	L 0	T 0	P 4	C 2
Course Objectives: <ol style="list-style-type: none"> 1. To impart practical skills in the assembly, disassembly, and welding of components using appropriate tools and techniques. 2. To provide hands-on training in electrical wiring practices, and the use of electronic components, sensors, and actuators. 					
List of Activities					
<p>(A). Dis-assembly & Assembly Practices</p> <ol style="list-style-type: none"> i. Tools and its handling techniques. ii. Dis-assembly and assembly of home appliances – Grinder Mixer Grinder, Ceiling Fan, Table Fan & Washing Machine. iii. Dis-assembly and assembly of Air-Conditioners & Refrigerators. iv. Dis-assembly and assembly of a Bicycle. <p>(B). Welding Practices</p> <ol style="list-style-type: none"> i. Welding Procedure, Selection & Safety Measures. ii. Power source of Arc Welding – Gas Metal Arc Welding & Gas Tungsten Arc Welding processes. iii. Hands-on session of preparing base material & Joint groove for welding. iv. Hands-on session of MAW, GMAW, GTAW, on Carbon Steel & Stainless Steel plates / pipes, for fabrication of a simple part. <p>(C). Electrical Wiring Practices</p> <ol style="list-style-type: none"> i. Electrical Installation tools, equipment & safety measures. ii. Hands-on session of basic electrical connections for Fuses, Miniature Circuit Breakers and Distribution Box. iii. Hands-on session of electrical connections for Lightings, Fans, Calling Bells. iv. Hands-on session of electrical connections for Motors & Uninterruptible Power Supply. <p>(D). Electronics Components / Equipment Practices</p> <ol style="list-style-type: none"> i. Electronic components, equipment & safety measures. ii. Dis-assembly and assembly of Computers. iii. Hands-on session of Soldering Practices in a Printed Circuit Board. iv. Hands-on session of Bridge Rectifier, Op-Amp and Transimpedance amplifier. v. Hands-on session of integration of sensors and actuators with a Microcontroller. vi. Demonstration of Programmable Logic Control Circuit. 					



(E). Contemporary Systems

- i. Demonstration of Solid Modelling of components.
- ii. Demonstration of Assembly Modelling of components.
- iii. Fabrication of simple components / parts using 3D Printers.
- iv. Demonstration of cutting of wood / metal in different complex shapes using Laser Cutting Machine.

References:

1. Stephen Christena, Learn to Weld: Beginning MIG Welding and Metal Fabrication Basics, Crestline Books, 2014.
2. H. Lipson, Fabricated - The New World of 3D Printing, Wiley, 1st edition, 2013.
3. Code of Practice for Electrical Wiring Installations (IS 732:2019)

	Description of CO	PO	PSO
CO1	Demonstrate proper use and handling of basic hand and power tools.	---	---
CO2	Carry out electrical wiring installations and repairs, applying safety measures in domestic applications.	PO1(3)	PSO2(1)
CO3	Develop solid innovative models through software.	PO5(2)	PSO2(2)
CO4	Adapt and follow safety protocols in the work environment.	PO11(2)	PSO3(2)



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UC25A01	Life Skills for Engineers – I	L 1	T 0	P 2	C 1
Course Objectives: <ul style="list-style-type: none"> To equip engineering students with essential life skills encompassing personal and emotional development, effective management of time and stress, financial literacy, digital safety, and civic responsibility. To enhance self-awareness, interpersonal skills, and resilience to prepare students for the professional and personal challenges of engineering careers and life beyond academics. 					
Personal and Emotional Development: Self-Awareness & Personality, Emotional Intelligence & Empathy, Positive thinking, Right attitude, Stress & Anger Management, Goal-Setting & Time Management, Growth Mindset & Resilience. Activities: Personality tests (MBTI, DISC), reflection journals, Empathy circle, role-playing difficult conversations, Guided mindfulness sessions, stress relief toolkit creation, Vision board creation, weekly time audit and planner, Group challenge scenarios, resilience journal					
Management Skills: Financial Literacy: Budgeting & Saving, Nutrition, Health, and Hygiene, Digital Literacy & Online Safety, Civic Responsibility & Ethics Activities: Create a monthly budget, financial simulation game, Meal planning workshop, physical wellness challenge, Social media audit, privacy and safety scenarios, Community service, values debate.					
Weightage: Continuous Assessment: 100%					
Assessment Methodology: Assignments (20%), Flipped Class & Worksheets (10%), Practical (30%), Internal Examinations (40%)					
References: <ol style="list-style-type: none"> Khera, S. (2003). <i>You can win</i>. Macmillan. Levesque, H. (n.d.). <i>Life skills 101: A practical guide to leaving home and living on your own</i>. (Publication year not specified) Mitra, B. K. (2017). <i>Personality development & soft skills</i> (3rd impression). Oxford University Press. ICT Academy of Kerala. (2016). <i>Life skills for engineers</i>. McGraw Hill Education (India) Private Ltd. 					

	Description of CO	PO	PSO
CO1	Understand personality traits and emotional intelligence, in interpersonal interactions.	---	---
CO2	To work and execute as a team through successful implementation of set goals.	PO7 (1) PO8 (2) PO9 (2)	PSO3(2)
CO3	Develop and implement best practices in day-to-day life, in terms of planning and execution.	PO11 (3)	PSO3(2)

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UC25A02	Physical Education - I	L 0	T 0	P 4	C 1
Course Objectives: <ul style="list-style-type: none"> To impart the fundamentals of physical education for development of students' physical, mental, and social well-being. To instill a lifelong appreciation for physical activity towards the development of positive attitude and fostering values of team work and sportsmanship. 					
Introduction to physical education: Exercise for Good Posture – Conditioning and Calisthenics for Before start, Jogging, Bending, Twisting, Standing, Sitting and Relaxation, Training on First Aid Practices.					
Participation of athletic events: Rules and regulations of important athletic events, Sprint, Jumps, Throws and Hurdles.					
Skill development in any one of the following outdoor games: Basket Ball, Volley Ball, Ball Badminton, Football, Hockey, Kho-Kho, Kabaddi, Cricket, Hand ball and Tennis.					
Skill development in any one of the following indoor games: Shuttle Badminton, Chess and Table Tennis.					
Weightage: Continuous Assessment: 100%					
Assessment Methodology: Attendance (60%), Quiz (10%), Participation in Sports and Games (20%) and Viva Voce (10%)					
References: <ol style="list-style-type: none"> Singh, A. (2008). Essentials of physical education. Kalyani Publishers. Kamlesh, M. L. (2006). Psychology in physical education and sport (3rd ed.). Metropolitan Book Co. Mangal, S. K. (2009). <i>Psychology of sports performance</i>. Sports Publication. 					
E-resources: https://www.who.int/health-topics/physical-activity					

	CO Description	PO	PSO
CO1	Understand and explain the importance of physical activity for mental and physical health.	---	---
CO2	Apply basic principles of exercise science in the routine life.	PO1(3)	PSO1(1)
CO3	Develop teamwork, discipline, and leadership through sports and group activities and collaborate effectively.	PO8(3)	PSO3(2)
CO4	Demonstrate independent learning in health, nutrition, and fitness-related topics.	PO11(2)	PSO3(2)


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SEMESTER – II

MA25C02 - Linear Algebra		L	T	P	C
		3	1	0	4
Course Objective	<ul style="list-style-type: none"> To impart foundational knowledge in linear algebra essential for analyzing and solving problems in engineering applications. To provide the knowledge on computation using software and interpret key linear algebra concepts using software. 				
Course Outcomes : The student will be able to					Cognitive Level
CO1	Understand the basic concepts of vector spaces, subspaces, span, basis, and dimension.				Ap
CO2	Apply methods to test linear dependence/independence and find basis and dimension of vector spaces.				An
CO3	Compute null space, range, eigen values, and eigenvectors of matrices and analyze diagonalizability.				Ap
CO4	Use inner product concepts, norms, and Gram–Schmidt process in R^2 and R^3				Ap
CO5	Perform matrix decompositions such as diagonalization, QR decomposition, and SVD, and solve least squares problems using software tools				Ap

UNIT I - VECTOR SPACES	9+3
<p>Introduction to Vector Spaces, Examples, Subspaces, Linear Combinations, Span, Generating Sets, Linear Dependence and Independence, Basis and Dimension, Dimension of Subspaces.</p> <p>Activities: Open-Source software, exercises to test linear dependence and independence using rank, compute span and basis of a set of vectors, determine the dimension of subspaces, and illustrate the concept of subspace and basis in R^2 and R^3 with visualization.</p>	
UNIT II - LINEAR TRANSFORMATIONS AND DIAGONALIZATION	9+3
<p>Null space, Range, Dimension Theorem (statement only), Matrix representation of a linear transformation, Eigenvalues & Eigenvectors, Diagonalizability.</p> <p>Activities: Open-Source software, exercises to compute the matrix representation of a linear transformation, find the null space and range of a matrix, and compute eigenvalues and eigenvectors of a matrix.</p>	
UNIT III - INNER PRODUCT SPACES	9+3
<p>Inner product, Norms, Cauchy, Schwarz inequality, Gram, Schmidt orthogonalization, Simple problems (up to R^3).</p> <p>Activities: Open-Source software, exercises to compute inner products and vector norms</p>	
UNIT IV - MATRIX DECOMPOSITION	9+3
<p>Orthogonal transformation of a symmetric matrix to diagonal form - Positive definite matrices, QR decomposition.</p>	

Activities: Open-Source software, exercises to check if a matrix is positive definite, perform QR decomposition using built-in functions.	
UNIT V - SINGULAR VALUE DECOMPOSITION AND LEAST SQUARES SOLUTIONS	9+3
Singular Value Decomposition (SVD), Least squares solutions- simple problems (up to 3×3 matrices). Activities: Open-Source software, exercises to check if a matrix is positive definite, perform singular value decomposition using built-in functions.	
TOTAL PERIODS	60

REFERENCES:
<ol style="list-style-type: none"> 1. Friedberg, S. H., Insel, A. J., & Spence, L. E. (2022). Linear algebra. Pearson. 2. Lay, D. C., Lay, S. R., & McDonald, J. J. (2020). Linear algebra and its applications with MATLAB. Pearson. 3. Bronson, R. (2011). Schaum's outline of matrix operations. McGraw-Hill Education. 4. Strang, G., & Thomson, R. (2005). Linear algebra and its applications. Brooks/Cole. 5. Lipschutz, S., & Lipson, M. (2009). Schaum's outline of linear algebra. McGraw-Hill. 6. Kreyszig, E. (2018). Advanced engineering mathematics. Wiley India.
E-RESOURCES:
<ol style="list-style-type: none"> 1. Stanford Engineering Everywhere EE261 - The Fourier Transform and its Applications. 2. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-003-signals-and-systems-fall-2011/ 3. https://www.coursera.org/learn/mathematics-engineers-fourier-laplace-ztransforms 4. Transforms and Applications Handbook Alexander D. Poularikas, Artyom

Mapping of COs with POs / PSOs														
COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	2	-	1	-	-	-	-	-	-	-	-	-	-
2	3	3	1	2	-	-	-	-	-	-	-	-	-	-
3	2	3	-	1	-	-	-	-	-	-	-	-	-	-
4	3	3	1	2	1	-	-	-	-	-	-	-	-	-
5	3	3	2	2	2	-	-	-	-	-	1	-	-	-
CO (W.A)	2.8	2.8	1.3	1.6	1.5	-	-	-	-	-	1.0	-	-	-

UC25H02 - தமிழர்களும் தொழில்நுட்பமும்		L	T	P	C
		1	0	0	1
Course Objective	<ul style="list-style-type: none"> இலக்கியங்கள் மற்றும் தொல்லியல் சான்றுகளின் மூலம் பண்டைய தமிழர்களின் தொழில்நுட்ப பாரம்பரியத்தைப் புரிந்துகொள்ளுதல். அறிவியல் தமிழ் மற்றும் தமிழ் கணினியியலின் வளர்ச்சியை அறிந்து கொள்ளுதல். 				

UNIT I - நெசவு மற்றும் பானைத் தொழில்நுட்பம்	3
சங்க காலத்தில் நெசவுத் தொழில், பானைத் தொழில்நுட்பம், கருப்பு-சிவப்பு பாண்டங்கள், பாண்டங்களில் கீறல் குறியீடுகள்.	
UNIT II - வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்	3
சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள், சங்க காலத்தில் வீட்டுப் பொருட்களின் வடிவமைப்பு, சங்க காலக் கட்டுமானப் பொருட்கள் மற்றும் நடுகற்கள், சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள், மாமல்லபுரம் சிற்பங்களும் கோயில்களும், சோழர் காலப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள், நாயக்கர் காலக் கோயில்கள் மற்றும் அவற்றின் மாதிரி கட்டமைப்புகள், மதுரை மீனாட்சி அம்மன் ஆலயம், திருமலை நாயக்கர் மஹால், செட்டிநாட்டு வீடுகள், பிரிட்டிஷ் காலத்தில் சென்னையில் தோன்றிய இந்தோ-சாரசெனிக் கட்டிடக்கலை.	
UNIT III - உற்பத்தித் தொழில்நுட்பம்	3
கப்பல் கட்டும் கலை, உலோகவியல், இரும்புத் தொழிற்சாலை, இரும்பை உருக்குதல், எஃகு தயாரித்தல், வரலாற்றுச் சான்றுகளாகச் செம்பு மற்றும் தங்க நாணயங்கள், நாணயங்கள் அச்சடித்தல், மணி உருவாக்கும் தொழிற்சாலைகள், கல்மணிகள், கண்ணாடி மணிகள், சுடுமண் மணிகள், சங்கு மணிகள், எலும்புத் துண்டுகள், தொல்லியல் சான்றுகள் மற்றும் சிலப்பதிகாரத்தில் குறிப்பிடப்படும் மணிகளின் வகைகள்.	
UNIT IV - வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில்நுட்பம்	3
அணை, ஏரி, குளங்கள், மதகு, சோழர் காலக் குமிழித் தூம்பின் முக்கியத்துவம், கால்நடை பராமரிப்பு, கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள், வேளாண்மை மற்றும் வேளாண்மை சார்ந்த செயல்பாடுகள், கடல்சார் அறிவு, மீன்வளம், முத்து மற்றும் முத்துக்குளித்தல், பெருங்கடல் குறித்த பண்டைய அறிவு, அறிவுசார் சமூகம்.	
UNIT V - அறிவியல் தமிழ் மற்றும் கணித்தமிழ்	3
அறிவியல் தமிழின் வளர்ச்சி, கணித்தமிழின் வளர்ச்சி, தமிழ் நூல்களை மின்னூல்களாகப் பதிப்பித்தல், தமிழ் மென்பொருட்கள் உருவாக்கம், தமிழ் இணையக் கல்விக்கழகம், தமிழ் மின்னூலகம், இணையத்தில் தமிழ் அகராதிகள், சொற்குவைத் திட்டம்.	
TOTAL PERIODS	15

REFERENCES:

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

UC25H02 - TAMILS AND TECHNOLOGY		L	T	P	C
		1	0	0	1
Course Objective	<ul style="list-style-type: none"> To understand the technological heritage of ancient Tamil society through literature and archaeological evidence. To explore the growth of Scientific Tamil and Tamil computing in the digital era. 				

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), Thirumalai Nayakar Mahal -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 gold- Coins as source of history - Minting of Coins, Beads making-industries Stonebeads, Glass beads, Terracotta beads -Shell beads/ bone beads, Archeological evidences - Gem stone types described in Silappathikaram.	
UNIT IV - AGRICULTURE AND IRRIGATION TECHNOLOGY	3
Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompuof 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.	
TOTAL PERIODS	15

REFERENCES:

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

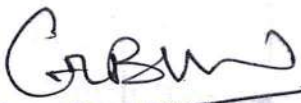
EE25C01 - BASIC ELECTRICAL AND ELECTRONICS ENGINEERING		L	T	P	C
		3	0	0	3
Course Objective	<ul style="list-style-type: none"> To impart foundational knowledge in the basics of working principles and application of DC machines. To explain the fundamentals of AC machines and safety measures taken. To educate on the fundamentals concepts of electrical Machines. To explain the fundamentals of semiconductor and applications. To educate on the fundamental concepts of digital electronics and micro controller. 				
Course Outcomes: The Student will be able to		Cognitive Level			
CO1	Compute the DC fundamentals and simple problems	Ap			
CO2	Understand the working principle and applications of AC fundamentals	U			
CO3	Explain the operating principles of electrical machines and simple problems	Ap			
CO4	Identify the basic concepts of semiconductor devices	U			
CO5	Remember the operating principles of digital electronics and microcontroller	U			

UNIT I - DC FUNDAMENTALS	9
Current and Voltage sources, Resistance, Inductance and Capacitance; Ohm's law, Kirchhoff's law, Series parallel combination of R, L and C components, Voltage Divider and Current Divider Rules. Activities: Virtual Demonstration of electrical laws & circuits, Hands-on Bread boarding, Solving GATE questions.	
UNIT II - AC FUNDAMENTALS	9
Faraday's Laws of Electro-magnetic Induction, Definition of Self and Mutual Inductances, Generation of sinusoidal voltage, Instantaneous & RMS values of sinusoidal signals, Introduction to 3-phase systems, Electrical Safety, Fuses and Earthing. Activities: Virtual Demonstration of electromagnetic induction, Measurement of instantaneous and RMS values of AC signals, Solving GATE questions.	
UNIT III - ELECTRIC MACHINES	9
DC Machines, Transformers, Star and delta Connections, Three phase Induction motors, Synchronous Generators, Single Phase Induction Motors, Stepper Motor, Universal Motor and BLDC motor. Activities: Virtual demonstration of step-up and step-down transformers, Virtual working models of Universal and BLDC motors, Solving GATE questions.	
UNIT IV - SEMICONDUCTOR DEVICES	9
PN junction diodes, Zener Diode, Voltage regulator, BJT & FET Transistors, Timers, Operational Amplifiers. Activities: Virtual demonstration of V-I characteristics of PN junction and Zener diodes using simulation, inverting/non-inverting amplifiers, Solving GATE questions.	

UNIT V - DIGITAL ELECTRONICS AND MICROCONTROLLER	9
Boolean algebra, Basic and Universal Gates, adders, multiplexers, demultiplexers and flip-flops, Microcontroller- Introduction - Architecture, Potential Applications. Activity: Online logic gate simulators, Solving GATE questions and physical demonstration of a microcontroller and online simulation of microcontroller.	
TOTAL PERIODS	45

TEXT BOOK:
<ol style="list-style-type: none"> 1. Kothari DP and I.J Nagrath, "Basic Electrical and Electronics Engineering", Second Edition, McGraw Hill Education, 2020. 2. J.B.Gupta, "Fundamentals of Electrical Engineering and Electronics", 11th Edition S.K.Kataria & Sons, 2024. 3. Ghoshal S., "8051 Microcontroller: Internals, Instructions, Programming and Interfacing", First Edition, Pearson Education, 2024.
REFERENCES:
E-resources:
<ol style="list-style-type: none"> 1. https://archive.nptel.ac.in/courses/108/106/108106172 2. Circuit Simulator –https://www.falstad.com/circuit

Mapping of COs with POs / PSOs														
COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	3	1	-	-	-	-	-	-	-	-	-	2	-	-
3	-	2	-	-	-	-	-	-	-	-	-	2	-	-
4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO (W.A)	3	1.5	-	-	-	-	-	-	-	-	-	2	-	-


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PH25C03 - Applied Physics(CSIE)- II		L	T	P	C
		2	1	0	3
Course Objective	<ul style="list-style-type: none"> To provide a comprehensive understanding of physics concepts in computer science and engineering applications. 				
Course Outcomes: The Student will be able to					Cognitive Level
CO1	Analyze the role of magnetic materials in modern magnetic data storage technologies.	An			
CO2	Analyze simple digital circuits using logic gates and simplified Boolean expressions.	An			
CO3	Examine the fundamentals of nano materials.	An			
CO4	Interpret the concept of quantum tunneling and its significance in nano-electronic devices.	Ap			
CO5	Apply the concepts of a quantum system for information processing and quantum computing	Ap			

UNIT I - MAGNETIC MATERIALS	6+3
Parameters, Ferromagnetic materials, Ferrites - Soft and Hard magnetic materials – GMR sensors - magnetic disk memories – Principle of magnetic recording – Magnetic data storage. Activities: Determination of Hysteresis loop for ferromagnetic materials.	
UNIT II - LOGIC GATES	6+3
Conversion of Binary to decimal - decimal to binary – binary coded decimal code-logic gates (OR, AND, NOT, NAND and NOR)–Exclusive OR gate- simplification based on basic Boolean theorems (sum of products, product of sums expression)- simplification by Karnaugh Map method (don't care conditions). Activities: Virtual demonstration of Logic Gates.	
UNIT III - FUNDAMENTALS OF NANO MATERIALS	6+3
Introduction – electron density in bulk material – size dependence of Fermi energy-quantum confinement – quantum structures: quantum wells, wires and dots – band gap of nano materials. Activities: Virtual demonstration of band gap of nano materials.	
UNIT IV - NANO ELECTRONIC DEVICES	6+3
Tunneling- Coulomb blockade - single electron transistor - resonant-tunneling diode- Carbon nano tubes: Properties and applications. Activities: Virtual demonstration of single electron transistor	
UNIT V - QUANTUM COMPUTING	6+3
Quantum system for information processing –quantum states– classical bits–quantum bits or qubits Bloch sphere –CNOT gate–Single and multiple qubits–quantum gates (Pauli–X,Y and Z Gates, Hadamard Gate, Phase gate-T gate .CNOT Gate)–advantage of quantum computing over classical computing. Activities: Virtual demonstration of quantum computing	
TOTAL PERIODS	45

REFERENCES:

1. Kasap, S. O. (2007). Principles of electronic materials and devices. McGraw-Hill Education.
2. Bernhardt, C.(2019).Quantum computing for everyone. MIT Press.
3. Hanson,G.W.(2009).Fundamentals of nano electronics. Pearson Education.

E-RESOURCES:

1. Single electron Transistor :<https://youtu.be/MTT729LtB-o?si=RGaEhGgmyWJWcZib>
2. Basics of quantum computing - <https://lab.quantum.flytrap.com>

Mapping of COs with POs / PSOs														
COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	2	1	1	1	1	-	-	-	1	2	-	-	-
2	3	2	1	1	2	1	-	-	-	1	2	-	-	-
3	3	2	1	1	1	1	-	-	-	1	2	-	-	-
4	3	2	1	1	2	1	-	-	-	1	2	-	-	-
5	3	2	1	1	2	1	-	-	-	1	2	-	-	-
CO (W.A)	3.0	2.0	1.0	1.0	1.6	1.0	-	-	-	1.0	2.0	-	-	-



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IT25201 – FOUNDATIONS OF DATA SCIENCE USING PYTHON		L	T	P	C
		3	0	2	4
Course Objective	<ul style="list-style-type: none"> To equip students with a strong foundational understanding of data science concepts. To collect, clean, manipulate, and analyse data using Python libraries. To perform data operations and derive insights from real-world datasets. 				
Course Outcomes: The Student will be able to		Cognitive Level			
CO1	Develop simple programs in Python with built-in data structures.	Ap			
CO2	Apply NumPy and Pandas libraries to organize and manipulate data efficiently.	Ap			
CO3	Apply pandas and analyze solutions involving APIs, databases, and real-world datasets.	An			
CO4	Design data using data wrangling and transformation techniques.	C			
CO5	Apply data visualization techniques to analyze and present data insights using appropriate	An			

UNIT I - PYTHON LANGUAGE BASICS AND DATA STRUCTURES	9
Python Language Basics – Scalar Types – Control Flow. Data Structures and Sequences: Tuple – List – Built-in Sequence Functions – dict – set – List, Set, and Dict Comprehensions. Functions: Namespaces, Scope, and Local Functions – Returning Multiple Values – Functions Are Objects – Files and the Operating System.	
UNIT II - NUMPY BASICS	9
The NumPy ndarray: A Multidimensional Array Object – Universal Functions – Fast Element-Wise Array Functions – Array-Oriented Programming with Arrays – File Input and Output with Arrays – Linear Algebra – Pseudorandom Number Generation.	
UNIT III - PANDAS BASICS AND DATA LOADING, STORAGE, AND FILE FORMATS	9
Introduction to pandas Data Structures – Loading and Understanding Data – Data aggregation for computing Descriptive Statistics – Data Cleaning and Preprocessing- Reading and Writing Data in Text Format – Binary Data Formats – Interacting with Web APIs – Interacting with Databases.	
UNIT IV - DATA EXPLORATION AND DATA WRANGLING	9
Data Transformation – String Manipulation. Data Wrangling: Hierarchical Indexing – Combining and Merging Datasets – Reshaping and Pivoting- Data Aggregation and Group Operations: GroupBy Mechanics – Data Aggregation – Apply: General split-apply-combine – Pivot Tables and Cross-Tabulation – Date and Time Data Types.	

UNIT V - DATA VISUALIZATION		9
Introduction to Data Visualization – Visualizing categorical data – Visualizing time series data – Visualizing multiple variables – Visualizing Distribution & Relationships – Multivariate and Time Series Visualization exploration.		
TOTAL PERIODS		45
List of Experiments:		
<ol style="list-style-type: none"> 1. Programs using data frames 2. Programs using functions and files 3. Programs using numpy. 4. Programs to solve linear algebra problems with numpy functions 5. Programs using pandas 6. Solving linear algebra problems with pandas functions 7. Programs for reading and writing data in text and binary formats 8. Programs for interacting with databases 9. Programs for interacting with web apis 10. Programs for string manipulations 11. Data wrangling operations using python 12. Data aggregation operations 13. Handle time series data 14. Visualization of different kinds of data 15. Programs for distribution analysis 		
HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS:		
HARDWARE REQUIRED:		
<ul style="list-style-type: none"> • Processor: Intel Core • RAM: Minimum 4 GB (8 GB recommended) • Display: 1366 × 768 resolution or higher 		


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SOFTWARE REQUIRED:

- Operating System: Windows 10/11
- Python: Python 3.10
- IDE/Editor: Jupyter Notebook, JupyterLab, Spyder, VS Code, or PyCharm
- Python Libraries:
 - NumPy
 - Pandas
 - Matplotlib
 - Seaborn
 - SciPy
 - Requests (for Web APIs)
 - SQLite3 / MySQL Connector (for Database Connectivity)
- Database Management System: SQLite or MySQL
- Package Manager: pip or Anaconda

TOTAL PERIODS**30****TEXT BOOK:**

1. McKinney, W. (2017). Python for data analysis: Data wrangling with pandas, NumPy, and IPython (Modules I–V). O'Reilly Media.
2. Mukhiya, S. K., & Ahmed, U. (2020). Hands-on exploratory data analysis with Python. Packt Publishing.

REFERENCES:

1. VanderPlas, J. (2017). Python data science handbook: Essential tools for working with data. O'Reilly Media.
2. Cielen, D., Meysman, A. D. B., & Ali, M. (2016). Introducing data science. Manning Publications.
3. Ward, M. O., Grinstein, G., & Keim, D. (2015). Interactive data visualization: Foundations, techniques, and applications. A. K. Peters/CRC Press.



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Mapping of COs with POs / PSOs														
COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	2	1	1	2	-	-	-	-	-	2	2	2	1
2	3	3	2	2	3	-	-	-	-	-	2	3	3	1
3	3	3	3	2	3	-	-	-	-	-	2	3	3	2
4	1	1	1	1	1	-	-	-	-	-	3	1	2	3
5	2	2	2	1	3	-	-	-	-	-	2	2	3	1
CO (W.A)	2.4	2.2	1.8	1.4	2.4	-	-	-	-	-	2.2	2.2	2.6	1.6


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IT25202 - DIGITAL PRINCIPLES AND SYSTEM DESIGN		L	T	P	C
		3	0	2	4
Course Objective	<ul style="list-style-type: none"> To understand the basics of number systems and Boolean algebra. To learn how to design and analyze combinational and sequential logic circuits. To use hardware description languages (HDL) for implementing digital systems. 				
Course Outcomes: The Student will be able to		Cognitive Level			
CO1	Identify number systems and basic logic gates	U			
CO2	Apply Boolean algebra and Karnaugh maps to simplify and implement combinational logic circuits	Ap			
CO3	Design combinational logic circuits using logic gates and HDL.	C			
CO4	Analyze sequential logic circuits including latches, flip-flops, registers, counters, and finite	An			
CO5	Design and implement digital systems using memory elements and programmable logic devices with appropriate hardware description techniques	C			

UNIT I - BOOLEAN ALGEBRA AND NUMBER SYSTEMS	9
Number Systems: Binary, Octal, Hexadecimal – Conversion between number systems –Representation of negative numbers – 1's and 2's complements – Binary arithmetic operations –Binary codes. Boolean Algebra: Boolean postulates and theorems – Boolean functions – Truth tables – Logic gates – Universal gates (NAND, NOR).	
UNIT II - CANONICAL FORMS AND SIMPLIFICATION TECHNIQUES	9
Canonical and standard forms – Minterms and Maxterms – Sum of Products (SOP) and Product of Sums (POS) – Conversion between canonical forms – Expansion of Boolean expressions. Karnaugh Maps: Simplification of Boolean functions using K-maps for 2, 3 and 4 variables –NAND and NOR implementations.	
UNIT III - COMBINATIONAL LOGIC CIRCUITS	9
Combinational circuits – Arithmetic circuits – Half adder and Full adder – Subtractors – Binary parallel adder – Carry look-ahead adder – BCD adder – Binary multiplier – Magnitude comparator – Code converters – Decoder, Encoder, Priority encoder – Multiplexer and Demultiplexer –Applications. Introduction to Hardware Description Languages (HDL) for combinational circuits.	

UNIT IV - SEQUENTIAL LOGIC CIRCUITS	9
Latches and Flip-Flops: R-S latch, D latch – Flip-flops: SR, JK, T, D – Master-Slave flip-flop – Flip-flop excitation tables. Analysis of clocked sequential circuits – Moore and Mealy models. Registers – Shift registers – Universal shift register. Counters: Asynchronous ripple counters – Synchronous counters – Ring counter – Johnson counter.	
UNIT V - MEMORY AND DIGITAL SYSTEM DESIGN	9
Memory systems – RAM and ROM – Memory decoding techniques – Error detection and correction. Digital system design using PROM, PLA, PAL and FPGA. System-level design considerations. Introduction to HDL for system-level digital design.	
TOTAL PERIODS	45
List of Experiments:	
<ol style="list-style-type: none"> 1. Simple functions using logic gates 2. Implementation of Boolean functions 3. Simplification and expansion of standard Boolean functions 4. Implementation of combinational circuits using gates for arbitrary functions 5. Implementation of arithmetic circuits and extended operations 6. Combinational circuits using code converters 7. BCD adder, encoder and decoder circuits 8. Design of digital circuits for solving practical problems 9. Project demonstration and presentation 10. Mini project on design of a digital circuit for solving practical problems 	
HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS:	
HARDWARE REQUIRED:	
<ul style="list-style-type: none"> • Digital Logic Trainer Kit / Breadboard • Power Supply (5V DC) • Connecting Wires and LEDs • Logic ICs (7400 Series or equivalent): <ul style="list-style-type: none"> AND, OR, NOT, NAND, NOR, XOR, XNOR Gates Encoders and Decoders Multiplexers and Demultiplexers Adders and Comparators Flip-Flops, Registers, and Counters • FPGA/CPLD Development Board (Optional for HDL-based design) 	
TOTAL PERIODS	30

TEXT BOOK:

1. Mano, M. M., & Ciletti, M. D., Digital Design, Pearson Education, 2018.
2. Roth, C. H., Fundamentals of Logic Design, Jaico Publishing House, 2003.

REFERENCES:

1. Wakerly, J. F., Digital Design Principles and Practices, Pearson Education, 2007.
2. Givone, D. D., Digital Principles and Design, Tata McGraw-Hill, 2003.
3. Kharate, G. K., Digital Electronics, Oxford University Press, 2010.

Mapping of COs with POs / PSOs

COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	1	-	-	-	-	-	-	-	-	-	3	-	-
2	3	2	2	-	1	-	-	-	-	-	-	3	-	-
3	2	2	3	-	2	-	-	-	-	-	-	2	2	-
4	2	3	2	-	2	-	-	-	-	-	-	2	2	-
5	2	2	3	-	3	-	-	-	-	-	1	-	3	2
CO (W.A)	2.4	2.2	2.5	-	2.0	-	-	-	-	-	1.0	2.5	2.3	2.0

EN25C02 - English Essentials – II		L	T	P	C
		1	0	2	2
Course Objective	<ul style="list-style-type: none">• To integrate vocabulary and functional grammar into communication tasks to improve fluency and accuracy.• To articulate ideas clearly and effectively in formal and informal spoken interactions.• To construct well-organized written documents including summaries, reports, and emails relevant to academic and workplace contexts.				
Course Outcomes: The Student will be able to		Cognitive Level			
CO1	Understand the importance of communication and drafting skills in engineering and technology.	U			
CO2	Apply listening strategies to comprehend spoken English in various contexts.	Ap			
CO3	Participate actively in group discussions by analyzing critically from different views.	An			
CO4	Create written reports coherently for various purposes.	Ap			
CO5	Adapt communication styles to global, multicultural environments.	An			

UNIT I - FUNDAMENTALS OF COMMUNICATION AND MEDIA LITERACY	3
Communication: Types-Inter and Intra-personal Communication; Communication Barriers-Summarising Visuals, Media Terminology	
UNIT II - LISTENING SKILLS AND FORMAL ORAL COMMUNICATION	3
Rhetorical devices-TED Talks-Listening strategies	
UNIT III - PROFESSIONAL CORRESPONDENCE AND APPLICATIONS	3
Modal Verbs-Job Application Letters-Resume Writing; Statement of Purpose	
UNIT IV - ACADEMIC AND PROFESSIONAL WRITING SKILLS	3
Paraphrasing & Summarizing - Executive Summary-Proposal	
UNIT V - TEAM WORK, LEADERSHIP AND PROFESSIONAL DECISION MAKING	3
Decision Making; Recommendations-Team Leader, Quality of Team Leader-Leadership Model, Negotiations	
TOTAL PERIODS	15
List of Experiments:	
<ol style="list-style-type: none"> Short presentation, Media based responses-Error detection; Activity: Worksheets Speeches; Welcome Address-Vote of Thanks; Formal Speeches-Activity: Listen and respond to short podcast Email writing-Submission of applications-Graphical summaries Report on college events-Report preparation; Recommendation letters 	

5. SWOT Analysis; Activity: Mock meetings-Group discussions; Activity: Brainstorming sessions	
TOTAL PERIODS	30
REFERENCES:	
1. Kasap, S. O. (2007). Principles of electronic materials and devices. McGraw-Hill Education. 2. Bernhardt, C.(2019).Quantum computing for everyone. MIT Press. 3. Hanson,G.W.(2009).Fundamentals of nano electronics. Pearson Education.	
E-RESOURCES:	
1. Single electron Transistor : https://youtu.be/MTT729LtB-o?si=RGaEhGgmyWJWcZib 2. Basics of quantum computing - https://lab.quantum.flytrap.com	

Mapping of COs with POs / PSOs														
COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	-	-	-	-	-	-	-	-	-	3	-	-	-	-
2	3	-	-	-	-	-	-	-	-	-	-	-	-	-
3	-	2	-	-	-	-	-	1	-	-	-	-	-	-
4	-	-	-	-	-	-	-	-	2	-	-	-	-	-
5	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO (W.A)	3.0	2.0	-	-	-	-	-	1.0	2.0	-	1.0	-	-	-


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ME25C05-Re-Engineering for Innovation		L	T	P	C
		0	0	4	2
Course Objective	<ul style="list-style-type: none"> To cultivate foundational skills in prototyping, and automation for development of prototypes with real-world applications. To provide a comprehensive, hands-on exposure to product development through reverse engineering concepts. 				
Course Outcomes : The student will be able to		Cognitive Level			
CO1	Understand the product development lifecycle, including stages such as concept generation, design, prototyping, and testing.	U			
CO2	Apply reverse engineering techniques to analyze and document existing products.	Ap			
CO3	Collaborate in teams to fabricate prototypes using appropriate tools.	Ap			
CO4	Engage in independent learning and continuously adapt to emerging technologies in product design	Ap			

BOOTCAMP 1	15
Introduction to Product Development, Reverse Engineering, Overview of the product lifecycle, Hands-on disassembly of simple products, Practice of basic measurements and sketching, Introduction to CAD modeling of disassembled parts, Virtual assembly of parts.	
BOOTCAMP 2	15
Embedded System Programming (Open-source platforms), Practice of interfacing sensors, reading data, automation in home, healthcare and agriculture.	
REVERSE ENGINEERING	30
Sketch and prototype alternative designs, Group brainstorming sessions, Manufacture prototype parts using 3D printing and / or workshop tools, Assemble prototype product.	
TOTAL PERIODS	60

REFERENCES:

1. Wang, W. (2010). Reverse engineering: Mechanisms, structures, systems & materials. CRC Press.
2. Margolis, M. (2020). Arduino cookbook: Recipes to begin, expand, and enhance your projects (3rd ed.). O'Reilly Media.

E-RESOURCES:

1. Grab CAD – <https://grabcad.com/>
2. GitHub – <https://github.com>

Mapping of COs with POs / PSOs

COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	3	1	2	2	-	-	-	1	-	-	3	2	1
2	2	2	3	1	3	-	-	-	-	1	-	3	3	1
3	3	2	3	2	3	1	1	-	-	-	-	2	3	2
4	2	2	3	3	3	1	1	-	3	2	2	3	3	3
CO (W.A)	2.5	2.3	2.5	2.0	2.8	1.0	1.0	-	2.0	1.5	2.0	2.8	2.8	1.8


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UC25A03 –LIFE SKILLS FOR ENGINEERS – II		L	T	P	C
		1	0	2	1
Course Objective	<ul style="list-style-type: none"> To impart and cultivate analytical reasoning, innovative thinking, effective collaboration, and ethical leadership to prepare students for complex challenges in professional and personal environments. 				
Course Outcomes : The Student will be able to		Cognitive Level			
CO1	Explain creativity, innovation, and critical thinking concepts.	U			
CO2	Apply thinking skills for problem-solving and decision-making.	Ap			
CO3	Use analytical and logical reasoning to solve problems.	Ap			
CO4	Demonstrate communication and teamwork skills.	Ap			
CO5	Exhibit leadership and ethical decision-making skills.	Ap			

UNIT I – CREATIVITY AND INNOVATION	9
Creativity – Imagination- Intuition- Experience- Sources of Creativity- Myths of Creativity. Activities: Two-Brainstorm Method -30 Circles Challenge -Creativity Myth Busters.	
UNIT II – CRITICAL AND LATERAL THINKING	9
Critical Thinking -Critical Thinking Vs Creative Thinking -Lateral Thinking -Convergent Thinking- Divergent Thinking -Critical Reading -Multiple Intelligence. Activities: Lateral Thinking Riddles and Puzzles -Fast vs. Slow Thinking Game -"What If?" Scenario Writing.	
UNIT III – PROBLEM SOLVING AND ANALYTICAL REASONING	9
Problem Solving Techniques -Six Thinking Hats -Mind Mapping -Forced Connections -Analytical Thinking -Numeric, Symbolic and Graphic Reasoning -Scientific Temperament -Logical Thinking. Activities: Case Study Analysis -Escape Room Challenge.	
UNIT IV – COLLABORATION AND COMMUNICATION	9
Collaboration -Communication -Active Listening -Teamwork and Delegation -Empathy -Conflict Management. Activities: Team-based Exercises -Communication Activities.	
UNIT V – LEADERSHIP AND DECISION MAKING	9
Leadership Styles and Self-Assessment -Decision Making -Responsibility -Integrity -Vision -Motivation - Goal Setting. Activities: Crisis Leadership Simulation -Tower Challenge -Leadership Dilemmas Role-Play -Team Vision Board	
TOTAL PERIODS	45

REFERENCES:

1. De Bono, E. (2017). Six thinking hats, Little, Brown Book Group.
2. Facione, P. A. (2015). Critical thinking: What it is and why it counts. Insight Assessment.
3. Kahneman, D. (2011). Thinking, fast and slow. Farrar, Straus and Giroux.
4. Whetten, D. A., & Cameron, K. S. (2016). Developing management skills. Pearson

Mapping of COs with POs / PSOs														
COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	3	2	-	-	-	-	-	-	-	-	1	1	-
3	-	-	-	2	-	-	-	-	-	-	2	1	-	2
4	-	-	-	-	-	-	-	2	3	-	-	-	-	3
5	-	-	-	-	-	-	-	3	-	-	2	-	1	2
CO (W.A)	-	3.0	2.0	2.0	-	-	-	2.5	3.0	-	2.0	1.0	1.0	2.3



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UC25A04 - PHYSICAL EDUCATION - II		L	T	P	C
		0	0	4	1
Course Objective	<ul style="list-style-type: none"> To develop fundamental knowledge and practical skills in gymnastic exercises for improving physical fitness, flexibility, balance, and coordination. To enhance game-specific skills and promote continuous upskilling to meet the performance requirements of a selected sport or game. 				
Course Outcomes : The Student will be able to					Cognitive Level
CO1	Understand and explain the importance of physical activity for mental and physical health	U			
CO2	Apply safety principles and methods during sports activities.	Ap			
CO3	Develop teamwork, discipline, and leadership through sports and group activities and collaborate effectively.	Ap			
CO4	Demonstrate the advanced technical skills and strategic understanding in the game of their interest.	Ap			
CO5	Demonstrate proficiency in gymnastic exercises and physical fitness activities to enhance strength, flexibility, endurance, and overall performance.	Ap			

List of Practical Activities:

- Basic gymnastics exercises: Warming up, Suitable exercise, Lead up games, Safety education, Movement education, Balanced Walk, execution, floor exercise, tumbling/acrobatics, grip, release, swinging, parallel bar exercise, horizontal bar exercise, flic-flac-walk and pyramids.
- Upskilling in any one of the athletics: Broad Jump, High Jump, Triple Jump, Relay Sprints, Javelin Throw, Discus Throw, Shot Put, Short and Long-distance Running. Advance skills in any one of the indoor/outdoor games, which has been opted by the student in the I semester.

TOTAL PERIODS **60**

REFERENCES:

- Singh, A., "Essentials of physical education", Kalyani Publishers, 2008.
- Kamlesh, M. L., "Psychology in physical education and sport", Metropolitan Book Co., 3rd Edition, 2006.
- Mangal, S. K., "Psychology of sports performance", Sports Publication, 2009.
- Kandappan, K., "Foundations of physical education", Friends Publications, 2004.

E-RESOURCES:

- <https://www.who.int/health-topics/physical-activity>

Mapping of COs with POs / PSOs														
COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	3	-	-	-	-	-	-	-	-	-	-	-	-	1
3	-	-	-	-	-	-	-	3	-	-	-	-	-	2
4	-	-	-	-	-	-	-	-	-	-	1	-	-	2
5	-	-	-	-	2	-	-	-	-	2	-	-	-	3
CO (W.A)	3.0	-	-	-	2.0	-	-	3.0	-	2.0	1.0	-	-	2.0


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FOREIGN LANGUAGE^					
UC25F01 - DEUTSCH – I		L	T	P	C
		1	0	2	1
Course Objective	<ul style="list-style-type: none">To develop foundational skills in the German language, including reading, writing, listening, and speaking for basic communication.To familiarize learners with German pronunciation, vocabulary, grammar, and sentence structures to communicate effectively in everyday situations.				
Course Outcomes: The Student will be able to					Cognitive Level
CO1	Understand simple spoken Deutsch in everyday contexts.				U
CO2	Communicate with widely used Deutsch words effectively.				Ap
CO3	Develop the skills necessary for self-directed learning and continuous improvement in Deutsch language.				Ap

UNIT I - BASICS & INTRODUCTION	5+10
<p>German alphabet and pronunciation, Basic greetings and farewells, Introducing yourself and others (Ich heiße..., Wer bist du?), Numbers 1–100 and days of the week, Personal pronouns (ich, du, er, sie...), Sentence structure (SVO word order).</p> <p>Activities: Alphabet spelling game, short skits, Use color-coded cards for SVO sentences.</p>	
UNIT II - GRAMMAR ESSENTIALS & EVERYDAY VOCABULARY	5+10
<p>Present tense of regular verbs (spielen, arbeiten, machen...), Common irregular verbs: sein (to be), haben (to have), gehen, kommen, Articles and gender (der, die, das; ein, eine), Simple questions and negation (nicht, kein), Describing people and things: adjectives and colors, Family, school, food, and common objects vocabulary.</p> <p>Activities: Conjugate regular and irregular verbs, “Question Chain” game, Create a simple family tree.</p>	
UNIT III - EVERYDAY COMMUNICATION IN GERMAN	5+10
<p>Asking for and giving directions, Telling the time and talking about schedules, Ordering food and drinks at a café or restaurant, Talking about hobbies, weather, and daily routines, Listening to short conversations and responding appropriately, Introduction to German culture and formal/informal language use (du vs Sie).</p> <p>Activities: Ordering food and drinks, Give directions, Formal / Informal greetings, Do’s and Don’ts.</p>	
TOTAL PERIODS	45

REFERENCE:

1. Funk, H., Kuhn, C., & Demme, S., "Menschen A1: Deutsch als Fremdsprache Kursbuch", Hueber Verlag, 2015.

Mapping of COs with POs / PSOs

COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	2	-	-	-	-	2
3	-	-	-	-	-	-	-	-	-	-	1	-	-	2
CO (W.A)	-	-	-	-	-	-	-	-	2.0	-	1.0	-	-	2.0



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UC25F02 - JAPANESE – I		L	T	P	C
		1	0	2	1
Course Objective	<ul style="list-style-type: none"> To develop fundamental proficiency in the Japanese language, including pronunciation, vocabulary, reading, writing systems (Hiragana, Katakana, and basic Kanji), and grammar. To enable learners to communicate effectively in basic everyday situations through listening, speaking, reading, and writing in Japanese. 				
Course Outcomes: The Student will be able to		Cognitive Level			
CO1	Understand simple spoken Japanese in everyday contexts	U			
CO2	Communicate with widely used Japanese words effectively	Ap			
CO3	Develop the skills necessary for self-directed learning and continuous improvement in Japanese language.	Ap			

UNIT I - WRITING SYSTEMS & BASIC COMMUNICATION	5+10
<p>Introduction to Hiragana: vowels, basic characters, reading & writing, Introduction to Katakana: basic characters and usage, Basic greetings and farewells (こんにちは, おはようございます, さようなら), Introducing yourself (名前、出身、年齢), Basic sentence structure: Subject–Object–Verb, Numbers 1–100, days of the week, classroom expressions.</p> <p>Activities: Flashcard games and writing drills, Self-introduction, Numbers & datematching, Greeting expressions, Listening to audio.</p>	
UNIT II - GRAMMAR & EVERYDAY VOCABULARY	5+10
<p>Particles: は (wa), を (wo), の (no), へ (e), に (ni), Present tense verbs: です, ます-form conjugation (たべます, のみます), Negative forms: ではありません, ません, Describing people and objects using adjectives (い and な), Question formation: なに, どこ, だれ, いつ, Vocabulary for family, food, colors, and basic actions.</p> <p>Activities: Verb conjugation drills, Guessing game, Picture description, “Shopping” with food vocab and counters.</p>	
UNIT III - CONVERSATION & CULTURAL ETIQUETTE	5+10
<p>Talking about routines and schedules (daily verbs, time expressions), Asking and giving simple directions (～はどこですか?), Ordering food and making polite requests (～をください、～をおねがいします), Expressing likes and dislikes (すき・きらい), Listening to short conversations and identifying key phrases, Introduction to formal/informal speech and Japanese etiquette.</p> <p>Activities: Skits and role-plays, daily schedule, beginner-level dialogue, Group discussion on etiquette.</p>	

Activities: Practice worksheets and flashcards for hiragana, Writing drills and reading simple katakana words, Dialogue practice for greetings and self-introduction, Sentence construction exercises with basic SOV structure, Particle usage exercises and short dialogues, Role-play scheduling, shopping, and telling time, Verb conjugation drills for common verbs, Descriptive sentence exercises using adjectives, Practice Q&A dialogues forming questions and negations, Kanji writing practice and quizzes for basic characters, Vocabulary tests and conversational practice on daily topics, Oral presentations and listening comprehension quizzes.

TOTAL PERIODS

45

REFERENCES:

1. Banno, E., Ikeda, Y., Ohno, Y., Shinagawa, C., & Tokashiki, K., "Genki I: An integrated course in elementary Japanese", The Japan Times, 2011.
2. The Japan Foundation, "Marugoto Japanese language and culture starter (A1) course book for communicative language activities", Goyal Publishers, 2017.

Mapping of COs with POs / PSOs

COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	2	-	-	-	-	2
3	-	-	-	-	-	-	-	-	-	-	1	-	-	2
CO (W.A)	-	-	-	-	-	-	-	-	2.0	-	1.0	-	-	2.0



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UC25F01 - KOREAN – I		L	T	P	C
		1	0	2	1
Course Objective	<ul style="list-style-type: none"> To develop fundamental proficiency in the Korean language, including Hangul reading and writing, pronunciation, vocabulary, and basic grammar. To enable learners to communicate effectively in everyday situations through listening, speaking, reading, and writing in Korean. 				
Course Outcomes: The Student will be able to					Cognitive Level
CO1	Understand simple spoken Korean in everyday contexts.				U
CO2	Communicate with widely used Korean words effectively.				Ap
CO3	Develop the skills necessary for self-directed learning and continuous improvement in Korean language.				Ap

UNIT I – FUNDAMENTALS OF KOREAN	5+10
Introduction to Hangul: consonants and vowels, Basic pronunciation and syllable formation, Common greetings and self-introductions, Numbers (Sino-Korean and Native Korean basics), Basic sentence structure (SubjectObject-Verb), Simple expressions (e.g., 감사합니다, 안녕하세요). Activities: Writing and reading Hangul practice sheets, Pronunciation drills and audio repetition, Dialogue practice for greetings and self-introduction, Counting and number exercises.	
UNIT II – ESSENTIAL GRAMMAR & VOCABULARY	5+10
Particles (은/는, 이/가, 을/를) and usage, Basic verbs and present tense conjugation, Sentence patterns: affirmative, negative, interrogative, Common adjectives and descriptive sentences, Expressing possession and location, Asking simple questions (어디, 뭐, 누구). Activities: Verb conjugation and sentence formation drills, Role-play conversations for shopping and daily routines, Descriptive writing and speaking exercises, Question and answer practice.	
UNIT III - EVERYDAY KOREAN COMMUNICATION	5+10
Polite speech levels and honorifics introduction, Talking about time, dates, and schedules, Ordering food, shopping phrases, counting objects, Simple directions and transportation vocabulary, Listening practice with short dialogues, Cultural notes on etiquette and communication. Activities: Role-play ordering at a restaurant or buying items, Listening comprehension exercises, Giving and asking for directions practice, Group conversations and presentations.	
TOTAL PERIODS	45



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REFERENCE:

1. King, R., Yeon, J., & Brown, A., "Elementary Korean", Tuttle Publishing, 2nd Edition, 2015.
2. Cho, Y., Lee, H., Schulz, C., Sohn, H.-M., & Sohn, S.-O., "Integrated Korean: Beginning 1", University of Hawai'i Press, 2001.

Mapping of COs with POs / PSOs

COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	2	-	-	-	-	2
3	-	-	-	-	-	-	-	-	-	-	1	-	-	2
CO (W.A)	-	-	-	-	-	-	-	-	2.0	-	1.0	-	-	2.0



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SEMESTER – III

MA25C14 – DISCRETE MATHEMATICS		L	T	P	C
		3	1	0	4
Course Objective:	<ul style="list-style-type: none"> To introduce foundational concepts of set theory, relations, functions, and recurrence relations relevant to modeling data and algorithmic structures and to explain principles of propositional and predicate logic, Boolean algebra, and lattice theory for reasoning and decision-making in AI systems. To present core ideas of graph theory and its applications to analyze and optimize networks, data structures, and intelligent systems. 				
Course Outcomes: The Student will be able to					Cognitive Level
CO1	Understand the concepts of sets, Functions, Recurrence Relations, Logic, Boolean algebra and graph theory.	U			
CO2	Apply principles of logic, functions, Boolean algebra, lattices, recurrence relations, and graph theory to solve real world engineering problems.	Ap			
CO3	Employ discrete mathematical structures such as relations, recurrence relations, logical statements, lattices and graphs to analyze engineering problems.	An			
CO4	Deconstruct engineering problems and provide discrete mathematics based solutions.	An			
CO5	Analyze discrete mathematical representations, truth tables, Hasse diagrams and algorithmic processes to determine optimal paths in AI system and networks.	An			

UNIT I-SET THEORY AND RELATIONS	9+3
Set theory – inductive definition of sets and proof by induction– Peano postulates – Relations – equivalence relations and partitions. Activities: Create and present Venn diagrams to illustrate union, intersection.	
UNIT II- FUNCTIONS AND RECURRENCE RELATIONS	9+3
Functions –Type of functions: Injective, surjective and bijective functions –Composition of functions – Inverse functions – Permutation functions – Recurrence relations – Solving linear recurrence relations. Activities: Categorize real-world mappings such as student-to-email ID, username-to-password, as injective, surjective, or bijective using role-play or sorting tasks.	
UNIT III-LOGIC	9+3
Propositions – Logical operators – Normal forms – Rules of inference – Consistency and inconsistency-Propositional logic – Proofs – Predicates – Quantifiers – Universe of discourse – Logical equivalences and implications for quantified statements – Rules of specification and generalization – Validity of arguments. Activities: Conduct a truth table building competition for compound propositions using logical operators.	
UNIT IV-BOOLEAN ALGEBRA AND LATTICE THEORY	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 – Sub Boolean Algebra – Boolean Homomorphism.	

Activities: Draw Hasse diagrams for lattices from a given set and identify sub lattices and lattice operations.	
UNIT V-GRAPH THEORY	9+3
Graphs – Types of graphs – Matrix representation of graphs- Graph isomorphism- Walk – Path – Cycles – Eulerian graphs – Hamiltonian graphs – Planar graphs – Euler formula – Shortest path algorithm: Dijkstra's algorithm. Activities: Implement Dijkstra's algorithm to find the shortest path in a weighted AI decision graph.	
TOTAL PERIODS	60

TEXTBOOK:
1. Kenneth H. Rosen, "Discrete Mathematics and its applications: With Combinatorics and Graph Theory (9th Edition)", Tata McGraw-Hill, 2025.
REFERENCES:
1. TremblyJ. PandManohar. R."Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw-Hill Pub. Company Limited, New Delhi, 1st Edition, 2017.
2. Mott J.L, Kandel A. and Baker T.P., "Discrete Mathematics for Computer Scientists and Mathematicians", 2nd Edition, Prentice Hall India, 2015.
3. Liu C.L, "Elements of Discrete Mathematics", 4th Edition, McGraw Hill, 2017.
4. Grimaldi, R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", 5th Edition, Pearson Education Asia, Delhi, 2016.
E-RESOURCES:
1. E-Book - "Mathematics for Computer Science" – Eric Lehman, MIT: https://courses.csail.mit.edu/6.042/spring17/mcs.pdf
2. NPTEL – Discrete Mathematics (IIT Ropar) - https://nptel.ac.in/courses/106106183
3. NPTEL – Graph Theory (IIT Madras) - https://nptel.ac.in/courses/111106100
4. MIT Open Course Ware – Mathematics for Computer Science (6.042J) - https://ocw.mit.edu/courses/6-042j-mathematics-for-computer-science-fall-2005/

Mapping of COs with POs / PSOs														
COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	3	2	2	-	-	-	-	-	-	-	3	-	-
2	3	3	2	2	-	-	-	-	-	-	-	3	-	-
3	3	3	3	2	-	-	-	-	-	-	-	-	2	-
4	3	2	2	2	-	-	-	-	-	-	-	3	3	2
5	3	2	3	3	-	-	-	-	-	-	-	-	2	2
CO (W.A)	3	2.6	2.4	2.2	-	-	-	-	-	-	-	3	2.3	2


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CW25201 - COMPUTER ORGANIZATION AND ARCHITECTURE		L	T	P	C
		3	1	0	4
Course Objective	<ul style="list-style-type: none"> To introduce the fundamental components of digital computer systems. To explain various Instruction Set Architecture (ISA) types and instruction execution processes. To impart knowledge on system performance metrics and evaluation techniques. 				
Course Outcomes: The Student will be able to		Cognitive Level			
CO1	Describe the functional units and instruction set architectures of a computer system.	U			
CO2	Apply knowledge of processor functionality to implement and analyze the internal operations of a computer system.	Ap			
CO3	Design and analyze basic digital systems and control units for efficient instruction execution	C			
CO4	Recognize the importance of learning advancements to keep up with evolving computer architecture	U			
CO5	Analyze advanced parallel processing techniques and next-generation processor architectures to assess their impact on the performance of modern computing systems.	An			

UNIT I - INTRODUCTION	9+3
Functional Units of a Digital Computer, Classes of Computer Systems, Hardware-Software Interface, Operation and Operands of Computer Hardware, Instruction Set Architecture, RISC and CISC Architectures, Addressing Modes, Assembly Language Programming, Translation from High-Level Language to Machine Language, Performance Metrics, Benchmarks, Transition from Uniprocessors to Multiprocessors.	
UNIT II - ARITHMETIC FOR COMPUTERS	9+3
Integer Arithmetic, Binary Parallel Adder, Carry Look ahead Adder, Carry Save Adder, Fast Adders, Binary Multiplication, Booth's Algorithm, Bit Pair Recoding, Binary Division, Restoring and Non-Restoring Division, Floating Point Numbers (Single and Double Precision), Floating Point Representation, Arithmetic Operations on Floating Point Numbers, ALU Design, Parallelism and Computer Arithmetic.	
UNIT III - PROCESSOR DESIGN	9+3
Design Conventions of a Processor, Data path Design, Building the Data path, Implementation of Basic MIPS ISA, Designing the Control Unit, Simple Implementation Scheme and Drawbacks, Execution of a Complete Instruction, Hardwired and Micro programmed Control, Instruction Level Parallelism, Basic	

Concepts of Pipelining, Pipelined Data path and Control, Performance, Pipeline Hazards – Structural, Data, and Control Hazards, Handling Exceptions.	
UNIT IV - MEMORY AND I/O	9+3
Types of Memories, Need for a Hierarchical Memory System, Cache Memories, Memory Mapping, Measuring and Improving Cache Performance, Virtual Memory, Paging and Segmentation, TLB, Implementing Protection with Virtual Memory, Memory Management Techniques, Associative Memories, Introduction to Virtual Machines, Memory and I/O Devices, Interfacing I/O Devices to the Processor, Memory and Operating System, Programmed Input/Output, Interrupts, Direct Memory Access (DMA), RAID.	
UNIT V - ADVANCED PARALLEL PROCESSING AND NEXT GENERATION COMPUTER ARCHITECTURES	9+3
Advanced Instruction-Level Parallelism (ILP), Exploitation of ILP, Out-of-Order Execution, Dynamic Scheduling, Speculation, Dynamic Branch Prediction, Multiple-Issue Processors - Static and Dynamic, Limitations of ILP, Multithreading, Multi core Architectures, Superscalar Processors, VLIW, Introduction to Multicore and Multiprocessor Systems, Graphics Processing Units (GPU), CUDA Programming Paradigm, Neural Processing Units (NPU), AI Processing Chips (AI PC), Overview of Next Generation Processor.	
TOTAL PERIODS	60

TEXT BOOK:

1. Stallings, W. (2016). Computer organization and architecture: Designing for performance. Pearson Education.
2. Hennessy, J. L., & Patterson, D. A. (2019). Computer architecture: A quantitative approach. Morgan Kaufmann / Elsevier Publishers.

REFERENCES:

1. Hayes, J. P. (2017). Computer organization and architecture. Tata McGraw Hill.
2. Sarangi, S. R. (2023). Next-gen computer architecture. White Falcon Publishing.
3. Patterson, D. A., & Hennessy, J. L. (2020). Computer organization and design: The hardware/software interface. Morgan Kaufmann / Elsevier.
4. Heuring, V. P., & Jordan, H. F. (2004). Computer systems design and architecture. Pearson Education.

E RESOURCES

1. https://onlinecourses.nptel.ac.in/noc22_cs88/preview?utm_source=chatgpt.com
2. <https://www.coursera.org/learn/comparch>
3. <https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=fBYckQKJvP3a/8Vd3L08tQ>
4. <https://www.coursera.org/learn/build-a-computer>

Mapping of COs with POs / PSOs														
COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	2	-	-	1	-	-	-	-	1	-	1	3	1
2	3	3	2	-	2	-	-	-	-	1	-	1	3	2
3	3	3	3	2	2	-	-	-	-	1	-	1	3	3
4	3	3	2	2	3	-	-	-	-	1	-	1	3	3
5	3	3	2	2	3	-	-	-	-	1	-	2	3	3
CO (W.A)	3	2.8	1.8	1.2	2.2	-	-	-	-	1.0	-	1.2	3	2.4

CS25C08 - DATA STRUCTURES		L	T	P	C
		3	0	4	5
Course Objective	<ul style="list-style-type: none"> This course presents various data structures and their importance to provide a comprehensive view about problem solving skills. 				
Course Outcomes: The Student will be able to		Cognitive Level			
CO1	Describe the concepts and operations of data structures for efficient data organization and manipulation.	U			
CO2	Analyze data structures to understand their performance and application suitability.	An			
CO3	Evaluate data structure algorithms in terms of time and space complexity for solving computational problems.	E			
CO4	Design appropriate data structures and algorithms for real world problem scenarios.	C			
CO5	Develop the ability to apply emerging data structures through continuous self-learning and practice.	Ap			

UNIT I – LINEAR DATA STRUCTURES	9
Abstract Data Types-Internal Representation of Primitive Data Structures-One Dimensional and Multi-Dimensional Arrays-linear lists- Singly, doubly, Circular linked lists- Applications.	
UNIT II - STACKS AND QUEUES	9
Stack: Representations – Operations – Implementations – Applications. Queue: Representations – Operations – Implementations – Types - Applications.	
UNIT III - TREES	9
Representations – Types. – Binary Search Trees (BSTs) - AVL Tree – Operations: Search, Traversals, Rotations - Balanced BSTs- Splay trees- B-trees- Binary Heaps.	
UNIT IV - SORTING, SEARCHING & HASHING TECHNIQUES	9
Linear and Binary Search - Bubble Sort - Insertion Sort- Merge Sort- Bucket Sort- Quick Sort- Heap sort- Hashing techniques- Dictionaries- Hash function- Collision - Separate chaining- open addressing.	
UNIT V - GRAPHS	9
Representation - Types – Operations - Prim's, Kruskal algorithms - Dijkstra's algorithm – Connected and Biconnected Components.	
TOTAL PERIODS	45

List of Experiments:	
<ol style="list-style-type: none"> 1. Single and Multidimensional arrays 2. Singly, Doubly and Circular Linked Lists 3. String reverse operations and Expression evaluation 4. Circular Queue and Priority Queue 5. Traversal operation 6. AVL Tree rotations 7. Query and Update operations on Balanced BSTs. 8. Quick and Heap Sort 9. Binary Search and Hashing 10. BFS and DFS algorithms 11. Minimum Spanning Tree and shortest path algorithms 	
HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS:	
HARDWARE REQUIRED: Computer System with minimum Intel Core i3 Processor RAM: Minimum 4 GB LAN / Internet Connectivity	
SOFTWARE REQUIRED: Operating System: Windows 7 Programming Language: C	
TOTAL PERIODS	60

REFERENCES:
<ol style="list-style-type: none"> 1. Gilberg, R. F., & Forouzan, B. A, "Data Structures: A Pseudocode Approach", Cengage Learning India Private Limited, 2023 2. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", 4th Edition, Pearson, 2014. 3. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson, 2001. 4. D.S. Malik, Data Structures Using C++, 2nd Edition, Cengage, 2012.

Mapping of COs with POs / PSOs														
COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	3	-	-	-	-	-	-	-	-	-	-	3	-	-
3	-	-	2	-	-	-	-	-	-	-	-	-	2	-
4	-	1	-	-	-	-	-	-	-	-	-	3	-	-
5	-	-	-	-	-	-	-	-	-	-	2	-	-	-
CO (W.A)	3	1	2	-	-	-	-	-	-	1	2	3	2	-

CS25C07 - OBJECT ORIENTED PROGRAMMING		L	T	P	C
		3	0	4	5
Course Objective	<ul style="list-style-type: none"> To impart the principles of object-oriented programming and their advantages over procedural programming. To develop problem-solving skills by creating real-world applications using OOP features. 				
Course Outcomes: The Student will be able to				Cognitive Level	
CO1	Understand the core OOP concepts and applications				U
CO2	Apply Object Oriented Paradigms to solve problems using C++				Ap
CO3	Design and Analyze solutions involving code reusability and complexity management				C
CO4	Demonstrate life-long learning skills through application development				Ap
CO5	Build applications I/O System and File Handling.				C

UNIT I - PRINCIPLES OF OBJECT-ORIENTED PROGRAMMING	9
Characteristics of object-oriented languages, C++ Program structure, Procedure Oriented Programming vs Object Oriented Programming, C++ constructs and syntax, tokens, variables, data-types, type conversion, operators, Expressions, Namespace, flow Control and decision, making statements.	
UNIT II - CLASSES AND OBJECTS	9
Abstraction mechanism: Classes, Objects, member data, member functions - Constructors and types - destructors, inline function, friend function, array of objects, objects as function arguments - memory allocation for objects, static members static data and static function.	
UNIT III - INHERITANCE AND COMPILE TIME POLYMORPHISM	9
Inheritance: Derived Classes – Single inheritance – Multilevel Inheritance – Multiple Inheritance – Hierarchical inheritance – Hybrid inheritance. Operator Overloading: Compile time Polymorphism – Overloading Functions, Overloading Operators, Overloading Unary Operators – Overloading Binary Operators – Operator Overloading with Friend Functions.	
UNIT IV - POINTERS, RUNTIME POLYMORPHISM, TEMPLATES AND EXCEPTION HANDLING	9
Pointers with arithmetic operations - this pointer – Pointers to Derived classes and Base classes - Compile time versus Runtime Polymorphism - Virtual functions - Late Binding - Abstract classes- Pure virtual functions and Virtual Destructors - Virtual base class. Class Templates - Function Templates – Overloading of Template Functions - String, iterators, hashes, IO streams; Exception Handling.	

UNIT V - I/O SYSTEMS AND FILE I/O	9
C++ Streams - Formatted and Unformatted I/O –File stream classes – File modes - File operations, Sequential Read / Write operations – Binary and ASCII Files - Error handling in file I/O with member function.	
TOTAL PERIODS	45
List of Experiments:	
<ol style="list-style-type: none"> 1. Use Simple programs to using Operators, and type conversion. 2. Programs using Conditional and Loop statements and loops 3. Programs using in-line and friend functions. 4. Programs using constructors and destructors 5. Programs for inheritance and its types. 6. Programs using friend function and operator overloading. 7. Programs for pointer manipulation. 8. Programs for virtual functions. 9. Programs using function and class templates. 10. Programs using Exception Handling. 11. Programs for Error handling in file and I/O management 12. Develop applications using OOP features. 	
HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS:	
HARDWARE REQUIRED:	
Computer System with minimum Intel Core i5 Processor	
RAM: Minimum 4 GB	
LAN / Internet Connectivity	
SOFTWARE REQUIRED:	
<ul style="list-style-type: none"> • Operating System: Windows 11 / Linux / macOS • Programming Language: C++ Compiler (G++) (GNU Compiler), MinGW (Windows) • IDE (Code::Blocks / VS Code / Visual Studio) • MinGW-w64 (Windows) • Standard C++ Library (STL) 	
TOTAL PERIODS	60

REFERENCES:

1. Deitel, P., & Deitel, H. (2024). C++ how to program: An objects-natural approach. Pearson Education .
2. Bronson, G. (2011). A First book of C++. Course Technology Inc.
3. Balagurusamy, E. (2020). Object oriented programming with C++. McGraw Hill Education.

E-Resources / E Materials:

1. <https://en.cppreference.com/w/cpp>
2. <https://youtu.be/M-mKgBHaMb0?si=1I-pEiAFgwwBA8IC>
3. <https://www.w3schools.com/>

Mapping of COs with POs / PSOs

COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	2	-	-	-	-	-	-	-	-	1	3	3	3
2	3	2	-	-	-	-	-	-	-	-	1	3	3	3
3	3	2	-	-	-	-	-	-	-	-	1	3	1	3
4	3	3	-	-	-	-	-	-	-	-	1	3	3	3
5	3	2	-	-	-	-	-	-	-	-	1	3	3	3
CO (W.A)	3.0	2.0	-	-	-	-	-	-	-	-	1.0	3.0	2.8	3.0



IT25301 – WEB TECHNOLOGIES		L	T	P	C
		3	0	2	4
Course Objective	<ul style="list-style-type: none"> To illustrate how the Internet works and how it is used in the real world. Students will learn to make web pages interactive using HTML, CSS, and JavaScript and build dynamic websites using both client-side and server-side tools. and tools such as AngularJS, React, Node.js, Express, Firebase, Docker, and Django. 				
Course Outcomes: The Student will be able to					Cognitive Level
CO1	Describe the fundamental concepts of web technologies used in developing modern web applications.				U
CO2	Analyze web technologies to understand performance and interoperability in web-based systems.				An
CO3	Evaluate web development approaches to assess effectiveness in building scalable and secure web applications.				E
CO4	Design web-based applications with appropriate technologies and frameworks for real-world deployment.				C
CO5	Engage in continuous learning to keep pace with evolving industry practices for professional development.				Ap

UNIT I - INTERNET FUNDAMENTALS AND HTML5	9
Introduction to World Wide Web and its Evolution – E-mail – Telnet – FTP – E-Commerce – Cloud Computing – Video Conferencing – Internet Service Providers (ISP) – IP Address – URL – Domain Name System (DNS) – Web Browsers – Search Engines – Web Server vs. Application Server – HTML5: HTML Tags – Document Structure – HTML Coding Conventions – Block Elements – Text Elements – Code Related Elements – Character References – Lists – Images – Semantic Elements (section, article, aside) – Navigation Elements (nav, a) – Header and Footer – Audio and Video Support – HTML Forms and Controls – Document Object Model (DOM).	
UNIT II - CSS AND RESPONSIVE WEB DESIGN	9
Introduction to Cascading Style Sheets (CSS) – CSS Rules, Syntax and Styles – Inline, Internal and External CSS – Class Selectors – ID Selectors – span and div Elements – Cascading and Inheritance – CSS Properties – UI Scripting – Responsive Web Design – Bootstrap Framework – Bootstrap Grid System – Grid Classes – Basic Structure of Bootstrap Grid – Typography – Components – Forms – Inputs – Bootstrap Themes – Templates.	
UNIT III - CLIENT-SIDE SCRIPTING AND MODERN JAVASCRIPT	9

JavaScript Fundamentals – Buttons – Variables – Identifiers – Functions – Assignment Statements – Objects – Document Object Model (DOM) – Forms – reset() and focus() Methods – Event Handler Attributes – External JavaScript Files – Manipulating CSS using JavaScript – Using z-index to Stack Elements – Textarea Controls – Pull-Down Menus – JSON (JavaScript Object Notation) – jQuery.	
UNIT IV - SERVER-SIDE PROGRAMMING	9
Model View Controller (MVC) Architecture – Servlets: Architecture – Servlet Life Cycle – Types of Servlets – Request Dispatcher – Session Tracking – Servlets with JDBC – Hibernate: Architecture – Object Relational Mapping (ORM) – Querying using Hibernate – Java Server Pages (JSP): Life Cycle – Components – Tags – Elements – Actions – Implicit Objects – JDBC – Spring Framework – Spring Architecture – Build Tools: Maven and Gradle – Spring Boot.	
UNIT V - PHP, XML AND MODERN WEB APPLICATION FRAMEWORKS	9
PHP: Variables – Program Control Statements – Built-in Functions – Form Validation – Laravel Framework – XML: Basic XML – Document Type Definition (DTD) – XML Schema – XML Parsers – XML Validation – XSL – AngularJS: MVC Architecture – Expressions and Data Binding – Conditional Directives – Style Directives – Controllers – Filters – Forms – Routers – Modules – Services – React – Node.js – Express – Firebase – Docker – Django.	
TOTAL PERIODS	45
List of Experiments:	
<ol style="list-style-type: none"> 1. Use Telnet to connect to a remote host and execute simple commands. 2. Set up a Web Server and demonstrate serving static web content. 3. Create a Registration Form or Feedback Form using HTML5 form controls. 4. Develop a Personal Portfolio Website using HTML5. 5. Demonstrate CSS Styling Methods using Inline, Internal and External CSS. 6. Design a Responsive Website using CSS and Bootstrap. 7. Implement Client-side Validation and Event Handling using JavaScript. 8. Develop an Interactive To-Do List Application using JavaScript and jQuery. 9. Develop a Dynamic Website using Servlet and JSP. 10. Develop a Hibernate-Based Web Application with database connectivity. 11. Develop a Dynamic Website using PHP and Database Connectivity. 12. Create and Validate an XML Document using DTD or XML Schema. 13. Develop a Front-End Web Application using AngularJS. 14. Create a RESTful API using Node.js and Express. 	

HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS:**HARDWARE REQUIRED:**

Computer System with minimum Intel Core i5 Processor

RAM: Minimum 4 GB

LAN / Internet Connectivity

SOFTWARE REQUIRED:

Operating System: Windows 10/11 or Linux (Ubuntu).

Programming Language: Java Development Kit (JDK 8 or above).

Web Browsers: Google Chrome, Mozilla Firefox, Microsoft Edge, **XML Editor** (VS Code/XML Plugins or Notepad++), **XAMPP / WAMP Server** (Apache, PHP, MySQL), **Database:** MySQL 8.x / MariaDB, Angular JS, Maven, Rest API

TOTAL PERIODS**30****REFERENCES:**

1. Paul Deitel, Harvey Deitel, Abbey Deitel, Internet and World Wide Web, 5e, Pearson, 2018.
2. Juha Hinkula, Full Stack Development with Spring Boot 3 and React, Packt, 2023.
3. Frank Zammetti, Modern Full-Stack Development, Apress, 2023.

E-Resources / E Materials:

1. https://onlinecourses.swayam2.ac.in/nou24_cs09/preview
2. <https://www.docs.spring.io/spring-boot/docs/current/reference/htmlsingle/>
3. <https://www.w3schools.com/>

Mapping of COs with POs / PSOs

COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	2	1	1	2	-	-	-	1	2	1	3	2	1
2	3	3	3	2	3	-	-	-	2	2	1	3	3	2
3	3	3	3	3	3	-	-	-	2	3	2	3	3	3
4	3	2	3	2	3	-	-	-	1	2	2	3	3	2
5	3	3	3	3	3	-	-	-	3	3	3	3	3	3

CO (W.A)	3.0	2.6	2.6	2.2	2.8	-	-	-	1.8	2.4	1.8	3.0	2.8	2.2
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SD25IT301 - SKILL DEVELOPMENT COURSE – CLOUD ESSENTIALS		L	T	P	C
		1	0	2	2
Course Objective	<ul style="list-style-type: none"> To understand the fundamentals of cloud computing and major cloud service providers including AWS, Azure, and GCP. To gain practical knowledge in deploying, managing, networking, storage, security, and monitoring of cloud services. 				
Course Outcomes: The Student will be able to					Cognitive Level
CO1	Apply AWS compute and storage services to deploy and manage cloud-based applications.				Ap
CO2	Analyze AWS networking, security, database, and monitoring services for managing cloud environments.				An
CO3	Deploy and manage Azure compute, storage, and application services for enterprise solutions.				An
CO4	Analyze and configure Azure networking, identity management, high availability, and monitoring services.				Ap
CO5	Analyze GCP compute, storage, networking, IAM, and monitoring services for cloud-based applications.				An

UNIT I –INTRODUCTION	3
Cloud computing paradigms (IaaS, PaaS, SaaS), deployment models (Public, Private, Hybrid), AWS Shared Responsibility Model, AWS Global Infrastructure (Regions and Availability Zones), Block vs Object storage concepts.	
UNIT II –AWS NETWORKING	3
Amazon VPC Architecture, Subnetting (Public vs Private), Internet vs NAT Gateways, IAM core principles, Relational (RDS) vs NoSQL (DynamoDB) databases in AWS.	
UNIT III – AZURE ARCHITECTURE	3
Azure Resource Manager (ARM), Subscriptions, Resource Groups, Azure App Services (PaaS) overview. Azure Storage replication models (LRS, GRS) and Access Tiers.	
UNIT IV – AZURE NETWORKING	3
Azure VNet architecture, VNet Peering mechanisms, Microsoft Entra ID (Azure AD) Directory services and Role-Based Access Control (RBAC). Scale Sets (VMSS) mechanics.	
UNIT V – CLOUD SERVICES	3
GCP Resource hierarchy (Projects, Folders), Google Compute Engine (GCE_ machine families. Cloud Storage classes. GCP VPC networks and Firewall fundamentals.	
TOTAL PERIODS	15

List of Experiments :

1. Configure AWS Billing Alarm and launch a Linux EC2 instance with Apache using User Data.
2. Create an S3 Bucket with versioning, static website hosting, and bucket policy.
3. Build a custom VPC with a public subnet, Internet Gateway, and Route Table.
4. Create an IAM user, attach a custom policy, and enable MFA.
5. Provision an Azure Windows VM, configure NSG rules, and deploy IIS.
6. Deploy a scalable HTML web application using Azure App Service.
7. Create Entra ID users/groups and assign custom RBAC roles.
8. Create a GCP project, launch a Compute Engine VM, and connect via Cloud Shell.

HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS:**HARDWARE REQUIRED:**

- Computer System with minimum Intel Core i5 Processor
- RAM: Minimum 8 GB
- LAN / Internet Connectivity

SOFTWARE REQUIRED:

- Operating System: Windows 10/11 or Linux (Ubuntu).
- Google Chrome / Mozilla Firefox / Microsoft Edge
- PuTTY / OpenSSH, Remote Desktop Connection (RDP), Visual Studio Code, Git, WinSCP / FileZilla, Apache Web Server, MySQL Client / MySQL Workbench, Azure Storage Explorer, Postman (optional), Terraform / AWS CLI / Azure CLI / GCloud SDK (optional).

TOTAL PERIODS**30****TEXT BOOK:**

1. AWS: Ben Piper, David Clinton, "AWS Certified Solutions Architect Study Guide: Associate (SAA-C03) Exam", Sybex, Latest Edition. (Units I & II)
2. Azure: Charles Pluta, "Exam Ref AZ-104 Microsoft Azure Administrator", Microsoft Press, Latest Edition. (Units III & IV)
3. GCP: Dan Sullivan, "Official Google Cloud Certified Associate Cloud Engineer Study Guide", Sybex, 2024. (Unit V)

REFERENCE BOOK:

1. General Cloud Reference: Barrie Sosinsky, "Cloud Computing Bible", Wiley Publishing Inc., Reprint Edition.

Mapping of COs with POs / PSOs														
COs	Pos											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	2	2	-	3	-	-	-	1	1	-	3	2	1
2	3	3	2	1	3	-	-	-	1	1	1	3	3	1
3	3	2	3	1	3	-	-	-	1	1	1	3	3	2
4	2	3	3	2	3	-	-	-	1	1	1	3	3	2
5	3	3	3	2	3	1	-	-	1	2	1	3	3	3
CO (W.A)	2.8	2.6	2.6	1.5	3.0	1.0	-	-	1.0	1.2	1.0	3.0	2.8	1.8

EN25C03-ENGLISH COMMUNICATION SKILLS LABORATORY-I		L	T	P	C
		0	0	2	1
Course Objectives	<ul style="list-style-type: none"> To foster students' confidence and fluency in professional and social communication. To bridge the gap between academic English and industry expectations by developing effective communication skills for workplace contexts. 				
Course Outcomes: The student will be able to		Cognitive Level			
CO1	Communicate effectively in everyday professional situations with confidence	Ap			
CO2	Deliver well-organised and effective presentations.	Ap			
CO3	Participate in group discussions and express ideas clearly and confidently.	Ap			
CO4	Create professional video resumes and participate in interviews effectively.	C			
CO5	Create record and publish motivational podcasts.	C			

List of Activities:

A. Elements of Effective Speaking and Listening

- (i) Sharing life experience/ turning point in their life – SATORI
- (ii) Situational Conversation – eg. Talking to a Senior about Internship Tips
- (iii) Welcoming a Guest Speaker at a Seminar
- (iv) Pictography to represent data using images or symbols
- (v) B2-C1 Listening exercises include lectures, interviews, and discussions

B. Mastering Presentations

- (i) Presentation Skills – Non-verbal communication
- (ii) Mini-Presentations: Topics like “My Dream Project,” “Engineering in 2050,” 3-minute technical pitches with logical flow
- (iii) Technical Presentations with PPT

C. Group Discussion Strategies:

- (i) Introduction to Group Discussions - Key skills for effective participation
- (ii) Phases in a GD and Conversational Phrases in GD.
- (iii) Group Discussions – Abstract and Factual topics

D. Resume & LinkedIn Optimization:

- (i) Building LinkedIn Profile – Drafting headlines and summaries
- (ii) Social Media Optimisation
- (iii) Preparing Video Resume

E. Podcast-Based Language Learning:

- (i) Listening to podcast (motivational, career oriented, success stories)
- (ii) Podcast Preparation – Purpose – Topic – Structure – Recording Tips - Publication of the Podcast

F. Mock Interviews and Communication Strategies:

- (i) Listening – Job interview
- (ii) Speaking – Mock interviews

Weightage: Continuous Assessment: 60%, End Semester Examinations: 40%.

Internal Assessment:

- 1. Listening (20 marks)
- 2. Video Resume (20 marks)
- 3. Creating a podcast (30 marks)
- 4. Mock interview (30 marks)

End Semester Assessment:

- 1. Presentation with PPT (50 marks)
- 2. Group Discussion (50 marks)

References:

- 1. Floyd Kory, “Interpersonal Communication”, McGraw Hill Publication, 2023.
- 2. Bharadwaj Apoorva, “Leadership Communication Skills for Intercultural Management: Strategies for Effective Intercultural Management (Contemporary Themes in Business and Management)”, Routledge India; 1st edition, 2024.
- 3. Helen Spencer-Oatey and Donna Lazidou, “Making Working Relationships Work: The TRIPS Toolkit for Handling Relationship Challenges and Promoting Rapport”, Castledown Publishers, 2023.
- 4. Presentations - Cambridge
- 5. Speaking Extra –
- 6. Listening Extra – Miles Craven by Cambridge University Press
- 7. CVs, Resumes, and LinkedIn: A Guide to Professional English – Springer International Publishing



E-resources:

1. Train your mind to perform under pressure- Simon Sinek <https://curiosity.com/videos/simon-sinek-on-training-your-mind-to-perform-underpressure-capture-your-flag/>
2. Brilliant way one CEO rallied his team in the middle of layoffs <https://www.inc.com/video/simon-sinek-explains-why-you-should-put-people-before-numbers.html>
3. Will Smith's Top Ten rules for success <https://www.youtube.com/watch?v=bBsT9omTeh0>

HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS:**HARDWARE REQUIRED:**

- Computer System with minimum Intel Core i5 Processor – 30 (1 per student)
- RAM: Minimum 4 GB
- LAN / Internet Connectivity
- Headphones with microphone – 30 (for listening & speaking tasks)
- Audio system / Speakers – 1 set (*for group listening activities*)
- LCD Projector / Smart Board – 1 (*for demonstrations & presentations*)
- Web Camera (Integrated or External) – 30 (for video résumé and mock interview activities).

SOFTWARE REQUIRED:

- Operating System: Windows 10/11 or Linux (Ubuntu)
- Web Browsers: Google Chrome / Mozilla Firefox / Microsoft Edge
- Presentation Software: MS PowerPoint / Google Slides
- Office Suite: MS Word / LibreOffice

TOTAL PERIODS 30**Mapping of COs with POs / PSOs**

COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	3	-	-	1	-	2
3	-	-	-	-	-	-	-	2	3	-	-	-	-	2
4	-	-	-	-	-	-	-	-	2	-	-	-	-	3
5	-	-	-	-	-	-	-	-	2	-	1	-	2	3
CO (W.A)	-	-	-	-	-	-	-	2.0	2.5	-	1.0	1.0	2.0	2.5

SEMESTER – IV

MA25C13 – PROBABILITY AND STATISTICS		L	T	P	C
		3	1	0	4
Course Objective:	<ul style="list-style-type: none"> To introduce data collection methods, classification techniques, and graphical representation of data using charts and plots, to explain the fundamental concepts of descriptive statistics, probability theory, random variables, and hypothesis testing for analyzing data. To demonstrate the application of statistical techniques such as experimental design and process control using R/Python for data-driven decision-making. 				
Course Outcomes: The Student will be able to		Cognitive Level			
CO1	Understand concepts of descriptive statistics, probability theory and testing of hypothesis.	U			
CO2	Apply probability distributions and statistical methods to solve engineering problems.	Ap			
CO3	Analyze data using correlation, regression, and probability models.	An			
CO4	Utilize hypothesis testing, ANOVA for data-driven decision-making.	Ap			
CO5	Design and analyze statistical experiments using Completely Randomized, Randomized Block, and Latin Square Designs with R Python tools.	An			

UNIT I-DESCRIPTIVE STATISTICS	9+3
Collection of Data-Classification-Tabulation-Graphical Representation – Simple Bar Chart – Pie Chart -Measures of Central Tendency: Arithmetic Mean, Median and Mode – Measures of Variation: Range, Quartile Deviation - Standard Deviation and Coefficient of Variation – Five Number Summary – Box Plot Technique. Activities: Application of descriptive statistics and data presentation methods using R/ Python programming and Analyzing data using Box Plots using R/ Python programming.	
UNIT II-PROBABILITY AND RANDOM VARIABLES	9+3
Axioms of probability - Conditional probability – Total probability – Bayes’ theorem Random variable – Distribution function – properties – Probability mass function – Probability density function – Moments - Standard Distributions - Binomial, Poisson and Normal Distributions-Problems, Uniform Distribution and Exponential Distribution (Simple Problems) . Activities: Application of various distributions using R/ Python programming.	
UNIT III- TWO-DIMENSIONAL RANDOM VARIABLES	9+3
Joint distributions – Marginal and conditional distributions – Expected values of functions of two variables– Correlation and regression (for discrete data only) - Central limit theorem – Statement and Simple Problems . Activities: Applications of Correlation and Regression using R/ Python programming.	
UNIT IV – TESTING OF HYPOTHESIS	9+3
Large sample tests for single mean and difference of means – Small samples tests based on t and F	

distributions (single mean, difference of means, paired t- test and variance ratio test) – Chi-square test for independence of attributes and goodness of fit. Activities: Application of Student – t test, F test ,Chi –s square test using R/ Python programming.	
UNIT V–DESIGN OF EXPERIMENTS	9+3
Analysis of Variance (ANOVA) – Completely Randomized Design (CRD) – Randomized Block Design (RBD) – Latin Square Design (LSD). Activities: Application and visualization of One-way ANOVA and Two -way ANOVA using R/ Python programming	
TOTAL PERIODS	60

TEXTBOOK:

1. Walpole R. E., Myers S.L. & Keying Ye, “Probability and Statistics for Engineers and Scientists”, Pearson Education Inc, 9th Edition, 2024.

REFERENCES:

1. Gareth James, Daniela Witten, Trevor Hastie and Robert Tibshirani, “An Introduction to Statistical Learning With Applications in R”, Springer, 2021.
2. Johnson R. A., Miller & Freund’s, “Probability and Statistics for Engineers”, 9th Edition, Pearson Education, Delhi, 2020.
3. Charles Henry Brase and Corrinne PellilloBrase, “Understandable Statistics: Concepts and Methods”, Cengage Learning, 12th Edition, 2018.
4. Richard A. Johnson and Dean W. Wichern, “Applied Multivariate Statistical Analysis”, 6th Edition, Pearson Education, Asia, 2012.
5. Anderson, T. W, “An Introduction to Multivariate Statistical Analysis”, 3rd edition, John Wiley and Sons, 2009.

E-RESOURCES:

1. NPTEL – Descriptive Statistics with R Software - https://onlinecourses.nptel.ac.in/noc22_mg87/preview
2. MIT OCW – Introduction to Probability and Statistics (18.05, Spring 2022) - <https://ocw.mit.edu/courses/18-05-introduction-to-probability-and-statistics-spring-2022/>
3. MIT OCW – Statistics for Applications (18.650, Fall 2016) - <https://ocw.mit.edu/courses/18-650-statistics-for-applications-fall-2016/>
4. Control Charts – Coursera: <https://www.coursera.org/learn/stability-and-capability-in-quality-improvement#modules>


Chairman - Board of Studies
Science and Humanities

Vandha College of Technology (Autonomous)
Erode - 638 052.

Mapping of COs with POs / PSOs														
COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	3	3	2	-	-	-	-	-	-	-	3	-	-
2	3	3	3	2	-	-	-	-	-	-	-	3	2	-
3	3	3	3	3	-	-	-	-	-	-	-	3	2	2
4	3	3	3	3	-	-	-	-	-	-	-	2	3	2
5	3	3	3	3	-	-	-	-	-	-	-	2	3	3
CO (W.A)	3.0	3.0	3.0	2.6	-	-	-	-	-	-	-	2.4	2.4	2.2



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Science and Humanities
Nandha College of Technology (Autonomous)
Erode - 638 052.

IT25401 – STANDARDS IN INFORMATION TECHNOLOGY		L	T	P	C
		1	0	0	1
Course Objective	<ul style="list-style-type: none"> To understand the fundamental principles of standardization and its importance in industry and information technology. To evaluate the national and international standards in ensuring quality, compatibility, and interoperability across systems. 				
Course Outcomes: The Student will be able to					Cognitive Level
CO1	Apply the principles of standardization to evaluate their importance and utilize key indian and international standards in practical scenarios.				Ap
CO2	Apply and evaluate major IT and software engineering standards.				Ap
CO3	Evaluate IT service and quality management standards for practical use.				Ap
CO4	Analyze telecommunication, internet, and web standards for interoperability.				An
CO5	Analyze ethical and professional responsibilities in computing by evaluating real-world scenarios using ACM standards and ethical guidelines.				An

UNIT I – OVERVIEW OF STANDARDS	3
Basic concepts of standardization: Purpose of Standardization - Marking and certification of articles and processes; Importance of standards to industry - Policy makers – trade - sustainability and innovation. Objectives - roles and functions of BIS - Bureau of Indian Standards Act - ISO/IEC Directives - WTO Good Practices for Standardization - Important Indian and International Standards.	
UNIT II - INTERNATIONAL STANDARDS IN COMPUTER SCIENCE	3
Introduction - Importance of standards in IT - Overview of key international standards organizations ANSI and IEEE Standards - ANSI standards for software engineering (e.g., ANSI/ISO/IEC 12207:2008 - Software Life Cycle Processes)- IEEE standards and their applications in software engineering (e.g., IEEE 830-1998 - Requirements Specifications)- ISO/IEC 20000: IT Service Management -Scope and requirements-Service delivery process-Certification and implementation challenges- ISO 9000 Series: Quality Management -Overview of ISO 9001-Quality management principles-Certification process and benefits.	
UNIT III - ITU-T STANDARDS IN TELECOMMUNICATIONS	3
ITU-T Standards in Telecommunications -Overview of ITU-T series (e.g., ITU-T X.509 for public key infrastructure)-Impact on global telecommunications standards- IETF Standards in Internet Protocols - Overview of key IETF standards (e.g., RFC 791 for IPv4)-Evolution and adoption of internet protocols- W3C Standards for the World Wide Web -Key W3C standards (e.g., HTML5, CSS3, Web Accessibility Guidelines)-Role of standards in web development and interoperability	
UNIT IV - ISO/IEC 27001: Information Security Management	3

Principles and Framework-Risk assessment and Management-Controls and compliance-NIST Standards and Frameworks -NIST Cybersecurity Framework (CSF) NIST Special Publications (e.g., SP 800 series) for cybersecurity.	
UNIT V - ACM STANDARDS AND GUIDELINES	3
ACM Code of Ethics and Professional Conduct-ACM Computing Classification System (CCS) and its role in standardization.	
TOTAL PERIODS	15

TEXT BOOK:

1. Kunas, Michael," Implementing service quality based on ISO/IEC 20000: A management guide" O'Reilly Publishers, Third Edition, 2012.
2. Sikos, Leslie, "Web Standards: Mastering HTML5,CSS3, and XML."Apress, 2011.
3. Calder, Alan,' NIST Cyber security Framewor: A Pocket Guide, "IT Governance Publishing, 2018.

REFERENCES:

1. Manual for Standards Formulation 2022, Bureau of Indian Standards.
2. Kan,S. H ," Standards for Information Technology and Systems", Prentice Hall,2017.
3. IEEE Computer Society.(2014)"IEEE Guide to the Software Engineering Body of Knowledge (SWEBOK)",Version 3.0.IEEE.Retrieval from IEEE Xplore.
4. Calder, Alan. "ISO/IEC 27001:2013-A Pocket Guide"IT Governance Publishing, 2013.
5. Association for Computing Machinery."ACM Code of ethics and Professional Conduct: A Guide "ACM,2018.

Mapping of COs with POs / PSOs														
COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	2	-	-	2	-	-	-	-	-	-	2	1	2
2	3	3	2	2	3	-	-	-	-	-	-	3	1	2
3	3	3	2	3	3	-	-	-	-	-	-	3	2	2
4	3	3	2	3	3	-	-	-	-	-	-	3	2	2
5	2	2	-	1	2	-	-	3	-	2	-	3	3	2
CO (W.A)	2.8	2.6	1.2	1.8	2.6	-	-	3.0	-	1.0	-	2.8	1.8	2.0

CS25C13 - DATABASE MANAGEMENT SYSTEMS		L	T	P	C
		3	0	4	5
Course Objective	<ul style="list-style-type: none"> This course provides a comprehensive foundation in database system concepts, including architecture, data modeling, and query languages. The course discusses the concepts of transaction management, concurrency control and query optimization. 				
Course Outcomes: The Student will be able to:				Cognitive Level	
CO1	Describe the fundamental concepts, of database management systems and data models.				U
CO2	Analyze database methods to ensure efficient data organization and retrieval.				An
CO3	Evaluate database design approaches in maintaining data integrity				E
CO4	Design database solutions for real-world applications.				C
CO5	Develop the ability to apply emerging topics through continuous self-learning.				Ap

UNIT I - INTRODUCTION	9
Purpose, architecture and types of DBMS – Data models: traditional, hierarchical, network, relational, object-oriented – DBMS architecture – Database users and languages (DDL, DML, DCL) – basic SQL queries.	
UNIT II - SQL COMMANDS	9
Primary key, foreign key, unique, not null, check, IN operator, Functions – aggregate functions, Built-in functions – numeric, date, string functions, set operations, sub-queries, correlated sub-Queries: Use of group by, having, order by, join and its types, Exist, Any, All, view and its types. Transaction control commands.	
UNIT III - DATABASE DESIGN	9
Entity Types, Entity Sets – Attributes – Keys: Candidate, Primary, Foreign – Relationship Types & Roles – Constraints: Participation, Degree – Weak Entities & Keys – Converting ER Diagrams to Relations – Handling M:N relationships, ISA hierarchies – EER Extensions: Specialization/Generalization. Functional dependencies – Normal forms: 1NF, 2NF, 3NF, 4NF, BCNF – Decomposition, lossless joins – Impact of normalization on schema.	

UNIT IV - TRANSACTIONS, CONCURRENCY AND RECOVERY	9
ACID Properties – Transaction States (active, committed, aborted) – System and User Transactions – Serializability – Locking Protocols (2PL), Timestamp Ordering, Deadlocks – Isolation Levels – Log-Based Recovery: Write-Ahead Logging – Checkpoints – ARIES – Shadow Paging.	
UNIT V - QUERY PROCESSING AND INDEXING	9
Parsing, Validation, Query Trees – Query Execution Plans – Cost Estimation – Physical Plan Strategies – Heuristics and Cost-Based Optimization – Disk Storage, RAID – File Organization – B+-Tree Indexes – Hash-Based Indexing: Static & Dynamic – NoSQL.	
TOTAL PERIODS	45
List of Experiments:	
<ol style="list-style-type: none"> 1. Installation and configuration of open-source DBMS. 2. Creation of databases and SQL operations. 3. Creation of sample database and perform CRUD operations. 4. Combining data from multiple tables and perform complex data retrieval. 5. Creation of ER Model for a real-world scenario using Draw.io and Lucidchart. 6. Conversion of ER Diagram to Relational Schema. 7. Identification of functional dependency, entities and attributes. 8. Implementation of the schema in SQL tool and populate with sample data. 9. ACID properties (e.g., missing commit, unhandled rollback). 10. Simulation of transaction in SQL. 11. Query Optimization Simulation Using Query Trees. 12. Analyze and compare execution plans in MySQL/PostgreSQL. 	
HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS:	
HARDWARE REQUIRED:	
<ul style="list-style-type: none"> • Processor: Intel Core i5 / AMD Ryzen 5 or above • RAM: Minimum 8 GB • Storage: Minimum 256 GB HDD/SSD 	
SOFTWARE REQUIRED:	
<ul style="list-style-type: none"> • Operating System: Ubuntu / Windows 10 / Windows 11 • DBMS Software: MySQL 8.0 / PostgreSQL 16 / Oracle Database 21c Express Edition • IDE/Editor: MySQL Workbench 8.0 / Oracle SQL Developer 	
TOTAL PERIODS	60

TEXT BOOK:

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", McGraw-Hill Education, Seventh Edition, 2021.

REFERENCES:

1. Carlos Coronel, Steven Morris, "Database Systems: Design, Implementation, and Management", Cengage Learning, Ninth Edition, 2024.
2. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Pearson Education, Seventh Edition, 2017.

E resources/E materials:

1. Link: <https://nptel.ac.in/courses/106105175>
2. Link : <https://nptel.ac.in/courses/106106095>
3. Link: <https://ocw.mit.edu/courses/6-5830-database-systems-fall-2010/>
4. Link: <https://online.stanford.edu/courses/soe-ydatabases0005-databases-relationaldatabases-and-sql>
5. Link : <http://university.mongodb.com>

Mapping of COs with POs / PSOs

COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	2	-	-	1	-	-	-	-	-	-	3	1	-
2	3	3	2	1	3	-	-	-	-	-	-	3	2	-
3	2	2	3	-	2	-	-	-	-	-	-	3	3	-
4	2	3	1	3	2	-	-	-	-	-	-	3	2	-
5	2	3	1	3	3	-	-	-	-	-	-	3	3	-
CO (W.A)	2.0	3.0	1.0	1.0	2.0	-	-	-	-	-	-	3.0	2.0	-

CS25C09 - JAVA PROGRAMMING		L	T	P	C
		3	0	4	5
Course Objective	<ul style="list-style-type: none"> The objective of this course is to impart knowledge on the fundamentals of Java programming and explore conceptual capabilities of Java Language. 				
Course Outcomes: The Student will be able to		Cognitive Level			
CO1	Describe object-oriented features of Java programming for developing robust applications.	U			
CO2	Analyze object-oriented constructs to understand program flow, data handling, and exception management.	An			
CO3	Evaluate appropriate Java programming constructs in different scenarios.	E			
CO4	Design Java applications to solve real-world problems.	C			
CO5	Develop the ability to adapt to emerging Java frameworks and tools.	C			

UNIT I - FOUNDATIONS OF OOP AND JAVA	9
Principles of Object-Oriented Programming – Java Development Kit (JDK) – Data Types, Variables and Arrays – Operators – Control Statements – Classes and Objects – Constructors – Method Overriding – Access Specifiers – Static Members – Inheritance.	
UNIT II - JAVA CONCEPTUAL FOUNDATIONS AND CAPABILITIES	9
Packages and Interfaces – Exception Handling – Multithreaded Programming – Enumerations – Autoboxing – Annotations – Generics – Lambda Expressions.	
UNIT III - JAVA CORE LIBRARIES, I/O AND GUI PROGRAMMING	9
String Handling – java.lang Package – Utility Classes – java.io Package – Reading and Writing Console I/O – Files – Event Handling – Working with AWT Controls – Layout Managers – Swing – Menus.	
UNIT IV - DATABASE CONNECTIVITY USING JAVA	9
JDBC – Types of JDBC Drivers – JDBC Packages – JDBC API and Driver – Associating the JDBC/ODBC Bridge with the Database – Database Connections and Operations.	
UNIT V - JAVA COLLECTION FRAMEWORK	9
Collection Framework – Regular Expressions (Regex) – java.util Package – Arrays and Collections – Map Interfaces – Iterators – Generics.	
TOTAL PERIODS	45

List of Experiments:

- Constructors and Static Members.
- Inheritance.
- Packages and Interfaces with Access Specifiers.
- Creation of User-Defined Exception and Multiple Threads.
- String Handling.
- Event Handling.
- Files I/O.
- Swing Application.
- Database Connections and Operations.
- ArrayList and Map Interfaces.

HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS:

HARDWARE REQUIRED:

- Computer System with minimum Intel i3 Processor
- 4 GB RAM or higher
- 500 GB Hard Disk or higher
- Network connectivity (LAN / Internet)

SOFTWARE REQUIRED:

- Java Development Kit (JDK)
- Java IDE (Eclipse / NetBeans)
- MySQL Database (for JDBC experiments)
- Text Editor (Notepad++)

TOTAL PERIODS	60
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TOTAL PERIODS	60
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TEXT BOOK:

1. Herbert Schildt, Dr. Danny Coward, Java - The Complete Reference, McGraw-Hill Education, Thirteenth Edition, 2024.

REFERENCES:

1. Aamer Khan, "Java Programming Language | Learn Java from Basic to Advance", Code Academy, 2022.
2. Tripti Paul, "Object-Oriented Programming Using Java", Cengage Learning, 2018.

Mapping of COs with POs / PSOs														
COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	2	2	-	-	-	1	1	1	-	2	2	2	-
2	3	3	2	-	-	-	1	1	1	-	2	3	2	-
3	3	3	2	-	-	-	1	1	1	-	2	3	2	-
4	3	3	2	-	-	-	1	1	1	-	2	3	2	-
5	3	3	2	-	-	-	1	1	1	-	2	3	2	-
CO (W.A)	3.0	2.8	2.0	-	-	-	1.0	1.0	1.0	-	2.0	2.8	2.0	-

CS25C11- OPERATING SYSTEMS		L	T	P	C
		3	0	2	4
Course Objective	<ul style="list-style-type: none"> To understand the core principles of modern operating systems. To understand and analyse the components such as process management, CPU scheduling, synchronization, memory, file systems, and I/O. 				
Course Outcomes: The Student will be able to		Cognitive Level			
CO1	Describe the operating systems concepts in managing computer hardware and software resources.	U			
CO2	Analyze operating system components and file systems	An			
CO3	Evaluate operating system algorithms in different computing environments.	E			
CO4	Design operating system solutions for managing system resources in real-world scenarios.	C			
CO5	Develop the ability to adapt to emerging trends, tools, and technologies.	Ap			

UNIT I – BASICS OF OPERATING SYSTEMS	9
History and Evolution of Operating Systems - Types of Operating Systems - Operating Systems Structures - Functions of Operating Systems - Challenges of Operating Systems - Unix & Linux Operating Systems.	
UNIT II – SYSTEM CALLS AND PROCESS MANAGEMENT	9
System Calls - Process Concepts and Lifecycle, Process Control Block (PCB) - Context Switching - Threading Models, Process vs Thread-Process Creation and Termination - Case study.	
UNIT III – CPU SCHEDULING	9
Scheduling Criteria and Objectives - Scheduling Algorithms - Preemptive and non-preemptive scheduling.	
UNIT IV – SYNCHRONIZATION AND DEADLOCKS	9
Concurrency Issues and Critical Section Problem - Synchronization Tools: Mutex, Semaphores - Deadlock: Necessary Conditions, Prevention, Avoidance, Detection, and Recovery.	

UNIT V – MEMORY MANAGEMENT AND FILE SYSTEMS AND I/O MANAGEMENT	9
Contiguous Memory Allocation, Paging, Segmentation - Virtual Memory, Demand Paging, Page Replacement Algorithms (FIFO, LRU, Optimal) - File System Concepts - Directory and File Access Control - I/O Management - Disk Scheduling, Buffering, Caching - Case study.	
TOTAL PERIODS	45
List of Experiments:	
<ol style="list-style-type: none"> 1. Installation of Linux OS. 2. Basic Linux Commands and Shell Scripting. 3. Process Creation using fork(), exec() and wait() system calls. 4. Multi-thread programming using POSIX threads. 5. Implementation of CPU Scheduling Algorithms (FCFS, SJF, RR, Priority Scheduling, Multilevel Queue Scheduling). 6. Implementation of Producer–Consumer Problem using Semaphores. 7. Implementation of Readers–Writers Problem. 8. Implementation of Deadlock Detection/Avoidance using Banker's Algorithm. 9. Implementation of Page Replacement Algorithms (FIFO, LRU, Optimal). 10. Implementation of Dynamic Memory Allocation and Deallocation. 11. Implementation of Linux File Operations and File Buffering. 12. Implementation of Disk Scheduling Algorithms (FCFS, SSTF, SCAN, LOOK). 	
HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS:	
HARDWARE REQUIRED:	
<ul style="list-style-type: none"> • Processor: Intel Core i3 / AMD Ryzen 3 or above • RAM: Minimum 4 GB • Hard Disk: Minimum 256 GB HDD/SSD 	
SOFTWARE REQUIRED:	
<ul style="list-style-type: none"> • Operating System: Ubuntu / Windows 10 • Compiler/IDE: GCC with Visual Studio Code • Hypervisor Software: Oracle VM VirtualBox 	
TOTAL PERIODS	30

REFERENCES:

1. Silberschatz, A., Galvin, P. B., & Gagne, G. "Operating System Concepts", 10th Edition, Wiley, 2021.
2. H. M. Deitel, P. J. Deitel, and D. R. Choffnes, "Operating Systems", 3rd edition Boston, MA, Pearson Education, 2003.
3. Mauerer, W. Professional "Linux Kernel Architecture", Wiley, 2017.
4. Greg Tomsho, Guide to Operating Systems, 5th Edition, Cengage, 2017.

Mapping of COs with POs / PSOs

COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	2	1	1	1	-	-	-	-	-	-	2	2	1
2	3	3	2	2	2	-	-	-	1	1	1	3	3	2
3	2	3	2	3	2	-	-	-	-	1	1	2	3	2
4	3	3	2	3	2	-	-	-	1	1	1	3	3	2
5	3	3	2	3	3	-	-	-	-	1	2	3	3	3
CO (W.A)	2.8	2.8	1.8	2.4	2	-	-	-	1	1	1.25	2.6	2.8	2

SD25CS401 - SKILL DEVELOPMENT COURSE II – ARTIFICIAL INTELLIGENCE ESSENTIALS		L	T	P	C
		1	0	2	2
Course Objective	<ul style="list-style-type: none"> To provide students with fundamental knowledge of Artificial Intelligence, Machine Learning concepts, and data preprocessing techniques using workflow-based analytics tools. To enable students to develop, visualize, and evaluate basic machine learning and deep learning models using RapidMiner, KNIME, TensorFlow, and PyTorch frameworks. 				
Course Outcomes: The Student will be able to		Cognitive Level			
CO1	Explain the fundamentals of Artificial Intelligence, Machine Learning, and data analytics concepts.	U			
CO2	Apply workflow-based tools such as RapidMiner and KNIME for data preprocessing and visualization tasks.	Ap			
CO3	Perform data cleaning, normalization, and feature selection techniques for machine learning applications.	Ap			
CO4	Develop and evaluate basic classification and clustering models using analytics tools and validation metrics.	An			
CO5	Build and test simple deep learning models using TensorFlow and PyTorch frameworks.	Ap			

UNIT I – INTRODUCTION TO ARTIFICIAL INTELLIGENCE	3
Overview and evolution of Artificial Intelligence and Machine Learning - Applications of AI and ML - Types of machine learning: supervised, unsupervised, and reinforcement learning - Basics of data preprocessing and analytics workflow.	
UNIT II – DATA SCIENCE TOOLS	3
Introduction to RapidMiner and KNIME - Workflow creation and visual programming concepts - Data import, transformation, and visualization using GUI-based tools.	
UNIT III – DATA PREPARATION TECHNIQUES	3
Data cleaning and handling missing values - Data transformation and normalization - Introduction to feature selection and dimensionality reduction.	
UNIT IV – VISUAL ANALYTICS	3
Workflow-based analytics using RapidMiner and KNIME - Classification and clustering using built-in operators - Introduction to dashboards, reporting, and model validation metrics.	
UNIT V – DEEP LEARNING FRAMEWORKS	3
Introduction to TensorFlow, Keras API, and PyTorch - Basics of neural network model creation - Training and testing simple ML models using deep learning frameworks.	
TOTAL PERIODS	15

List of Experiments:

1. Study and installation of AI & ML tools: RapidMiner, KNIME, TensorFlow, and PyTorch.
2. Create workflows in RapidMiner for data import, preprocessing, and visualization.
3. Design KNIME workflows for data cleaning, transformation, and normalization.
4. Perform feature selection and dimensionality reduction using GUI-based tools.
5. Build classification and clustering models using RapidMiner and KNIME operators.
6. Develop dashboards, generate reports, and evaluate models using validation metrics.
7. Build and train a simple neural network model using TensorFlow or PyTorch.

HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS:

HARDWARE REQUIRED:

- Computer System with minimum Intel Core i5 Processor
- RAM: Minimum 4 GB
- Storage: Minimum 100 GB

SOFTWARE REQUIRED:

- Operating System: Windows 10/11 or Linux (Ubuntu).
- IDE/Editor: RapidMiner, KNIME Analytics Platform, Python, TensorFlow, PyTorch, Jupyter Notebook / Google Colab

TOTAL PERIODS	30
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30

TEXT BOOKS:

1. Ethem Alpaydin, “Introduction to Machine Learning”, MIT Press, 4th Edition, 2020.
2. Aurelien Geron, “Hands-On Machine Learning with Scikit-Learn, Keras and TensorFlow”, O’Reilly Media, 3rd Edition, 2022.
3. Francois Chollet, “Deep Learning with Python”, Manning Publications, 2nd Edition, 2021.
4. Andreas C. Müller and Sarah Guido, “Introduction to Machine Learning with Python”, O’Reilly Media, 2017.
5. Ian Goodfellow, Yoshua Bengio and Aaron Courville, “Deep Learning”, MIT Press, 2016.
6. John D. Kelleher, Brian Mac Namee and Aoife D’Arcy, “Fundamentals of Machine Learning for Predictive Data Analytics”, MIT Press, 2nd Edition, 2020.

REFERENCES:

1. Tom M. Mitchell, "Machine Learning", McGraw-Hill Education, 1997.
2. Trevor Hastie, Robert Tibshirani and Jerome Friedman, "The Elements of Statistical Learning", Springer, 2nd Edition, 2009.
3. Sebastian Raschka and Vahid Mirjalili, "Python Machine Learning", Packt Publishing, 3rd Edition, 2019.
4. Charu C. Aggarwal, "Neural Networks and Deep Learning", Springer, 2018.
5. Gareth James, Daniela Witten, Trevor Hastie and Robert Tibshirani, "An Introduction to Statistical Learning", Springer, 2nd Edition, 2021.

Mapping of COs with POs / PSOs														
COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	2	-	-	1	-	-	-	-	1	-	2	1	-
2	2	3	1	1	3	-	-	-	1	1	-	3	2	1
3	2	3	1	2	3	-	-	-	-	-	-	3	2	1
4	3	3	2	2	3	-	-	-	1	1	-	3	3	1
5	3	2	2	2	3	-	-	-	1	1	1	3	3	2
CO (W.A)	2.6	2.6	1.5	1.8	2.6	-	-	-	1.0	1.0	1.0	2.8	2.2	1.3

EN25C04-ENGLISH COMMUNICATION SKILLS LABORATORY-II		L	T	P	C
		0	0	2	1
Course Objectives	<ul style="list-style-type: none"> To build students' advanced communication skills for workplace readiness and develop intercultural competence for effective collaboration in global and virtual teams. To prepare students for competitive exams with focused skill-building and test-oriented practice. 				
Course Outcomes: The student will be able to		Cognitive Level			
CO1	Understand basic industry-related reading materials.	U			
CO2	Design and present a domain specific poster.	C			
CO3	Deliver effective digital presentations	Ap			
CO4	Communicate appropriately in intercultural/cross cultural contexts	Ap			
CO5	Perform in interviews and competitive exams successfully.	Ap			

List of Activities:

Stage Ready – Impactful Public Speaking:

- (i) Simulate a formal event such as an academic conference, convocation, or awards ceremony, where students' roles including Master of Ceremonies (MC), Role as a dignitary, and a Commentator
- (ii) Visual Prompt Storytelling: Use random images to create spontaneous stories, focusing on plot, setting, and character.
- (iii) Digital Presentation - Record a short video explaining a project or technical concept, using slides, voiceover, and visual aids (to be uploaded using google classroom or drive link)

Professional and Application-Oriented Writing:

- (i) Resume Preparation: Design ATS-friendly resumes tailored to various job descriptions, using action verbs and quantifiable impact.
- (ii) Design engaging content for poster presentation relevant to their domain.

Receptive Skills in Workplace Communication:

- (i) Reading articles related to their domain and discuss in groups
- (ii) Visit company websites, make inferences and present in the class
- (iii) Listen to recorded mock interviews and take detailed notes. Summarise key points and action items in a professional format and make a presentation.

Intercultural Communication:

- (i) Assertive vs Aggressive communication
- (ii) Role play activities – workplace communication in intercultural/cross-cultural contexts

From Campus to Career: Industry Skills and Global Exam Preparation:

- (i) Participate in HR interviews using AI tools or peer interviewers, responding to behavioural questions

using methods like STAR (Situation, Task, Action, Result)

(ii) Practice Verbal Ability in competitive exams like UPSC, SSC, CDS, TNPSC, etc.

Weightage: Continuous Assessment: 60%, End Semester Examinations: 40%.

Internal Assessment Methodology:

1. Oral story telling using visual prompts (30 marks)
2. Poster presentation (40 marks)
3. ATS resume writing (30 marks)

End Semester Assessment:

1. Interview (50 marks)
2. Verbal Ability test (50 marks) (students must bring the resume but evaluation must be done based on the performance in the interview)

References:

1. Lucas, Stephen, and Paul Stob. The Art of Public Speaking. Thirteenth edition, McGraw- Hill Education, 2020.
2. Abrahams, Matt. Think Faster, Talk Smarter: How to Speak Successfully When You're Put on the Spot. Simon & Schuster, 2023.
- 3.. Beshara, Tony. Powerful Phrases for Successful Interviews, Rev. ed., McGraw-Hill, 2023.
4. Papalia, Anna. Interviewology: The New Science of Interviewing. Harper Business, 2024.
5. Verbal Ability and Reading Comprehension by Ajay Singh McGraw Hill Education 2020

E-resources:

1. Purdue OWL – Online Writing Lab (Academic and professional writing help) <https://owl.purdue.edu/>
2. Canva Resume Builder (Creative, ATS-friendly resume design) <https://www.canva.com/resumes/>
3. BBC Learning English – Pronunciation <https://www.bbc.co.uk/learningenglish/english/features/pronunciation>
4. India Bix website

HARDWARE / SOFTWARE REQUIRED FOR A BATCH OF 30 STUDENTS:

HARDWARE REQUIRED:

- Computer System with minimum Intel Core i5 Processor – 30 (1 per student)
- RAM: Minimum 4 GB
- LAN / Internet Connectivity
- Headphones with microphone – 30 (for listening & speaking tasks)
- Audio system / Speakers – 1 set (for group listening activities)
- LCD Projector / Smart Board – 1 (for demonstrations & presentations)
- Web Camera (Integrated or External) – 30 (for video résumé and mock interview activities).



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SOFTWARE REQUIRED:

- Operating System: Windows 10/11 or Linux (Ubuntu)
- Web Browsers: Google Chrome / Mozilla Firefox / Microsoft Edge
- Presentation Software: MS PowerPoint / Google Slides
- Office Suite: MS Word / LibreOffice

TOTAL PERIODS**30****Mapping of COs with POs / PSOs**

COs	POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	3	-	-	2	-	3
3	-	-	-	-	-	-	-	-	3	-	-	-	1	-
4	-	-	-	-	-	-	-	-	3	-	1	-	-	3
5	-	-	-	-	-	-	-	-	3	-	-	-	-	1
CO (W.A)	-	-	-	-	-	-	-	-	3.0	-	1.0	2.0	1.0	2.3


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