



Sri Eshwar
College of Engineering
An Autonomous Institution
Affiliated to Anna University, Chennai

Programme Handbook

Regulation 2023 Choice-based Credit System

B.E. CSE –Artificial Intelligence and Machine Learning



Sri Eshwar College of Engineering
(Autonomous Institution,

Affiliated to Anna University, Chennai and Approved by
All India Council for Technical Education, New Delhi.)

Kondampatti (Post)
Coimbatore – 641 202

[Signature]
Chairman – Board of Studies
Department of CSE – AI & ML
Sri Eshwar College of Engineering (Autonomous)
Kinathukadavu, Coimbatore – 641 202

Chairman – Board of Studies

1.0 Vision, Mission and Core Values of the Institution

Vision

"To be recognized as a premier institution, grooming students into globally acknowledged engineering professionals."

Mission

Our Mission at Sri Eshwar College of Engineering is:

- ✓ *Providing outcome and value-based engineering education*
- ✓ *Nurturing research and entrepreneurial culture*
- ✓ *Enabling students to be industry-ready and fulfil their career aspirations*
- ✓ *Grooming students through behavioural and leadership training programs*
- ✓ *Making students socially responsible*

2.0 Vision and Mission of the Department of CSE –Artificial Intelligence and Machine Learning

Vision:

"To become a model hub for Computer Science and Engineering-Artificial Intelligence and Machine Learning education and research by acquiring, disseminating, and generating knowledge in order to meet societal demands."

Mission:

- ✓ *Evolve curriculum and delivery approaches to provide broad and wide exposure to the learner to gain adequate knowledge in their field of study.*
- ✓ *Provide opportunities for faculties to enhance their domain knowledge and skills required for the programs offered.*
- ✓ *Establish connections with local, national and global experts to share, utilize and exchange domain expertise*
- ✓ *Conduct Outreach activities for the society that involve the use of artificial intelligence and machine learning solutions to deal with societal issues.*
- ✓ *Create and provide a conducive ecosystem and facilities for offering education related to artificial intelligence and machine learning.*

3.0 Programme Educational Objectives (PEO)

PEO1: Graduates will have successful careers in AI and ML-related fields, including positions such as data scientists, machine learning engineers, AI researchers, and consultants.

PEO2: Graduates will recognize the dynamic nature of AI and ML technologies and engage in continuous learning to stay abreast of the latest advancements, tools, and techniques in the field.

PEO3: Graduates will have the knowledge and skills to identify opportunities for applying AI and ML in various domains, potentially founding startups, or contributing to the growth and competitiveness of existing organizations.

4.0 Programme Outcomes (POs)

- PO1: **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
- PO2: **Problem analysis:** Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using the first principles of mathematics, natural sciences, and engineering sciences
- PO3: **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and the cultural, societal, and environmental considerations
- PO4: **Conduct investigations of complex problems:** Use research-based knowledge and research methods, including design of experiments, analysis and interpretation of data, and synthesis of the information, to provide valid conclusions for complex problems:
- that cannot be solved by straightforward application of knowledge, theories, and techniques applicable to the engineering discipline, as against problems given at the end of chapters in a typical textbook that can be solved using simple engineering theories and techniques;
 - that may not have a unique solution. For example, a design problem can be solved in many ways and lead to multiple possible solutions;
 - that require consideration of appropriate constraints/requirements not explicitly given in the problem statement such as cost, power requirement, durability, product life, etc.; which need to be defined (modelled) within an appropriate mathematical framework; and that often requires the use of modern computational concepts and tools, for example, in the design of an antenna or a DSP filter.
- PO5: **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
- PO6: **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
- PO7: **Environment and sustainability:** Understand the impact of professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
- PO8: **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
- PO9: **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
- PO10: **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
- PO11: **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's work, as a member and leader in a team, to manage projects and in multidisciplinary environments

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

5.0 Programme Specific Outcomes (PSOs)

PSO1: Apply the knowledge of mathematical concepts, programming fundamentals and algorithms for solving complex problems in AI and ML domains.

PSO2: Design, implement, and evaluate end-to-end AI solutions, including data acquisition, pre-processing, model development, deployment, and monitoring, adhering to best practices in software engineering and system design.

**Sri Eshwar College of Engineering
Autonomous Institution**

BE CSE (AIML) Curriculum - Regulation 2023

SEMESTER I

Sl. No.	Course Code	Course Name	Cate- gory	Periods / Week				Total Contact Periods	Cre- dits
				L	T	P	J		
Theory Courses									
-	-	Induction Program	-	-	-	-	-	-	-
1	U23MA201	Calculus for Engineers	BS	3	1	0	0	4	4
2	U23CS301	Problem solving using C	ES	3	0	0	0	3	3
Theory cum Practical Courses									
3	U23HS181	Technical English	HS	2	0	2	0	4	3
4	U23CS381	Application Design and Development	ES	2	0	2	0	4	3
5	U23EC381	Electronics and Microprocessors	ES	3	0	2	0	5	4
Practical Courses									
6	U23GE351	Engineering Practices Laboratory	ES	0	0	2	0	2	1
7	U23CS351	Problem-solving using C Laboratory	ES	0	0	4	0	4	2
Professional Development Courses									
8	U23EM751	Soft Skills	EM	0	0	2	0	2	1
Mandatory Courses									
9	U23MC901	தமிழர்மரபு/ Heritage of Tamils	HSMC	1	0	0	0	1	1
Total				14	1	14	0	29	22

SEMESTER II

Sl. No.	Course Code	Course Name	Cate- gory	Periods / Week				Total Contact Periods	Cre- dits
				L	T	P	J		
Theory Courses									
1	U23MA203	Linear Algebra	BS	3	1	0	0	4	4
2	U23CS401	Data Structures	PC	3	0	0	0	3	3
3	U23PH201	Computational Physics	BS	3	0	0	0	3	3
4	U23CS402	Object Oriented Programming using C++	PC	3	0	0	0	3	3
5	U23NCC01	NCC Credit Course Level 1#	-	2	0	0	0	2	2 [#]
Theory cum Practical Courses									
6	U23HS1XX	Language Elective	HS	2	0	2	0	4	3
Theory cum Practical cum Project Courses									
7	U23AD491	Python for AI	ES	2	0	2	2	6	4
Practical Courses									
8	U23CS451	Data Structures Laboratory	PC	0	0	4	0	4	2
9	U23CS452	Object Oriented Programming using C++ Laboratory	PC	0	0	2	0	2	1
Professional Development Courses									
10	U23EM752	Logical Thinking	EM	0	0	2	0	2	1
Mandatory Courses									

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Sl. No.	Course Code	Course Name	Category	Periods / Week				Total Contact Periods	Credits
				L	T	P	J		
11	U23MC902	தமிழரும் தொழில்நுட்பம்/ Tamils and Technology	HSMC	1	0	0	0	1	1
		Total		19	01	12	2	34	25

#Offered only for NCC students

SEMESTER III

Sl. No.	Course Code	Course Name	Category	Periods / Week				Total Contact Periods	Credits
				L	T	P	J		
Theory Courses									
1	U23MA204	Discrete Mathematics	BS	3	1	0	0	4	4
2	U23CS403	Design and Analysis of Algorithms	PC	3	0	0	0	3	3
3	U23CS404	Database Management Systems	PC	3	0	0	0	3	3
Theory cum Practical cum Project Courses									
4	U23CS491	Java Programming	PC	2	0	2	2	6	4
Theory cum Project Course									
5	U23AD493	Artificial Intelligence	PC	3	0	0	2	5	4
Practical Courses									
6	U23CS453	Design and Analysis of Algorithms Laboratory	PC	0	0	4	0	4	2
7	U23CS454	Database Management Systems Laboratory	PC	0	0	2	0	2	1
Professional Development Courses									
8	U23EM753	Advanced Logical Thinking	EM	0	0	2	0	2	1
Mandatory Courses									
9	U23MC903	Environmental Science	MC	2	0	0	0	1	NC
		Total		15	1	10	4	30	22

SEMESTER IV

Sl. No.	Course Code	Course Name	Category	Periods / Week				Total Contact Periods	Credits
				L	T	P	J		
Theory Courses									
1	U23MA209	Probability and Statistics	BS	3	1	0	0	4	4
2	U23NCC02	NCC Credit Course Level 2#	MC	3	0	0	0	3	NC
Theory cum Practical Courses									
3	U23EC384	Computer Networks	ES	2	0	2	0	5	3
4	U23EC382	Digital Principles and Computer Organization	ES	2	0	2	0	5	3
Theory cum Practical Cum Project Courses									
5	U23AM491	Machine Learning	PC	2	0	2	2	6	4
6	U23AD492	Data Science	PC	2	0	2	2	6	4
Mandatory Courses									
7	U23MC904	Universal Human Values	MC	1	0	0	0	1	NC
		Total		15	1	8	4	30	18

SEMESTER V

Sl. No.	Course Code	Course Name	Cate- gory	Periods / Week				Total Contact Periods	Cre- dits
				L	T	P	J		
Theory Courses									
1	U23CB401	Operating Systems	PC	3	0	0	0	3	3
2	U23XXXX	Professional Elective I	PE	3	0	0	0	3	3
Theory cum Practical Courses									
3	U23AD482	Data Visualization & Exploration	PC	2	0	2	0	4	3
4	U23EC383	Embedded Systems and IoT	PC	3	0	2	0	5	4
Theory cum Practical with Project Course									
5	U23CS492	Full Stack Development	PC	2	0	2	2	6	4
6	U23AM492	Deep Learning for Computer Vision	PC	2	0	2	2	6	4
Practical Courses									
7	U23CB451	Operating Systems Laboratory	PC	0	0	2	0	2	1
Professional Development Course									
8	U23IAMXX	Industry Oriented Course	PC	0	0	2	0	2	1
Total				15	0	12	4	31	23

SEMESTER VI

Sl. No.	Course Code	Course Name	Cate- gory	Periods / Week				Total Contact Periods	Cre- dits
				L	T	P	J		
Theory Courses									
1	U23XXXX	Professional Elective II	PE	3	0	0	0	3	3
2	U23XXXX	Professional Elective III	PE	3	0	0	0	3	3
3	U23XXXX	Open Elective I*	OE	3	0	0	0	3	3
4	U23NCC03	NCC Credit Course Level 3#	--	3	0	0	0	3	NC
Theory Cum Practical Courses									
5	U23IT481	Software Engineering	PC	2	0	2	0	4	3
Theory cum Practical with Project Courses									
6	U23AM493	Generative AI	PC	2	0	2	2	6	4
7	U23AM494	Natural Language Processing	PC	2	0	2	2	6	4
Project Work									
8	U23AM604	Innovative / Multi-Disciplinary Project	PW	2	0	0	2	4	3
Total				20	0	6	6	29	23

*L T P C either 3 0 0 3 or 2 0 2 3, #-Offered only for NCC students

SEMESTER VII

Sl. No.	Course Code	Course Name	Cate- gory	Periods / Week				Total Contact Periods	Cre- dits
				L	T	P	J		
Theory Courses									
1	U23CB103	Principles of Management	HS	3	0	0	0	3	3
2	U23XXXX	Professional Elective IV	PE	3	0	0	0	3	3

Sl. No.	Course Code	Course Name	Cate- gory	Periods / Week				Total Contact Periods	Cre- dits
				L	T	P	J		
3	U23XXXX	Open Elective II*	OE	3	0	0	0	3	3
4	U23CB104	Project Management and Finance	MC	1	0	0	0	1	1
Theory cum Practical Course									
5	U23IT483	Blockchain Technologies	PC	3	0	2	0	5	4
Project Work									
6	U23AM607	Project Work – Phase I	PW	0	0	0	12	12	6
Total				10	0	0	12	22	20

SEMESTER VIII

Sl. No.	Course Code	Course Name	Cate- gory	Periods / Week				Total Contact Periods	Cre- dits
				L	T	P	J		
Project Work									
1	U23AM605	Industry Internship/Project Work -Phase II	PW	0	0	0	20	20	10
Total				0	0	0	20	20	10

Total Number of Credits: 163

CREDIT SUMMARY

Sl. No.	Course Category	Credits per Semester								Credits	Credit %
		I	II	III	IV	V	VI	VII	VIII		
1	HS	3	3	-	-	-	-	3	-	9	5.5
2	BS	4	7	4	4	-	-	-	-	19	11.6
3	ES	13	4	-	6	-	-	-	-	23	14.0
4	PC	-	9	18	7	20	11	4	-	69	42.1
5	PE	-	-	-	-	3	6	3	-	12	7.3
6	OE	-	-	-	-	-	3	3	-	6	3.7
7	PW	-	-	-	-	-	3	6	10	19	11.6
8	EM	1	1	1	-	-	-	-	-	3	1.8
9	NC	-	✓	✓	✓	-	-	-	-	0	0.0
10	MC	-	-	✓	✓	-	-	1	-	1	0.6
11	HSMC	1	1	-	-	-	-	-	-	2	1.2
Total		22	25	23	17	23	23	20	10	163	100

SYLLABI
SEMESTER I

U23MA201	CALCULUS FOR ENGINEERS	L	T	P	J	C
		3	1	0	0	4

1. Course Description

Calculus for Engineers is typically a challenging but essential course for engineering students, as it provides them with the mathematical foundation necessary for more advanced coursework in their respective engineering disciplines. This course aims to provide engineering students with a strong understanding of calculus concepts and their practical applications in engineering fields. Calculus teaches critical problem-solving skills that are invaluable in engineering. Through solving calculus problems, students learn to analyze complex systems, break them down into smaller, manageable parts, and develop strategies to solve them effectively. These problem-solving skills are transferrable to various engineering disciplines and real-world scenarios. Employers often value candidates with strong mathematical skills, including proficiency in calculus. For internships, co-op positions, or full-time engineering roles, demonstrating competence in calculus can enhance your resume and make you more competitive in the job market.

2. Course Objectives:

1. To familiarize the student with functions of several variables.
2. To make the students understand various techniques of double integration.
3. To make the students acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.
4. To study about vector calculus and can be widely used for modeling the various laws of physics.
5. To understand various techniques of vector integration.

3. Syllabus

Unit-I: Differential Calculus

Limits and Continuity; Partial derivatives: Total derivative, Differentiation of implicit functions; Jacobian, properties; Taylor's series; Maxima and minima of functions of two variables.

Unit-II: Integral Calculus

Double integrals: Integrals in cartesian and polar coordinates; Area enclosed by plane curves; Change of order of integration; Change of variables between cartesian and polar co-ordinates.

Unit-III: Ordinary Differential Equations

Higher order linear differential equations with constant coefficients; Method of variation of parameters; Cauchy's and Legendre's linear differential equations; Application of ordinary differential equations in spring mass system.

Unit-IV: Vector Differentiation

Vector and scalar functions; Derivatives: Curves, tangents, arc length, curves in mechanics, velocity and acceleration; Gradient of a scalar field; Directional derivative; Divergence of a vector field ; Curl of a vector field ; Scalar potential function.

Unit-V: Vector Integration

Line Integral; Green's theorem in a plane; Triple integral (simple problems); Gauss divergence theorem; Stoke's theorem (statement only).

Lab Components for Assignments/Tutorials:

1. Working procedure, Basic commands and symbolic computation.
2. Drawing the curve for the given function $f(x)$ and the surface for the given function.
3. To find Partial derivative of a given function $f(x, y)$.
4. Evaluating Extreme values of a single variable function.

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5. Evaluating Maxima and minima of functions of two variables.
6. Differentiation of various functions.
7. Integration - Definite and indefinite integrals - Constant and variable limits.
8. Understanding integration as Area under the curve.
9. Evaluating triple integrals.
10. Visualizing different surfaces.
11. Evaluating gradient, curl and divergence.
12. Directional derivative of a given function.
13. Evaluating line integrals.

Text Books:

1. Erwin Kreyszig, "Advanced Modern Engineering Mathematics", 10th Edition, John Wiley and Sons (Asia) Ltd, Singapore, 2017.
2. Dennis G Zill "Advanced Engineering Mathematics", Jones & Bartlett India P Ltd., New Delhi, 2017.
3. Grewal. B. S, "Higher Engineering Mathematics", 44th Edition, Khanna Publications, Delhi, 2015.
4. Maurice D. Weir, Joel Hass, Christopher Heil "Thomas' Calculus" 14th Edition, Pearson Education, New Delhi, 2018.

References:

Reference Books:

1. John Bird, "Higher Engineering Mathematics", An imprint of Elsevier, Burlington, Reprint 2010.
2. Bali. N. P and Manish Goyal," A Text book of Engineering Mathematics", 8th Edition, Laxmi publications Ltd, 2011.
3. Srimanta Pal and Subodh C Bhunia, "Engineering Mathematics", 3rd Edition, Oxford University Press, New Delhi, 2016.

Video references:

1. <https://www.youtube.com/watch?v=f6-r3IPAhpo>
2. <https://www.youtube.com/watch?v=CogfMjKUGc0>
3. http://videolectures.net/mit1803s06_mattuck_lec19/
4. <http://freevideolectures.com/Course/3244/Advanced-Engineering-Mathematics/12>
5. <https://www.youtube.com/watch?v=OUbMX4eQ5oM>

NPTEL Courses

1. <https://archive.nptel.ac.in/courses/111/104/111104092/>
2. <https://www.youtube.com/watch?v=mIeeVrv447s>
3. <https://archive.nptel.ac.in/courses/111/105/111105122/>

4. Course Outcomes

CO. No.	Course Outcome	BTL	POs	PSOs
U23MA201.1	Explain the relationship between the derivative of a function as a function and classify the extreme values of functions of two variables.	K4	1, 2, 3, 4, 12	-
U23MA201.2	Apply integration concepts to compute area of the given surfaces, integrals in cartesian and polar coordinates.	K3	1, 2, 3, 4, 12	-
U23MA201.3	Assess various techniques in solving differential	K5	1, 2,	-
U23MA201.4	Compare the ideas of vector differentiation and exhibit the relation between them.	K3	1, 2, 3, 4 12	-

U23MA201.5	Apply fundamental theorem of Green's theorem, Stoke's theorem and Divergence theorem to evaluate integrals.	K3	1, 2, 3, 4, 12	-
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5. Course Articulation matrix

CO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02	
U23MA201.1	3	3	2	2	1	-	-	-	-	-	-	-	2	-	-
U23MA201.2	3	3	1	2	1	-	-	-	-	-	-	-	2	-	-
U23MA201.3	3	3	1	2	1	-	-	-	-	-	-	-	2	-	-
U23MA201.4	3	3	2	2	1	-	-	-	-	-	-	-	2	-	-
U2MA201.5	3	3	2	2	1	-	-	-	-	-	-	-	2	-	-
Course to PO	3	3	1.6	2	1	-	-	-	-	-	-	-	2	-	-

"3"—High, "2"—Medium, "1"—Low, "-"—No Correlation

U23CS301	Problem Solving using C	L 3	T 0	P 0	J 0	C 3
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1. Course Description:

This course introduces students to the fundamental concepts of programming using the C language. The course covers essential topics such as basic C programming constructs, conditional and looping statements, modular programming, and advanced concepts like pointers, arrays, and structures. Through theoretical lectures, practical demonstrations, and coding exercises, students will develop problem-solving skills and learn how to design and implement efficient algorithms to solve a variety of complex problems.

2. Course Objectives:

1. To understand the basic concepts of C programming.
2. To learn to apply conditional and looping statements for different programming scenarios.
3. To understand the importance of modular programming.
4. To write programs effectively with pointers, arrays, structures.

3. Syllabus

Unit-I: C Fundamentals

Basic computer organization, Problem solving techniques, Algorithm, Flowchart, Pseudocode; Introduction to C programming: Phases of a C program, Features of C, Keywords, Variable Name, Scope, Declaration, Coding Standards, Data Types and sizes: integer, float and character types, constants, Formatted I/O, Operators, Bitwise Manipulations, Expression Evaluation, Type Conversions, Preprocessor Directives

Unit-II: Control Structures

Conditional and Branching Statements: if, if-else, else-if ladder, nested-if, switch constructs, range using switch, Looping constructs: for, while, do-while -break and continue- goto and Label

Unit-III: Pointers and Functions

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Pointer - Types of Pointers: NULL, Dangling, Generic Pointers, Wild pointer, Arithmetic Operations in Pointer, Pointer to pointer, Functions: The anatomy of a function, Types of functions, Pointers and Function Arguments : Call by Value and Call by Reference, Function Pointers, return statement, Recursion, Storage Classes in C

Unit-IV: Arrays

Arrays: Declaring and initializing 1D array, Two dimensional arrays, Multi-dimensional arrays, Variable Length Arrays, Dynamic Memory Allocation, Passing 1D and 2D Array as arguments, Pointers and Arrays, Array of pointers

Unit-V: Strings, User-Defined Data Types and Files

Strings: Introduction, string handling functions, Two-dimensional array of strings; Structure: Basics of structure, Nested structures, Array of structures, Pointer to structures; Unions; Bit Fields; Files: Basics, File Functions, Random Access Files

Text Books:

1. Herbert Schildt, "C – The Complete Reference", Tata McGraw Hill Publishing Company, New Delhi, 2017.
2. Kernighan B. W. and Ritchie D. M., "C Programming Language (ANSI C)", Prentice Hall of India Private Limited, New Delhi, 2010.

References:

Reference Books:

1. Deitel and Deitel, "C How to Program", Pearson Education, New Delhi, 2011.
2. Simple Program Design: A Step-by-Step Approach, Fifth Edition by Lesley Anne Robertson.

Web Resource:

1. <https://www.udemy.com/course/c-programming-2019-master-the-basics>
2. <https://www.tutorialspoint.com/cprogramming>

Video References:

1. https://www.youtube.com/watch?v=EjavYOFoJJ0&list=PLdo5W4Nhv31a8UcMN9-35ghv8qyFWD9_S
2. <https://www.youtube.com/watch?v=irqbmMNs2Bo>

NPTEL / Online Courses:

1. https://onlinecourses.NPTEL/Online Courses: ac.in/noc22_cs40/preview
2. https://onlinecourses.NPTEL/Online Courses: ac.in/noc23_cs53/preview

4. Course Outcomes

CO. No.	Course Outcome	BTL	POs	PSOs
U23CS301.1:	Understand problem solving techniques and typical programming constructs C	K3	1,2,3,4,5,8,12	1,2
U23CS301.2:	Apply looping and conditional constructs to solve real world problems	K3	1,2,3,4,5,8,12	1,2
U23CS301.3:	Apply arrays and functions effectively to address complex programming challenges	K3	1,2,3,4,5,8,12	1,2
U23CS301.4:	Understand and apply best practices in pointers, memory allocation and error handling for modular programming efficiency	K4	1,2,3,4,5,8,12	1,2
U23CS301.5	Choose and implement complex data structures using structures and Unions,	K2	1,2,3,4,5,8,12	1,2

	applying advanced file operations in C for effective problem solving			
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5. Course Articulation matrix

CO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02
U23CS301.1	3	3	3	2	1	-	-	2	-	-	-	2	1	1
U23CS301.2	3	3	3	2	1	-	-	2	-	-	-	2	1	1
U23CS301.3	3	3	3	2	1	-	-	2	-	-	-	2	1	1
U23CS301.4	3	3	3	2	1	-	-	2	-	-	-	2	1	1
U23CS301.5	3	3	3	2	1	-	-	2	-	-	-	2	1	1
Course to PO	3	3	3	2	1	-	-	2	-	-	-	2	1	1

"3"—High, "2"—Medium, "1"—Low, "-"—No Correlation

U23HS181	Technical English	L	T	P	J	C
		2	0	2	0	3

1. Course Description

This course aims to educate the first year B.E/B.Tech students in basic principles of English language, facilitate them to use vocabulary in different academic and professional contexts. It also cultivates their LSRW skills, namely listening, speaking, reading and writing skills thereby improving their proficiency in oral and written communication in technical English. It also covers all the areas of grammar, word formation, summarizing, report writing, which are necessary for the students of engineering sciences.

2. Course Objectives:

1. Enable learners of Engineering and Technology to develop their basic communication skills in English.
2. Emphasize specially the development of speaking skills amongst learners of Engineering and Technology.
3. Ensure that learners use the electronic media such as internet and supplement the learning materials used in the class room.
4. Inculcate the habit of reading and writing leading to effective and efficient communication.

3. Syllabus

Unit-I: Basic Language Development

Reading: Types of Reading, Skimming and Scanning, Reading Comprehension

Writing: Word Formation, Sequence Words, Types of Sentences, Hints Development, Informal Letters—Congratulating, apologizing, etc

Grammar: Parts of Speech, Articles, Tenses.

Unit-II: Different Strategies of Reading

Reading: Articles from Newspapers & Magazines, Cloze Exercises

Writing: Instructions, Recommendations, Paragraph Writing

Grammar: Homonyms, Homophones, Homographs, Subject – Verb Agreement, Modal Verbs, Question Types, Wh-type, Yes/ No and Tag Questions.

Unit-III: Group Interaction

Reading: Reading for Specific Information & Identifying Lexical and Contextual Meaning

Writing: Formal Letters—Seeking Permission for Industrial Visit, Letter of Invitation (acceptance/declination), Jumbled Sentences

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Grammar: Cause and Effect Expressions, Purpose & Function, Compound Nouns.

Unit-IV: Introduction to Effective Writing

Reading: Summarizing, Paraphrasing, Note Making

Writing: Business Letters (Enquiry, Calling for Quotations & Placing Orders), Email-Etiquette, Writing Emails, Free Writing on any given topic

Grammar: Phrasal Verbs, Single Sentence Definitions.

Unit-V: Technical Writing Practice

Reading: Reading Practice based on Competitive Examinations

Writing: Preparing Transcript for a Speech, Pictorial Representation (Charts —Flowcharts, Pie Charts, Bar Charts, Tabular Column, etc)

Grammar: Single Word Substitute, Abbreviations & Acronyms, Spotting Errors.

List of Experiments:

1. Listening - Listening Types - Listening to Audio files and answering
2. Listening - Listening for specific information – Listening to announcements and Radio Broadcasts
3. Listening - Listening to TED Talks & News Reading from English News Channels (CNN, NDTV, India)
4. Today etc.)
5. Listening - Listening Comprehension and answering accordingly.
6. Listening - Listening to Eminent personality interviews & other forms of interviews
7. Speaking - Introducing oneself & family - Role Play
8. Speaking – Extempore - Just A Minute (JAM) Sessions
9. Speaking - Group Discussion
10. Speaking - Narrating a story
11. Speaking – Compering, Welcome Address & Vote of Thanks

Text Books:

1. Jack C. Richards, "Interchange Student's Book 1", Cambridge University Press; Fourth Edition, 2015.
2. S. N. Mahalakshmi, "Technical English for Engineers", V. K. Publications; Chennai, Eighth Edition, 2020.

References:

Reference Books:

1. Rizvi M.Ashraf, "Effective Technical Communication", Tata McGraw Hill Publishing Company; New Delhi, 2015.
2. Andrea J.Rutherford, "Pearson Education" Inc. and The Darling Kindersley Publishing Inc., 2020.
3. Raman, Meenakshi and Sharma, Sangeetha "Technical Communication Principles and Practice", 4. Oxford University Press; New Delhi, 2019.
4. Richards C. Jack, "Interchange", Fourth edition; Cambridge University Press, 2020.
5. Butterfield, Jeff, "Soft skills for Everyone", Sixth Indian Reprint, 2018.

Video References:

1. <https://www.youtube.com/watch?v=tBtc6rpcMz4>
2. <https://www.youtube.com/watch?v=Ll23cChDSKE>
3. <https://www.youtube.com/watch?v=fyAtyAdCStM>

Web References:

1. <https://leo.stcloudstate.edu/grammar/subverag.html>
2. http://www.learningdifferences.com/Main%20Page/Topics/Compound%20Word%20Lists/Compound_Word_%20Lists_complete.htm
3. <http://examples.yourdictionary.com/examples-of-active-and-passive-voice.html>
4. <http://www.perfectyourenglish.com/grammar/numeral-adjectives.htm>
5. https://en.wikipedia.org/wiki/Commonly_misspelled_English_words
6. <https://www.englisch-hilfen.de/en/grammar/if.htm>
7. <http://www.englishforeveryone.org/Topics/Reading-Comprehension.htm>

NPTEL Courses:

1. <https://www.udemy.com/topic/communication-skills/free/>
2. <https://www.bbc.co.uk/learningenglish/english/course/how-to-speak-english>

4. Course Outcomes

CO. No.	Course Outcome	BTL	POs	PSOs
U23HS181.1	Listen, Comprehend and Correspond with others in various contexts.	K3	9,10,12	-
U23HS181.2	Develop effective reading skills especially for academic purposes.	K3	9,10,12	-
U23HS181.3	Enhance Speaking skills with clarity and confidence to develop their employability skills.	K3	9,10,12	-
U23HS181.4	Compose letters, E-mails with proper structure.	K6	9,10,12	-
U23HS181.5	Illustrate clear and legible writing skills in error free style in a coherent manner.	K4	9,10,12	-
U23HS181.6	Choose the writing strategies and apply them in technical and workplace writing tasks.	K6	9,10,12	-
U23HS181.7	Apply reading skills to analyze, interpret and evaluate different genres of text.	K3	9,10,12	-
U23HS181.8	Analyze, infer and comprehend all kinds of academic discussions.	K4	9,10,12	-
U23HS181.9	Classify thoughts clearly and present orally using appropriate communicative and writing strategies.	K4	9,10,12	-
U23HS181.10	Discuss flawlessly by rehearsing various speaking models.	K6	9,10,12	<i>Renuka S</i>

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5. Course Articulation matrix

CO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02
U23HS181.1	0	0	0	0	0	0	0	0	2	3	0	2	0	0
U23HS181.2	0	0	0	0	0	0	0	0	2	3	0	2	0	0
U23HS181.3	0	0	0	0	0	0	0	0	2	3	0	2	0	0
U23HS181.4	0	0	0	0	0	0	0	0	2	3	0	2	0	0
U23HS181.5	0	0	0	0	0	0	0	0	2	3	0	2	0	0
U23HS181.6	0	0	0	0	0	0	0	0	2	3	0	2	0	0
U23HS181.7	0	0	0	0	0	0	0	0	2	3	0	2	0	0
U23HS181.8	0	0	0	0	0	0	0	0	2	3	0	2	0	0
U23HS181.9	0	0	0	0	0	0	0	0	2	3	0	2	0	0
U23HS181.10	0	0	0	0	0	0	0	0	2	3	0	2	0	0
Course to PO	-	-	-	-	-	-	-	-	2	3	-	2	-	-

“3”—High, “2”—Medium, “1”—Low, “—”—No Correlation

U23CS381	Application Design and Development	L 2	T 0	P 2	J 0	C 3
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1. Course Description:

Application Design and Development is a comprehensive integrated course that blends theoretical understanding with practical hands-on experience in creating diverse applications. Students will delve into essential web development concepts using HTML, CSS, and JavaScript, mastering the foundations of building interactive and responsive web interfaces. Additionally, they will learn version control using Git and GitHub, enabling collaborative development and effective management of project iterations. Furthermore, students will explore mobile application development using MIT App Inventor, gaming application development with Construct 2, and image/video editing using Blender tools. Through a combination of theoretical lectures, interactive labs, and project-based learning, students will gain the skills necessary to design, develop, and deploy various types of applications.

2. Course Objectives:

1. To study HTML, CSS and JavaScript concepts to develop dynamic web pages
2. To learn GIT and GIT HUB repository and to apply the version control concepts
3. To understand MIT app inventor to develop mobile applications
4. To learn Construct 2 tool to develop gaming applications and blender tools to edit images and videos

3. Syllabus

Unit-I: HTML and CSS

Software Development: SDLC (Waterfall Model)- Phases - Methods and Practices- Introduction to web- Standards and Terminologies.HTML: Introduction and versions-HTML 5-standards and tags-Head and Body-List-Labels-Tables-Forms-Videos and Audios-Figure, Figure Captions, Images CSS: Introduction-Embedded Types-CSS Selectors-Borders, Margins, Paddings-Colors and Backgrounds- Introduction to Bootstrap-Tailwind CSS

Unit-II: Interactive Web Design using JavaScript

Introduction-Java Script adding Techniques-Variables and Operators- Conditional and Control Statements- Data Types and Functions-Events-Form Validation-Page Redirect-Java Script Exception Handling-Document Object Model (DOM)

Unit-III: Git, Git Hub and Shell Scripting

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Introduction to Git and GitHub-Terminologies-Local Repository Actions- Remote Repository Actions- Advanced Repository Actions-Branching-Merging-Software Developers Communities: Google Developers Group, Google Student Developers Community, Linux Developer Community, Stack Overflow, Kaggle Shell Scripting: Processing (PS) and Listing (LS)- File Creations and Handling-Users and Groups

Unit-IV: Mobile Application Development with MITAI

Types of Mobile OS (Android and IOS)-Architecture- Phases of Mobile Application Development -MIT app inventor-Components-Viewer-Properties – Publishing an app

Unit-V: Template Driven Applications and Multimedia

Content Management System: Dynamic content-Web flow - Collection fields – Search Engine Optimization, Multimedia: Design with Canva and Blender- Image and Video Editing –Game Development with Construct 2

List of Laboratory Experiments / Exercises:

1. Develop a visually appealing static website with an intuitive user interface with multimedia content such as text, images and videos using HTML, CSS and JavaScript
2. Create a simple form to collect the name, address, email ID and phone number from the user and use JavaScript to validate each field before submitting the form
3. Create an interactive quiz that allows the user to select answers to multiple-choice questions. Use JavaScript to calculate the user's score and provide feedback based on their performance
4. Create a simple animation using CSS and JavaScript. Use CSS to define the animation's properties, such as duration and timing and use JavaScript to trigger the animation in response to user input or other events
5. Create a local repository using Git and perform basic operations such as initializing the repository, adding files, committing changes, creating and managing multiple branches to organize and track changes
6. Create a shell script that can automate file management tasks such as processing, listing, creation and handling of files and user and group management tasks
7. Develop mobile applications using MITAI (Simple calculator, Step counter, Weather app that retrieves current weather information from an API, Talk to Me, Translation App)
8. Design a poster for an event using Canva templates
9. Create a visual infographic using Canva tools to present data and information
10. Develop a simple 2D game using Construct visual interface and event system
11. Model a 3D object using Blender modelling tools and techniques
12. Animate a short scene or character using Blender animation tools and timeline

Text Books:

1. Internet & World Wide Web How to Program, 5th edition, by Paul Deitel Harvey Deitel, Abbey Deitel, Pearson Publication, 2018.
2. App Inventor 2: Create Your Own Android Apps 2nd Edition by David Wolber, Hal Abelson, Ellen Spertus, Liz Looney, 2014.

References:

Reference Books:

1. CS50's Web Programming with Python and JavaScript - <https://cs50.harvard.edu/web/2020>
2. Get Coding! Learn HTML, CSS & JavaScript & Build a Website, App & Game – by Young Rewired State, Walker Books, 2016.
3. Version Control with Git, by Jon Loeliger, Matthew McCullough, 2nd Edition, 2012,

Web References:

1. [Ultimate-web-design-course-https://university.webflow.com/courses/ultimate-web-design-course](https://university.webflow.com/courses/ultimate-web-design-course).
2. <https://in.coursera.org/learn/html-css-javascript-for-web-developers>
3. <https://amigoscode.com/p/git-github>

Video References:

1. <https://www.youtube.com/watch?v=XIOLqoPHCJ4>
2. <https://www.youtube.com/watch?v=RGOj5yH7evk>
3. <https://www.youtube.com/watch?v=TwxhwwX4T5U>
4. <https://www.youtube.com/watch?v=WKM8QCuxmQY>

NPTEL / Online Courses:

1. <https://www.coursera.org/learn/html-and-css-in-depth>
2. <https://amigoscode.com/courses/enrolled/1317178>
3. <https://in.coursera.org/learn/html-css-javascript-for-web-developers>
4. <https://amigoscode.com/p/git-github>

4. Course Outcomes

CO. No.	Course Outcome	BTL	POs	PSOs
U23CS381.1:	Utilize HTML5 and CSS to develop responsive web	K4	1, 2, 3, 5, 6, 8, 9, 10, 11, 12	1, 2
U23CS381.2:	Create Interactive web applications using java script	K6	1, 2, 3, 5, 6, 8, 9, 10, 11, 12	1, 2
U23CS381.3:	Analyze and apply GIT and GIT HUB operations and advanced repository actions	K4	1, 2, 3, 5, 6, 8, 9, 10, 11, 12	1, 2
U23CS381.4:	Create mobile applications using MIT app inventor	K6	1, 2, 3, 5, 6, 8, 9, 10, 11, 12	1, 2
U23CS381.5	Create simple game applications using Construct	K6	1, 2, 3, 5, 6, 8, 9, 10, 11, 12	1, 2

5. Course Articulation matrix

CO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02
U23CS381.1	2	2	3	-	3	2	-	3	3	2	1	3	2	3
U23CS381.2	2	2	3	-	3	2	-	3	3	2	1	3	2	3
U23CS381.3	2	2	3	-	3	2	-	3	3	2	1	3	2	3
U23CS381.4	2	2	3	-	3	2	-	3	3	2	1	3	2	3
U23CS381.5	2	2	3	-	3	2	-	3	3	2	1	3	2	3
Course to PO	2	2	3	-	3	2	-	3	3	2	1	3	2	3

“3”—High, “2”—Medium, “1”—Low, “—”—No Correlation

U23EC381	ELECTRONICS AND MICROPROCESSOR				L	T	P	J	C
					3	0	2	0	4

1. Course Description:

This course offers a comprehensive exploration of fundamental concepts of semiconductor theory, diodes and transistors. Delve into the architecture and instruction set of the iconic

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8085 microprocessor, learning to write assembly programs that bring it to life. Uncover the inner workings of the versatile 8051 microcontroller, mastering its architecture, instruction set, and interfacing principles for peripheral devices.

2.Course Objectives:

1. To understand the basics of semiconductor theory and working of diodes.
2. To understand the working of BJT and FET and Biasing techniques.
3. To understand the architecture, instruction set and write assembly program for 8085.
4. To understand the architecture, instruction set of 8051 and comprehend the interfacing principles, peripheral devices of 8051.

3.Syllabus

Unit-I: C Diode and its Applications

Intrinsic and extrinsic semiconductor; p type and n type semiconductor; PN junction diode: properties, biasing and VI characteristics; half wave rectifier and centre tap full wave rectifier; Zener diode; Zener diode as voltage stabilizer.

Unit-II: Transistors and Amplifiers

Transistor: Transistor action, Transistor as an amplifier, CB, CE, CC connections and its comparison, transistor biasing; Field effect transistor: types, JFET, working principle, difference JFET and BJT; MOSFET: types, circuit operation of D-MOSFET and E-MOSFET.

Unit-III: Introduction to 8085 Microprocessor

8085 Hardware Architecture; 8085 Pin out; register organization; addressing modes; instruction set; programming 8085 (commonly used instructions only).

Unit-IV: Introduction to 8051 Microcontroller

8051 architecture; memory organization; special function registers; port operation; timer/counters; serial interface; interrupts; operand addressing; instruction set.

Unit-V: Interfacing 8051 Microcontroller

LCD & Keyboard Interfacing; ADC, DAC & Sensor Interfacing; External Memory Interface; Stepper Motor and Waveform generation.

List of Experiments

1. Develop the circuit of the P-N junction diode and plot the V-I characteristics to determine the knee voltage by varying the forward bias voltage and current in reverse biased condition due to minority carriers.
2. Analyze the breakdown mechanism of Zener diode for voltage regulation in a circuit with varying load currents and plot its VI characteristics.
3. Construct the circuit of BJT in Common Emitter Configuration and plot its input and output characteristic curves by varying the V_{BE} and V_{CE} and plotting the I_B and I_C .
4. Write assembly language programs using 8085 instructions for performing various arithmetic and logical operations and verify the same for various test cases.
5. Write assembly language programs using 8051 instructions for performing various arithmetic and logical operations and verify the same for various test cases.
6. Design of simple automation projects using 8051 Microcontroller

Text Books:

1. V.K.Mehta and Rohit Mehta, "Principles of Electronics" S.Chand, 12edition, 2014 (Unit I & II)
2. Krishna Kant, "Microprocessors and Microcontrollers: Architecture, Programming and System Design 8085, 8086, 8051, 8096", PHI, 2013 (Unit III, IV & V)

References:

Reference Books:

Sunil Sh
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| <ol style="list-style-type: none"> 1. Robert Boylestad, Louis Nashelsky, "Electronic devices and Circuit theory", Pearson, 11/e, 2015 2. A.K.Ray and K.M.Bhurchandi, "Advanced Microprocessor and Peripherals", MGH, 3/e, 2017 3. Mohammed Ali Mazidi, "The 8051 Microcontroller and Embedded Systems: Using Assembly and C", Pearson, 2edition, 2012 |
|--|

4. Course Outcomes

CO. No.	Course Outcome	BTL	POs	PSOs
U23EC381.1	Differentiate between signal diodes, rectifiers, and Zener diodes based on their characteristics and applications.	K4	1,2,3,4,5,9,10,12	1,2
U23EC381.2	Analyze BJT and FET symbol representations, internal structures, and biasing circuits.	K4	1,2,3,4,5,9,10,12	1,2
U23EC381.3	Comprehend the architecture, instruction set and write assembly program for 8085 Microprocessor	K4	1,2,3,4,5,9,10,12	1,2
U23EC381.4	Comprehend the architecture, instruction set and write assembly program for 8051Microcontroller	K4	1,2,3,4,5,9,10,12	1,2
U23EC381.5	Interpret the working of peripherals and interface with 8051.	K3	1,2,3,4,5,9,10,12	1,2

5. Course Articulation matrix

CO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02
U23EC381.1	3	3	3	1	2	-	-	-	1	1	-	1	3	1
U23EC381.2	3	3	3	1	2	-	-	-	1	1	-	1	3	1
U23EC381.3	3	3	3	3	3	-	-	-	1	1	-	1	3	1
U23EC381.4	3	3	3	3	3	-	-	-	1	1	-	1	3	1
U23EC381.5	3	3	3	1	3	-	-	-	1	1	-	1	3	1
Course to PO	3	3	3	1.8	2.6	-	-	-	1	1	-	1	3	1

"3"—High, "2"—Medium, "1"—Low, "-"—No Correlation

U23GE351	ENGINEERING PRACTICES LABORATORY	L 0	T 0	P 2	J 0	C 1
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1. Course Description

The course encompasses a comprehensive set of practical modules aimed at providing hands-on experience in computer science, mechanical engineering, electrical engineering, and electronics. In Module I, students engage in computer assembly and disassembly, honing troubleshooting skills for both hardware and software issues. Module II delves into

mechanical engineering practices, including plumbing, basic machining operations, and rapid prototyping with 3D printing. The exploration extends to the assembly of a centrifugal pump, hands-on exercises involving pump/motor submersible pump sets, and A/C refrigeration and air-conditioning systems. In Group B, Module III focuses on electrical engineering practices, involving UPS connections, domestic wiring, safety precautions, and the design of solar PV systems. Module IV, dedicated to electronics engineering practices, includes soldering techniques, a study of smartphone components, and practical projects in home automation. Through this multifaceted course, students gain a well-rounded understanding of essential skills in computer science, mechanical engineering, electrical engineering, and electronics, preparing them for diverse applications in the field.

2. Course Objectives:

1. To impart knowledge on computer assembling, disassembling and troubleshooting.
2. To provide exposure to the students with rapid prototyping with 3D printing, plumbing and basic machining operations.
3. To gain practical experience on UPS connections, domestic house wiring and solar PV system.
4. To expose the students to understand the home automation, smart phone operation and soldering and desoldering techniques.

3. Syllabus

Group A (Computer Science & Mechanical)

Computer Sceince And Engineering Practices

Assembly & Disassembly

1. Identifying components of disassembling and assembling the PC

Troubleshooting

1. Basic H/W and S/W troubleshooting

Mechanical Engineering Practices

Plumbing

1. Construction of pipeline using fittings: joints, gate valves, taps, reducers; examine the functions of the plumbing tools.
2. Develop plumbing connection of a residential building involving minor troubleshooting

Basic Machining

1. Inspect the dimension of the given work piece after executing simple lathe operations

Rapid Prototyping

1. Additive Manufacturing of 3D component without support structure
2. Additive Manufacturing of 3D component with support structure

Demonstration only

Study and assemble/ maintenance the following:

1. Different types of pumps, Dynamic: Centrifugal pump, Submersible pump; Positive Displacement: Reciprocating Pump
2. Experimental learning on basic connections with minor troubleshooting of Refrigeration System.
3. Experimental learning on basic connections with minor troubleshooting of Air-Conditioning System.

Group B (Electrical & Electronics)

Electrical Engineering Practices

1. UPS Connection - Hands on exercise on basic electrical connections with UPS Connection

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2. Domestic Wiring - Hands on exercise on basic domestic wiring
3. Safety Precautions - Hands on exercise on electrical earthing and safety precautions
4. Renewable Energy - Design of Solar PV System for Residence (Study)

Electronics Engineering Practices

1. Demonstrate proper soldering technique and Analyze the role of different components and equipment used in electronics.
2. Analyze smartphone component integration, design choices and their effects on performance.
3. Design a simple home automation projects and choose appropriate hardware and software components.

4. Course Outcomes

CO. No.	Course Outcome	BTL	POs	PSOs
U23GE351.1	Perform the basic troubleshooting of the PC including assembly and disassembly.	K3	PO1, PO2, PO3, PO6, PO8, PO9, PO10	PSO1, PSO2
U23GE351.2	Identify minor plumbing troubleshooting in residential buildings and develop 3D component by additive manufacturing	K6	PO1, PO2, PO3, PO6, PO8, PO9, PO10	PSO1, PSO2
U23GE351.3	Inspect work piece after executing basic machining operations like turning, drilling & tapping and minor troubleshooting, maintenance task in an AC & pump/motor.	K4	PO1, PO2, PO3, PO6, PO8, PO9, PO10	PSO1, PSO2
U23GE351.4	Perform basic domestic wiring of a residential building with provision of inverter and safety measures and Design solar PV System for residence.	K3	PO1, PO2, PO3, PO6, PO8, PO9, PO10	PSO1, PSO2
U23GE351.5	Execute basic home automation projects.	K3	PO1, PO2, PO3, PO6, PO8, PO9, PO10	PSO1, PSO2

5. Course Articulation matrix

CO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02
U23GE351.1	2	1	1	-	-	1	-	1	1	2	-	-	2	1
U23GE351.2	2	1	1	-	-	1	-	1	1	2	-	-	2	1
U23GE351.3	2	1	1	-	-	1	-	1	1	2	-	-	2	1
U23GE351.4	2	1	1	-	-	1	-	1	1	2	-	-	2	1
U23GE351.5	2	1	1	-	-	1	-	1	1	2	-	-	2	1
Course to PO	2	1	1	-	-	1	-	1	1	2	-	-	2	1

"3"—High, "2"—Medium, "1"—Low, “—”—No Correlation

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U23CS351	Problem Solving using C Laboratory	L	T	P	J	C
		0	0	4	0	2

1.Course Description:

The Problem-Solving Using C Laboratory is a practical course designed to complement theoretical knowledge with hands-on experience in programming using the C language. Through a series of laboratory sessions, students will delve into the basic concepts of C programming, including conditional and looping statements, modular programming, and advanced topics such as pointers, arrays, and structures. By actively engaging in coding exercises and projects, students will develop problem-solving skills, algorithmic thinking, and proficiency in implementing efficient solutions to various computational problems.

2.Course Objectives:

1. To implement the basic concepts of C programming.
2. To learn to apply conditional and looping statements for different programming scenarios.
3. To understand the importance of modular programming.
4. To write programs with pointers, arrays, structures.

3. List of Laboratory Experiments / Exercises:

1. Develop flow charts and solve simple real-life or scientific or technical problems (Traffic signal control / Water level controller / Temperature control system / Automatic washing machine control system / Automatic Street light control system / Electricity Billing / Retail shop billing /Computing Electrical Current in Three Phase AC circuits) (Minimum 3 problems)
2. Implementation of applications of input and output statements. (Integer, char, Float, string input and output, ASCII value of character, User details)
3. Implementation operators and expressions (Centigrade to Fahrenheit, Quotient and Remainder, Kilometres per hour to miles per hour, Hour and Minutes, Profit Calculator)
4. Implementation of real-time applications using conditional statements. (Vowel or Consonant, Eligible for casting vote, Leap year or not, Display the description for the given grade, Display number of days in a month, Calculator, Triangle type, Roots of a quadratic equation)
5. Implementation of technical applications using iterative loops (Display first N natural numbers, Read N numbers and find their sum and average, find cube of the number upto a given integer, Multiplication table, Sum of N natural numbers, Sum of N natural odd numbers, Pattern printing)
6. Implementation of one-dimensional array (Display the array elements, Elements in reverse order, Sum of array elements, make a copy of array elements, Maximum and minimum, odd sum and even sum)
7. Implementation of two dimensional and multi-dimensional array (sum, subtraction, transpose, multiplication, frequency of even numbers, print diagonals, sum of diagonal elements, compare)
8. Implementation of Functions in the program (Factorial, largest number, area of shape, sum of digits, prime number or not)
9. Implementation of real time applications using recursion (factorial, Fibonacci series, count digits of number, length of string, prime or not, GCD, sum of all digits, palindrome)

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10. Implementation of pointer in applications (swap two numbers, print string, read array elements, double pointer, find maximum number, palindrome, reverse array, dynamic memory allocation)
11. Implementation of strings handling functions with and without library functions (compare two strings, reverse, concatenate, copy, palindrome, count number of character, number of words, find, replace)
12. Implementation of file-handling operations (read, write, append file, compare two files, read student details and store into files)
13. Implementations of Structure in real time applications (Accept & display employee details, Calculate total payment of workers, Library operations, Menu driven program for employee structure)
14. Implementations of Union in programs (Accept & display employee details, Calculate total payment of workers, Library operations, Menu driven program for employee structure)
15. Mini Project: Develop an application for any real-world problem

References:

Reference Books:

1. Herbert Schildt, "C – The Complete Reference", Tata McGraw Hill Publishing Company, New Delhi, 2017.
2. Kernighan B. W. and Ritchie D. M., "C Programming Language (ANSI C)", Prentice Hall of India Private Limited, New Delhi, 2010.
3. Deitel and Deitel, "C How to Program", Pearson Education, New Delhi, 2011.
4. Simple Program Design: A Step-by-Step Approach, Fifth Edition by Lesley Anne Robertson.

Web References:

1. <https://www.udemy.com/course/c-programming-2019-master-the-basics>
2. <https://www.tutorialspoint.com/cprogramming>

4. Course Outcomes

CO. No.	Course Outcome	BTL	POs	PSOs
U23CS351.1:	Demonstrate the ability to identify, define, and analyze complex problems using appropriate algorithms, data structures, methodologies and	K3	1,2,3,4,5,8,9,10,11,12	1,2
U23CS351.2:	Design effective visual representations (UML diagrams/Flowchart) to solve the identified problems	K3	1,2,3,4,5,8,9,10,11,12	1,2
U23CS351.3:	Create solutions and implement them using suitable programming platforms	K6	1,2,3,4,5,8,9,10,11,12	1,2
U23CS351.4:	Develop effective presentation skills to present and defend the designs and solution	K4	1,2,3,4,5,8,9,10,11,12	1,2
U23CS351.5	Understand issues related to privacy, security and Coding	K2	1,2,3,4,5,8,9,10,11,12	1,2

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	accessibility and adhere to coding standards			
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5. Course Articulation matrix

CO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PS O 01	PS O 02
U23CS351.1	3	3	3	2	2	-	-	2	1	1	1	3	2	1
U23CS351.2	3	3	3	2	2	-	-	2	1	1	1	3	2	1
U23CS351.3	3	3	3	2	2	-	-	2	1	1	1	3	2	1
U23CS351.4	3	3	3	2	2	-	-	2	1	1	1	3	2	1
U23CS351.5	3	3	3	2	2	-	-	2	1	1	1	3	2	1
Course to PO	3	3	3	2	2	-	-	2	1	1	1	3	2	1

"3"—High, "2"—Medium, "1"—Low, "-"—No Correlation

U23EM751	SOFT SKILLS	L	T	P	J	C
		0	0	2	0	1

1. Course Description

This course aims to equip engineering students with essential soft skills that are integral for their holistic development. It is designed to enhance their basic language proficiency through comprehensive exercises, fostering a positive behavioural approach in daily activities, and instilling social awareness to encourage empathy and inclusivity in their interactions. Furthermore, it seeks to cultivate a teamwork mindset among students through collaborative projects and activities, emphasizing the value of synergy and cooperation. Lastly, this course endeavours to eradicate stage fear by providing practical techniques and opportunities for public speaking, thereby empowering students to communicate confidently and effectively in professional settings.

2. Course Objectives:

1. To enhance basic language skills for freshers.
2. To inculcate positive behaviour in daily activities.
3. To bring Social awareness among freshers.
4. To create a teamwork awareness among students.
5. To eradicate stage fear among the students.

3. Syllabus

Unit-I: Behavioural Session, Goal Setting, Power Dressing

Behavioural session, Regarding interview and Life Skills a practical session is hosted for the students for how they should carry themselves in today's society and how to meet up the company's expectations.

Goal Setting, Activities and goal establishment psychology classes are conducted for the students to improve their short term and long-term goals (A Goal Sheet is prepared) Power Dressing, Perking up their dressing style.

Unit-II: Language proficiency, communication building

Language proficiency, Neutral accent refinement speaking classes for students.

Communication building, Multi tasking activities for communication building.

Unit-III: Lexicon Building, Body Language, Story Building

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Lexicon Building (Speaking session)
 Body Language (Demo and practical session)
 Story Building (Activity building).

Unit-IV: Team Building, Outdoor Speech

Team Building (Activity based)
 Outdoor Speech, Basic Topic (Change of environment).

Unit-V: Outdoor journalism

Outdoor journalism (Activity based).

References

Reference Books:

1. Norman Lewis, "Word power made easy".2020.
2. Sylvia Reyes," Team Building: The Ultimate Guide to Build & Manage Winning Teams", MC Graw hill, 2014.
3. Dan Clay, how to write the perfect resume 2018.
4. Tyler Hayden," Communication Activities: A Team Building Activity Book", 2019.
5. Ian Tuhovsky, "Communication Skills Training: A Practical Guide to Improving Your Social Intelligence, 2019.
6. Presentation, Persuasion and Public Speaking (Positive Psychology Coaching Series Book 9) 2015.

Video Reference:

1. https://youtube.com/playlist?list=PLLy_2iUCCG87CQhELCytvXhOE_ybOOI_q&feature=shared
2. https://youtube.com/playlist?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KIJ&feature=shared
3. <https://m.youtube.com/watch?feature=shared&v=DUIsNJtg2L8>

4. Course Outcomes

Co. No.	Course Outcome	BTL	POs	PSOs
U23EM751.1	(Apply) apply the basic personality traits in social activity for future working environment.	K3	1, 2, 3, 6	-
U23EM751.2	(Apply) apply receptiveness and get customized to today's corporate world.	K3	1, 2, 3, 9	-
U23EM751.3	(Analyze) analyze and mingle with different types of people to overcome and eradicate fear.	K4	1, 2, 3, 9	-
U23EM751.4	(Create) create a team environment in the classroom to measure their individual team player skills.	K6	1, 2, 3, 9	-
U23EM751.5	(Create) create a vivid vision about their behaviour and discipline in future and through which they can measure themselves in socializing.	K6	1, 2, 3, 12	-
U23EM751.6	(Apply) apply the conveyance methodologies in linguistics for future professional client handling.	K3	1, 2, 3, 10	<i>Chairman - Board of Studies</i>

5. Course Articulation matrix

CO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02	
U23EM751.1	3	3	2	-	-	3	-	-	-	-	-	-	1	-	-
U23EM751.2	3	3	2	-	-	-	-	-	3	-	-	-	1	-	-
U23EM751.3	3	3	2	-	-	-	-	-	3	-	-	-	1	-	-
U23EM751.4	3	3	2	-	-	-	-	-	3	-	-	-	1	-	-
U23EM751.5	3	3	2	-	-	-	-	-	-	-	-	-	3	-	-
U23EM751.6	3	3	2	-	-	-	-	-	-	3	-	-	1	-	-
Course to PO	3	3	2	-	-	3	-	-	3	3	-	1.3	-	-	-

"3"—High, "2"—Medium, "1"—Low, "—" — No Correlation.

U23MC901	தமிழர் மரபு / Heritage of Tamils	L 1	T 0	P 0	J 0	C 1
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1. Course Description / பாடநெறி விளக்கம்

This course is taught to provide insight to the students into the rich culture and heritage of the state. The students should know the valued things such as historic buildings that have been passed down from previous generations and relating to things of Tamil historical and cultural value that are worthy of preservation. This course explains the growth of nationalism, the growth of the Tamil language, various religious reformers, the spread of the Dravidian movement and its possible impact on society, the role of the self-respect movement, educational development in Tamilnadu since independence and the growth of fine arts in Tamilnadu.

மாநிலத்தின் வளமான கலாச்சாரம் மற்றும் பாரம்பரியம் பற்றிய நுண்ணறிவை மாணவர்களுக்கு வழங்க இந்த பாடநெறி கற்பிக்கப்படுகிறது. முந்தைய தலைமுறையினரிடமிருந்து பெறப்பட்ட வரலாற்று கட்டிடங்கள் மற்றும் தமிழ் வரலாற்று மற்றும் கலாச்சார மதிப்புள்ள விஷயங்கள் பாதுகாக்கப்பட வேண்டிய மதிப்புமிக்க விஷயங்களை மாணவர்கள் அறிந்து கொள்ள வேண்டும். தமிழ்நாட்டின் தேசியத்தின் வளர்ச்சி, தமிழ் மொழியின் வளர்ச்சி, பல்வேறு சமய சீர்திருத்தவாதிகள், திராவிட இயக்கத்தின் பரவல் மற்றும் சமுதாயத்தில் அதன் தாக்கம், சுயமரியாதை இயக்கத்தின் பங்கு, சுதந்திரத்திற்குப் பிறகு தமிழகத்தில் கல்வி வளர்ச்சி மற்றும் தமிழகத்தில் நுண்கலைகளின் வளர்ச்சி பற்றி இந்த பாடநெறி விளக்குகிறது.

2. Course Objectives / பாடத்தின் நோக்கங்கள் :

1. To make an inference about language and traditional of the state.

மாநிலத்தின் மொழி மற்றும் பாரம்பரியம் பற்றி அனுமானிக்க உதவுகிறது.

2. To acquire knowledge in construction of status and various musical instruments

கட்டிடக்கலை மற்றும் பல்வேறு இசைக்கருவிகளை உருவாக்குவதற்கான அறிவைப் பெறுதல்.

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3. To study the detailed information about folklore and paramilitary arts.
 நாட்டுப்புறவியல் மற்றும் ராணுவக் கலைகள் பற்றிய விரிவான தகவல்களைப் படிக்க உதவுகிறது.
4. To gain knowledge of rich culture and success history of ancient kingdoms.
 பண்டைய ராஜ்யங்களின் வளமான கலாச்சாரம் மற்றும் வெற்றி வரலாற்றைப் பற்றிய அறிவைப் பெற உதவுகிறது.
5. To acquaint the student with the knowledge of Siddha medicine and about the Indian freedom struggle.
 சித்த மருத்துவம் மற்றும் இந்திய சுதந்திரப் போராட்டம் பற்றிய அறிவை மாண்வருக்கு அறிமுகப்படுத்துதல்.

3. Syllabus / பாடத்திட்டங்கள்:

Unit-I / அலகு-I: Language And Literature / மொழி மற்றும் இலக்கியம்

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 Thirukkural – 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 Bharathiyan and Bharathidhasan.

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

Unit-II / அலகு - II: Heritage-Rock Art Paintings to Modern Art –Sculpture / மரபு - பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை - சிற்பக்கலை

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.

நடுக்கல் முதல் நவீன சிற்பங்கள் வரை - ஜம்பொன் சிலைகள் - பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினை பொருள்கள், பொம்மைகள் - தேர் செய்யும் கலை - சுடுமண் சிற்பங்கள் - நாட்டுப்புறத் தெய்வங்கள் - குமரி முனையில் திருவள்ளுவர் சிலை - இசைக் கருவிகள் - மிருதங்கம், பறை, யாழ், வீணை, நாதஸ்வரம் - தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு

Unit-III / அலகு-III: Folk and Martial Arts / நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்

Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance – Sports and Games of Tamils.

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தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஓயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம் - தமிழர்களின் வீர விளையாட்டுகள்.

Unit-IV / அலகு-IV: Thinai Concept of Tamils / தமிழர்களின் திணைக்கோட்பாடுகள்

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.

தமிழகத்தின் தாவரங்களும், விலங்குகளும் - தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் - தமிழர்கள் போற்றிய அறக்கோட்பாடு - சங்க காலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் - சங்க கால நகரங்களும் துறை முகங்களும் - சங்க காலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி - கடல் கடந்த நாடுகளில் சோழர்களின் வெற்றி.

Unit-V/ அலகு-V: Contribution Of Tamils To Indian National Movement And Indian Culture / இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு

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.

இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிற்பகுதியில் தமிழ்ப் பண்பாட்டின் தாக்கம் - சுய மரியாதை இயக்கம் - இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.

Text Books:

1. தமிழக வரலாறு - மக்களும் பயன்பாடுகளும் - கே கே பிள்ளை (தமிழக பாட நூல் கழகம் மற்றும் கல்வியல் பணிகள் கழகம்).
2. கணினித் தமிழ் - முனைவர் இல. சுந்தரம் (விகடன் பிரசுரம்).
3. கீழடி - வைகை நதிக்கரையில் சங்க கால 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).

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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.

References:

1. Journey of Civilization Indus to Vaigai - R. Balakrishnan, Published by: RMRL.
2. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

4. Course Outcomes/ பாடநெறி முடிவுகள்

CO. No.	Course Outcome / பாடநெறி முடிவுகள்	BTL	POs	PSOs
U23MC901.1	To know about the language families in India, the impact of the religions, and the contribution of Bharathiar and Bharathidhasan. இந்தியாவில் உள்ள மொழி குடும்பங்கள், மதங்களின் தாக்கம், பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு பற்றி தெரிந்து கொள்வது.	K2	9, 12	-
U23MC901.2	Observe the growth of sculpture making of musical instruments and the role of temples in socio and economic lives. தமிழர்களின் வாழ்வில் இசைக்கருவிகள், சிற்பங்களை உருவாக்கும் முறைகள், சமூக, பொருளாதார வளர்ச்சி மற்றும் கோவில்களின் பங்களிப்பு பற்றி அறிந்து கொள்வது	K2	8, 9, 12	-
U23MC901.3	Understand the significance of folklore and martial arts. நாட்டுப்புறவியல் மற்றும் தற்காப்புக் கலைகளின் முக்கியத்துவத்தைப் புரிந்து கொள்வது.	K2	8, 9, 12	-
U23MC901.4	Learn the Sangam literature, Sangam age and overseas conquest of Cholas. சங்க இலக்கியம், சங்க காலம் மற்றும் சோழர்களின் வெற்றிகள் ஆகியவற்றைக் கற்றுக்கொள்வது.	K2	9	-

U23MC901.5	Understand the contribution of Tamils to the Indian freedom struggle and the role of Siddha medicines. இந்திய சுதந்திரப் போராட்டத்தில் தமிழர்களின் பங்களிப்பு, சித்த மருந்துகளின் பங்கு ஆசியவற்றைப் புரிந்து கொள்வது.	K2	8, 9	-
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5. Course Articulation matrix

CO	P	P	P	P	P	P	P	P	P	P	P	P	P	P	S	S
	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
	01	02	03	04	05	06	07	08	09	10	11	12	01	02	01	02
U23MC901.1	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-
U23MC901.2	-	-	-	-	-	-	-	1	1	-	-	1	-	-	-	-
U23MC901.3	-	-	-	-	-	-	-	1	1	-	-	1	-	-	-	-
U23MC901.4	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
U23MC901.5	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-
Course to PO	-	-	-	-	-	-	-	1	1	-	-	1	-	-	-	-

"3"—High, "2"—Medium, "1"—Low, “-”—No Correlation

SYLLABI SEMESTER II

U23MA203	Linear Algebra	L	T	P	J	C
		3	1	0	0	4

1. Course Description

This course encompasses matrix theory and linear algebra, focusing on concepts applicable across various disciplines. Linear algebra is a branch of mathematics that studies systems of linear equations and the properties of matrices. The course covers the theory of vector spaces and linear transformations as well as practical methods like diagonalization and row-reduction of matrices that can be used to solve issues in mathematical biology, engineering, and economics. It finds widespread use in machine learning for solving linear regression, eigenvalue problems, orthogonalization, matrix inversion and enhancing numerical stability in various algorithms.

2. Course Objectives:

1. To explore about matrix method to solve linear equations.
2. To investigate the vector space and its attributes.
3. To study inner product spaces and its applications.
4. To acquire knowledge in linear transformations.
5. To examine the Eigen values and Eigen vectors through study.

3. Syllabus

Unit-I: Linear Equations

System of linear equations: Row reduction, echelon forms, Gaussian elimination method, Gauss Jordan method, LU decomposition, invertibility.

Unit-II: Vector Spaces

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Vector spaces: Subspaces, linear combinations, linear independence and linear dependence, basis and dimensions.

Unit-III: Inner Product Spaces

Inner product: Norms, Gram-Schmidt orthogonalization process, QR decomposition, least square approximation.

Unit-IV: Linear Transformations

Linear transformation: Null spaces, ranges, dimension theorem, matrix representation of a linear transformations; Inverse linear transformation basic problem only.

Unit-V: Eigenvalues and Eigenvectors

Eigen values and eigen vectors, Diagonalization: Orthogonal diagonalization; Reduction of quadratic form to canonical form; Singular value decomposition; Principal component analysis.

Lab Components for Assignments/Tutorials:

1. Working procedure, Basic commands and symbolic computation.
2. Solving several types of systems of linear equations.
3. Matrix Operations.
4. Eigen values and Eigen vector computation.
5. Matrix decomposition - QR decomposition - LU decomposition.
6. Shifting and scaling of vectors.
7. Least Square method (case study).

Text Books:

1. Howard Anton and Chris Rorres, "Elementary Linear Algebra", Wiley India, New Delhi, 2018.
2. Gilbert Strang, Introduction to Linear Algebra, 5th Edition, ANE Books, 2016.

References:

Reference Books:

1. David C Lay, "Linear Algebra and its Applications", Pearson, New Delhi, 2016.
2. Friedberg, A.H., Insel, A.J. and Spence, L., "Linear Algebra", 4th Edition, Prentice Hall of India, New Delhi, 2004.
3. Gareth Williams, "Linear Algebra with Applications", Narosa Publishing House, New Delhi, 2012.

Journals:

1. International Journal of PCA (<https://www.scirp.org/journal/paperinformation.aspx?paperid=38103>)
2. International journal of SVD
3. <https://www.sciencedirect.com/topics/engineering/singular-value-decomposition>
4. SIAM Journal on Matrix Analysis and its Applications
5. Linear algebra and its applications.

Video References:

1. <https://www.youtube.com/watch?v=JnTa9XtvmfI>
2. <https://www.khanacademy.org/math/linear-algebra>
3. <https://www.youtube.com/watch?v=kjBOesZCoqc>
4. <https://www.youtube.com/watch?v=lUUte2o2Sn8>
5. <https://www.youtube.com/watch?v=WwQpG9kldL4>

NPTEL Lectures:

1. https://onlinecourses.nptel.ac.in/noc22_ma45/preview
2. <https://archive.nptel.ac.in/courses/111/101/111101115/>
3. https://onlinecourses.nptel.ac.in/noc24_ee48/preview

4. Course Outcomes

CO. No.	Course Outcome	BTL	POs	PSOs
U23MA203.1	Utilize fundamental concepts of the matrix method for solving linear equations.	K3	1,2,3,4,12	-
U23MA203.2	Implement the principles of vector space and its characteristics to address real time problems.	K3	1,2,3,4,12	-
U23MA203.3	Examine orthonormal basis within inner product spaces concerning a specified vector.	K5	1,2,3,4,12	-
U23MA203.4	Articulate matrix role as a linear transformation within a finite dimensional space.	K3	1,2,3,4,12	-
U23MA203.5	Discriminating the characteristics of a linear system with eigen values and vectors.	K4	1,2,3,4,12	-

5. Course Articulation matrix

CO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02
U23MA203.1	3	3	2	2	1	-	-	-	-	-	-	-	2	-
U23MA203.2	3	3	2	2	1	-	-	-	-	-	-	-	2	-
U23MA203.3	3	3	2	2	1	-	-	-	-	-	-	-	2	-
U23MA203.4	3	3	2	2	1	-	-	-	-	-	-	-	2	-
U23MA203.5	3	3	2	2	1	-	-	-	-	-	-	-	2	-
Course to PO	3	3	2	2	1	-	-	-	-	-	-	-	2	-

"3"—High, "2"—Medium, "1"—Low, “—”—No Correlation

U23CS401	Data Structures	L	T	P	J	C
		3	0	0	0	3

1. Course Description:

This course provides a comprehensive introduction to data structures. Students will delve into the principles behind organizing and manipulating data efficiently, covering a wide array of topics including lists, stacks, queues, sorting algorithms, searching techniques, hashing, trees, and graphs. Through a combination of theoretical lectures, practical coding exercises, and real-world applications, students will gain a solid understanding of how to select and implement the appropriate data structures and algorithms to solve complex computational problems.

2. Course Objectives:

- To understand the concepts of abstract data types
- To learn linear data structures – lists, stacks, and queues
- To understand sorting, searching and hashing algorithms
- To learn to apply the tree and graph structures to real world problems

3. Syllabus

Unit-I: Linked Lists

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Arrays vs Linked list; Linked lists: types, singly linked list, doubly linked list, singly circular linked list, doubly circular linked list, operations, insertion, deletion, find, reverse, modifying linked list; Floyd's cycle finding algorithm: slow pointer and fast pointer

Unit-II: Stacks and Queue

Stack: implementation using array and linked list, Operations: push, pop; Applications: infix to postfix conversion, processing function calls; Queue: implementation using array and linked list, enqueue, dequeue, priority queue, circular queue; Applications: call log management

Unit-III: Trees

Terminologies; Binary Trees: implementation, traversals, expression trees, cousins of binary tree; Binary Search Trees: construction, insertion, deletion, searching, find-min, find-max; AVL Trees: insertion, deletion; Priority Queues: heaps; Applications: dictionary, text processing

Unit-IV: Graphs

Representation; Types; Traversals: Depth First Search (DFS), Breadth First Search (BFS); Dijkstra's algorithm; Topological sort; Minimum Spanning Tree (MST): Prim's, Kruskal's algorithm; Applications: traffic redirection problem, traveling salesman problem

Unit-V: Sorting, Searching and Hashing

Internal sorting: bubble, insertion, quick; External sorting: merge sort; Searching: linear search, binary search; Hashing: hash table, hash functions, collision resolution techniques; Applications: Telephone Directories, Spell Checker, Design of Game Boards

Text Books:

1. Reema Thareja, "Data Structures Using C", Second Edition, Oxford University Press, 2019
2. Seymour Lipschutz," Data Structures using C", First Edition, McGraw Hill Education, 2017

References:

Reference Books:

1. Narasimha Karumanchi "Data Structures and Algorithms Made Easy" Fifth Edition, Career Monk publications,2017
2. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education, 1997.

Web References:

1. <https://www.geeksforgeeks.org/data-structures>
2. <https://www.javatpoint.com/data-structure-tutorial>
3. <https://www.udemy.com/course/datastructurescncpp/>

NPTEL /Online Courses:

1. <https://in.coursera.org/learn/data-structures?action=enroll>

4. Course Outcomes

CO. No.	Course Outcome	BTL	POs	PSOs
U23CS401.1:	Apply the concepts of linked lists by demonstrating and understanding of their implementation and usage to solve given problems	K3	1,2,3,5,12	1,2 <i>Sunitha</i>

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	Construct stacks and queues using			
U23CS401.2:	arrays and linked lists and apply these structures to appropriate scenarios	K3	1,2,3,5,12	1,2
U23CS401.3:	Implement tree data structures and their operations to enhance data management and retrieval systems	K3	1,2,3,5,12	1,2
U23CS401.4:	Assess graph-based algorithms to solve complex problems requiring efficient data traversal and manipulation	K4	1,2,3,5,12	1,2
U23CS401.5	Examine sorting, searching and hashing algorithms to organize and retrieve data effectively	K5	1,2,3,5,12	1,2

5. Course Articulation matrix

CO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02	
U23CS401.1	3	3	2	-	1	-	-	-	-	-	-	-	2	1	2
U23CS401.2	3	3	2	-	1	-	-	-	-	-	-	-	2	1	2
U23CS401.3	3	3	2	-	1	-	-	-	-	-	-	-	2	1	2
U23CS401.4	3	3	2	-	1	-	-	-	-	-	-	-	2	1	2
U23CS401.5	3	3	2	-	1	-	-	-	-	-	-	-	2	1	2
Course to PO	3	3	2	-	1	-	-	-	-	-	-	-	2	1	2

"3"—High, "2"—Medium, "1"—Low, "-"—No Correlation

U23PH201	COMPUTATIONAL PHYSICS	L	T	P	J	C
		3	0	0	0	3

1. Course Description:

Computational Physics is a foundational course designed to introduce students to the principles governing the equilibrium and motion of bodies under the influence of forces. The course encompasses statics and dynamics, laying the groundwork for further studies in various engineering disciplines. Topics covered include vector analysis, force systems, equilibrium, friction, kinematics, dynamics and the application of these principles to analyze and solve engineering problems. Moreover, this course providing knowledge to students in the analytical tools and problem-solving skills necessary for success in more advanced engineering courses and in professional engineering practice.

2. Course Objectives:

- To learn the action forces, reaction forces and resultant forces in static bodies for statically determinate structure through scalar and vector approach.
- To study and determine the properties of surfaces and solids.
- Understand the principles of kinematic pairs, chains and their classification, DOF, inversions, planar mechanisms
- Analyze the planar four bar and slider crank mechanisms for position, velocity and acceleration
- To learn about the fundamentals of friction concepts, force analysis in robots

3. Syllabus

Unit-I: Statics of Particles and Rigid Bodies

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9441202

Introduction to Mechanics: Units and Dimensions, Laws of Mechanics, Coplanar Forces, Force as 3D Vector; Resolution of Forces: Resultant of Forces, Equilibrium of a particle in space; Types of supports: Action and reaction forces; stable equilibrium; Moments and Couples: Moment of a force about a point and about an axis, Varignon's theorem.

Computer Aided Simulation: Newton's three laws, identify the common forces working on a given object in a given situation, finding the net force acting on an object and identify how it will affect the object; Modeling center of gravity, moment of force and lever arm.

Unit-II: Properties of Surfaces and Solids

Centroids and centre of mass: Rectangular, circular, triangular areas, T section, I section, Angle section, Hollow section by using standard formula; Area moments of inertia: simple plane areas Computer Aided Simulation: Methods of finding centre of gravity of an irregular body; Model a situation for centre of gravity; create an interactive simulation

Unit-III: Fundamentals of Mechanisms

Basic Terminology: Kinematic link, Pair, joints, Structure, Machine, Degree of freedom, Grubler & Kutzbach Criterion; Inversions: four bar mechanism, single slider mechanism, double slider mechanism; Mechanical advantage; Transmission Angle.

Computer Aided Simulation: Planar Mechanisms simulation

Unit-IV: Kinematic Analysis of Mechanisms

Relative velocity of kinematic link; Rubbing Velocity of kinematic pair; Coriolis component of acceleration; Construction of velocity and acceleration diagram by graphical method (Relative Velocity Method): Four bar mechanism, slider crank mechanisms; Kinematics of particles: assumptions, cartesian, cylindrical & spherical frames, motion of particles; Translation and rotation of rigid bodies in 2D & 3D.

Computer Aided Simulation: Simulation of Velocity and Acceleration analysis for planar mechanisms

Unit-V: Friction and Fundamentals of Robotics

Friction: mechanism, types, Frictional force, Laws of Coulomb friction; Friction analysis: Simple contact friction, Ladder friction, Belt friction, Screw friction; Rolling resistance;

Robotics: Law of robotics, Anatomy, configuration of robots, types of robots, free body diagram of robot configuration, force analysis.

Computer Aided Simulation: Robot programming and simulation for pick and place / machining (cutting, welding); Simple 6-DOF Robot Manipulator Simulation System

Total: 60 Hours

Text Books:

1. Beer F P and Johnson E R, —Vector Mechanics for Engineers, Statics and Dynamics, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 11th edition, 2017
2. Mikell P Groover, Mitchell Weiss, Roger N Nagel, Nicholas Odrey, Ashish Dutta "Industrial Robotics (SIE): Technology, Programming and Applications", McGraw Hill Education India., 2012
3. S.S Rattan, Theory of Machines, Tata McGraw Hill Publishing Company Pvt. Ltd, New Delhi, 2014.

References:

Reference Books:

1. Irving H. Shames, G. Krishna Mohana Rao, Engineering Mechanics - Statics and Dynamics - Pearson Education Asia Pvt. Ltd., 2014, 4th edition.
2. Arthur P. Boresi, Richard J. Schmidt, Engineering Mechanics Statics and Dynamics— Cengage Learning, 2008, 1st edition.
3. Sadhu Singh, Theory of Machines, Second Edition, Pearson Education, 2012.

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| 4. F.B. Sayyad, "Kinematics of Machinery", MacMillan Publishers Pvt Ltd., Tech-max Educational resources, 2011. |
| 5. J. J. Uicker, G. R. Pennock and J. E. Shigley, Theory of Machines and Mechanisms, Oxford University Press, New York, 2011. |
| 6. Groover M.P., "Industrial Robotics -Technology Programming and Applications", McGraw Hill, 2017. |

4. Course Outcomes

CO. No.	Course Outcome	BTL	POs	PSOs
U23PH201.1:	Solve the scalar and vector representation of forces and analyze the behavior of particles in equilibrium conditions.	K3	1, 2, 3, 4, 5, 8, 12	1, 2
U23PH201.2:	Analyze the properties of surfaces and solids.	K3	1, 2, 3, 4, 5, 8, 12	1, 2
U23PH201.3:	Identify the simple mechanisms based on given application	K3	1, 2, 3, 4, 5, 8, 12	1, 2
U23PH201.4:	Find velocity and acceleration of simple mechanisms.	K3	1, 2, 3, 4, 5, 8, 12	1, 2
U23PH201.5	Determine the frictional force & its effects by using laws of friction and understand the fundamentals of force analysis in robots.	K3	1, 2, 3, 4, 5, 8, 12	1, 2

5. Course Articulation matrix

CO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02	
U23PH201.1	3	2	-	3	2	-	-	-	1	-	-	-	2	1	1
U23PH201.2	3	2	-	3	2	-	-	-	1	-	-	-	2	1	1
U23PH201.3	3	2	-	3	2	-	-	-	1	-	-	-	2	1	1
U23PH201.4	3	2	-	3	2	-	-	-	1	-	-	-	2	1	1
U23PH201.5	3	2	-	3	2	-	-	-	1	-	-	-	2	1	1
Course to PO	3	2	-	3	2	-	-	-	1	-	-	-	2	1	1

"3"—High, "2"—Medium, "1"—Low, "-"—No Correlation

U23CS402	Object Oriented Programming using C++	L	T	P	J	C
		3	0	0	0	3

1. Course Description:

This course serves as an intensive exploration into the principles and practices of object-oriented programming (OOP) using the C++ programming language. Students will embark on a journey through the core concepts of OOP, including classes and objects, inheritance, polymorphism, and dynamic memory allocation. Additionally, the course will delve into advanced topics such as the Standard Template Library (STL), lambda expressions, and concurrency. Through hands-on coding exercises, projects, and real-world examples, students

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will gain a solid understanding of how to design, implement, and maintain object-oriented C++ programs efficiently.

2. Course Objectives:

1. To understand the foundations of C++
2. To understand the Object-Oriented Programming Concepts in C++
3. To know inheritance and polymorphism in C++
4. To implement common data structures and containers in C++
5. To develop concurrent C++ applications

3. Syllabus

Unit-I: Foundations of C++

Introduction to C++ : features, identifiers, data types, namespace, keywords, operators, input & output, streams, control statements; arrays; strings; functions: inline functions, default arguments; references & pointers; dynamic memory management

Unit-II: Classes and Objects

OOP Mechanisms: classes and objects, access specifiers, constructors, destructors & object lifetime, copy constructor & copy assignment operator; static members; structs & enumeration; friend function & friend class

Unit-III: Inheritance and Polymorphism

Inheritance & its types; aggregation; abstract classes; polymorphism: static and dynamic binding, virtual function table, function overloading, operator overloading; type casting: cast operators

Unit-IV: Standard Template Libraries

STL: components: containers, algorithms, functions, iterators; containers: array, vector, deque, list, forward list, stack, queue, set, multiset map, multimap, unordered set, unordered multiset, unordered map, unordered multimap; file handling

Unit-V: Lambda and Concurrency

Exception & its types; concurrency: atomic, thread, mutex; lambda in C++; resource management by smart pointers; C++ series: rvalue, lvalue & perfect forwarding; templates in C++ : features & types

Text Books:

1. C++20 - The Complete Guide by Nicolai M. Josuttis, 2022
2. C++: The Complete Reference by Herbert Schildt, 4th Edition, 2017

References:

Reference Books:

1. Modern C++ Tutorial: C++11/14/17/20 On the Fly by Changkun Ou, 2023
2. Effective Modern C++: 42 Specific Ways to Improve Your Use of C++11 and C++14 by Scott Meyers, 2015

Web References:

1. <https://cplusplus.com/>
2. <https://google.github.io/styleguide/cppguide.html>
3. <https://www.udemy.com/course/cpp-deep-dive>
4. https://onlinecourses.nptel.ac.in/noc23_cs78/course

NPTEL Courses:

1. https://onlinecourses.nptel.ac.in/noc21_cs02/preview
2. https://onlinecourses.nptel.ac.in/noc22_cs103/preview
3. https://onlinecourses.nptel.ac.in/noc22_cs42/preview

4. Course Outcomes

CO. No.	Course Outcome	BTL	POs	PSOs
U23CS402.1	Demonstrate problem-solving skills by writing C++ programs for simple applications	K3	1,2,3,5,7,12	1,2
U23CS402.2	Design and implement simple classes with attributes, methods and appropriate access modifiers	K3	1,2,3,5,7,12	1,2
U23CS402.3	Illustrate the concepts of inheritance and polymorphism in real time objects	K3	1,2,3,5,7,12	1,2
U23CS402.4	Evaluate and choose the appropriate STL (vectors, lists, maps, etc.) for real time applications	K5	1,2,3,5,7,12	1,2
U23CS402.5	Apply the modern concepts of C++ in real time concurrent processing	K3	1,2,3,5,7,12	1,2

5. Course Articulation matrix

CO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02
U23CS402.1	3	3	3	-	1	-	2	-	-	-	-	-	3	3
U23CS402.2	3	3	3	-	1	-	2	-	-	-	-	-	3	3
U23CS402.3	3	3	3	-	1	-	2	-	-	-	-	-	3	3
U23CS402.4	3	3	3	-	1	-	2	-	-	-	-	-	3	3
U23CS402.5	3	3	3	-	1	-	2	-	-	-	-	-	3	3
Course to PO	3	3	3	-	1	-	2	-	-	-	-	-	3	3

"3"—High, "2"—Medium, "1"—Low, "-"—No Correlation

U23NCC001	NCC CREDIT COURSE LEVEL I	L	T	P	J	C
		2	0	0	0	2#

1. Course Description

The NCC Course is designed to instil discipline, leadership, and a sense of social responsibility in participants. Through a blend of theory and practical activities, students learn to respect cultural diversity, manage time effectively, and handle stress efficiently. They develop teamwork skills and engage in social service initiatives, fostering a well-rounded approach to personal and community development.

2. Course Objectives:

- To know about the history of NCC, its organization, and incentives of NCC for their career prospects.
- To understand the concept of National Integration and its importance.
- To understand the concept of self-awareness and Emotional Intelligence and develop a sense of time management
- To develop a sense of stress management in a changing environment
- To understand the concept of a team and its functioning
- To understand the concept and importance of Social service

3. Syllabus

Unit-I: NCC General

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Aims, Objectives & Organization of NCC - Incentives - Duties of NCC Cadet - NCC Camps: Types & Conduct
Unit-II: National Integration and Awareness National Integration: Importance & Necessity - Factors Affecting National Integration - Unity in Diversity & Role of NCC in Nation Building - Threats to National Security
Unit-III: Personality Development Self-awareness, Empathy, Critical & Creative Thinking, Decision-making and Problem-Solving - Communication Skills - Group Discussion: Stress & Emotions, Time Management, Team Work – Career Counseling, SSB Procedure & Interview Skills – Public Speaking
Unit-IV: Leadership Traits, Indicators, Motivation, Moral Values, Honour code - Case Studies: Shivaji, Jhansi Ki Rani, APJ Abdul Kalam, Tippu Sultan, Rabindranath Tagore, Ratan Tata
Unit-V: Social Service aAnd Community Development Basics - Rural Development Programmes, NGOs, Contribution of Youth – Swachh Bharat Abhiyan – Drug Abuse, Tree Plantation Traffic Awareness, Digital Awareness, Beti Padhao Beti Bachao, Women Health & Sanitation - Protection of Children and Women Safety - Road / Rail Travel Safety - New Initiatives - Cyber and Mobile Security Awareness
Text Books: 1. National Cadet Corps “Cadets Hand Book – Army(Common Subjects)”
Web references: 1. https://indiancc.nic.in/

4. Course Outcomes

CO. No.	Course Outcome	BTL	POs	PSOs
U23NCC001.1	Demonstrate the conduct of NCC cadets, exhibiting discipline and leadership qualities, respect and appreciate the diversity of Indian culture, and fostering a sense of unity amidst differences.	K2	8, 9, 10, 12	-
U23NCC001.2	Conduct a comprehensive SWOT analysis to identify personal strengths and weaknesses, and implement strategies to overcome weaknesses, enhancing overall performance.	K2	3, 6, 7, 8, 9, 10, 12	-
U23NCC001.3	Utilize various strategies for stress management, ensuring mental well-being and resilience in challenging situations	K3	3, 6, 7, 8, 9, 10, 11, 12	-
U23NCC001.4	Collaborate effectively within a team, demonstrating teamwork skills to achieve common objectives.	K2	3, 4, 7, 8, 9, 10, 11, 12	-
U23NCC001.5	Engage in social service activities on different occasions, contributing positively to the community and fostering a sense of social responsibility	K3	3, 6, 7, 8, 9, 10, 11,	<i>Rumathi</i>

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5. Course Articulation matrix

CO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02
U23NCC001.1	-	-	-	-	-	-	-	3	3	3	-	3	-	-
U23NCC001.2	-	-	3	-	-	3	2	3	3	3	-	3	-	-
U23NCC001.3	-	-	3	-	-	3	2	3	3	3	3	3	-	-
U23NCC001.4	-	-	3	3	-	-	2	3	3	3	3	3	-	-
U23NCC001.5	-	-	3	-	-	3	2	3	3	3	3	3	-	-
Course to PO	-	-	3	3	-	3	2	3	3	3	3	3	-	-

"3"—High, "2"—Medium, "1"—Low, "-"—No Correlation,

#NCC Credit Course is offered for NCC Students Only

U23HS183	Business English	L	T	P	J	C
		2	0	2	0	3

1. Course Description:

Business English encompasses the specialized language and communication skills necessary for success in various business contexts. It involves the ability to write, speak, and comprehend English effectively in situations such as meetings, presentations, negotiations, correspondence, and reports. This includes using appropriate vocabulary, grammar, tone, and style tailored to the audience and purpose. Business English also emphasizes the importance of intercultural communication and understanding global business etiquette. Mastering business English facilitates collaboration, fosters relationships, and enhances productivity in the corporate world.

2. Course Objectives:

1. Develop strategies and skills to enhance their ability to read and comprehend Engineering and technology texts.
2. Strengthen their listening skills which will help them to comprehend lectures and talks in their areas of specialization.
3. Develop their speaking skills to make technical presentations.
4. Foster their ability to write convincing job applications and effective reports.
5. Build their confidence to participate in group discussions.

3. Syllabus

Unit-I: Types of Conversation

Listening - Importance of Interpersonal skills in the corporate world - Listening to CEO talks - Speaking – Proper Articulation and Pronunciation Reading - Reading for information - Writing – Checklists - Process Description – Grammar - Regular and Irregular verbs - Discourse Markers - Single Word Substitute.

Unit-II: Listening Comprehension

Listening – Listening to motivational talks – Speaking – interpreting an article from newspapers - Reading - Reading Longer Texts and Practicing Speed reading - Writing – Job Application with Resume - Autobiographical Writing - Grammar - If conditionals - Active and Passive Voice.

Unit-III: Presentation Skills

Listening – Listening to Classroom Lectures - Note-taking practice - Speaking - Reviews (Books, Novels & Movies) - Reading – Reading Business plans and reports - Writing – Memorandum, Circular, Notice, Agenda - Minutes of Meeting – Grammar - Degrees of Comparison - Numerical Adjectives.

Unit-IV: Report Writing

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Listening - Listening to Sports commentary - Motivational Speech - Speaking – Technical Presentation - Reading – Descriptive and Narrative Passages - Writing - Report Writing (Types of Reports) – Feasibility, Accidental and Incidents Reports - Grammar - Using Idioms in sentences - Simple, Compound and Complex Sentences.

Unit-V: Interview Skills

Listening - Listening to HR interviews - Speaking Mock interviews - Reading – Intensive & Extensive Reading - Note-making – Writing - Preparing Technical Proposals - Grammar – Extended Definitions - Reported speech - Embedded Sentences.

Total: 30 Hours

List of Experiments

1. Listening – Listening Comprehension and Answering
2. Speaking – Conversation Building
3. Listening - Listening to Various Technical talks and summarizing
4. Speaking – Describing a Process
5. Listening - Listening to Class Room Lectures and Seminars – Preparing Hints
6. Speaking – Process Description for a new product
7. Listening – Listening and Note-taking practice
8. Speaking - Techniques to develop effective Presentation – Oral Presentation
9. Listening - Listening to Foreign Speakers and interpreting promptly
10. Speaking - Reviews (Books, Novels & Movies)- Technical Presentation
11. Listening – Listening to TED Talks and inferring the idea
12. Speaking - Listening to HR Interviews

Total: 30 Hours

Text Books:

1. Jack C. Richards, "Interchange Student's Book 1", Cambridge University Press; Fourth Edition, 2015.
2. S. N. Mahalakshmi, "Technical English for Engineers", V. K. Publications; Chennai, Eighth Edition, 2020.

References:

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Reference Books:

1. Rizvi M. Ashraf, "Effective Technical Communication", Tata McGraw Hill Publishing Company; New Delhi, 2015.
2. Andrea J.Rutherford, "Pearson Education" Inc. and The Darling Kindersley Publishing Inc., 2020.
3. Raman, Meenakshi and Sharma, Sangeetha "Technical Communication Principles and Practice", Oxford University Press; New Delhi, 2019.
4. Richards C. Jack, "Interchange", Fourth edition; Cambridge University Press, 2020.
5. Butterfield, Jeff, "Soft skills for Everyone", Sixth Indian Reprint, 2018.

Web Resources:

1. <https://www.youtube.com/watch?v=tBtc6rpcMz4>
2. <https://www.youtube.com/watch?v=Ll23cChDSKE>
3. <https://www.youtube.com/watch?v=fyAtyAdCStM>
4. <https://leo.stcloudstate.edu/grammar/subverag.html>
5. http://www.learningdifferences.com/Main%20Page/Topics/Compound%20Word%20Lists/Compound_Word_%20Lists_complete.htm
6. <http://examples.yourdictionary.com/examples-of-active-and-passive-voice.html>
7. <http://www.perfectyourenglish.com/grammar/numeral-adjectives.htm>
8. https://en.wikipedia.org/wiki/Commonly_misspelled_English_words
9. <https://www.englisch-hilfen.de/en/grammar/if.htm>
10. <http://www.englishforeveryone.org/Topics/Reading-Comprehension.htm>

NPTEL Courses:

1. https://onlinecourses.nptel.ac.in/noc22_hs05/preview
2. https://onlinecourses.nptel.ac.in/noc23_hs72/preview

4. Course Outcomes:

CO. No.	Course Outcome	BTL	POs	PSOs
U23HS183.1	Apply different conversation techniques in day-to-day communication.	K3	9, 10, 12	-
U23HS183.2	Practice effective listening techniques during conversations.	K3	9, 10, 12	-
U23HS183.3	Develop effective presentation skills.	K3	9, 10, 12	-
U23HS183.4	Compose technical and non-technical reports.	K6	9, 10, 12	-
U23HS183.5	Discover an advantageous position in various employment contexts.	K4	9, 10, 12	-
U23HS183.6	Take part in speaking and writing convincingly, using appropriate communicative and effective writing strategies.	K4	9, 10, 12	-
U23HS183.7	Examine different genres of texts, infer implied meanings and critically analyse and evaluate all spoken and written discourses.	K4	9, 10, 12	-
U23HS183.8	Construct drafts with clear articulation of fluency and accuracy.	K6	9, 10, 12	-
U23HS183.9	Develop critical ideas and logical conclusions utilizing appropriate grammatical structures,	K6	9, 10, 12	-

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	digital literacy tools and textual traits in business writing.			
U23HS183.10	Discover the right pronunciation and accent by listening to a variety of speeches.	K4	9, 10, 12	-

5. Course Articulation matrix:

CO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02
U23HS183.1	-	-	-	-	-	-	-	-	2	3	-	2	-	-
U23HS183.2	-	-	-	-	-	-	-	-	2	3	-	2	-	-
U23HS183.3	-	-	-	-	-	-	-	-	2	3	-	2	-	-
U23HS183.4	-	-	-	-	-	-	-	-	2	3	-	2	-	-
U23HS183.5	-	-	-	-	-	-	-	-	2	3	-	2	-	-
U23HS183.6	-	-	-	-	-	-	-	-	2	3	-	2	-	-
U23HS183.7	-	-	-	-	-	-	-	-	2	3	-	2	-	-
U23HS183.8	-	-	-	-	-	-	-	-	2	3	-	2	-	-
U23HS183.9	-	-	-	-	-	-	-	-	2	3	-	2	-	-
U23HS183.10	-	-	-	-	-	-	-	-	2	3	-	2	-	-
Course to PO	-	-	-	-	-	-	-	-	2	3	-	2	-	-

"3"—High, "2"—Medium, "1"—Low, "-"—No Correlation

U23HS184	BASIC JAPANESE	L	T	P	J	C
		2	0	2	0	3

1. Course Description:

The primary objective of this course is to provide a solid foundation in speaking, listening, reading, and writing Japanese. Through interactive lessons and practical exercises, you'll learn essential vocabulary, grammar structures, and pronunciation. Additionally this course will introduce the various facets of the Japanese culture with cultural insights and real-life scenarios, thereby enhancing their awareness of the cultural subtleties inherent in the language.

2. Course Objectives:

1. Develop proficiency in basic Japanese language skills including speaking, listening and reading and writing to facilitate effective communication in everyday situations.
2. Acquire a solid understanding of the fundamental Japanese grammar structures, vocabularies and pronunciations to construct simple sentences and engage in basic conversations.
3. Enhance language proficiency through interactive activities, role-plays and real-life scenarios, fostering practical language usage and confidence in communication.
4. Build a foundation for further language study and cultural exploration, enabling the students to pursue advanced language proficiency and deeper cultural understanding.

3. Syllabus:

Unit-I: INTRODUCTION TO JAPANESE SCRIPTS AND BASIC GREETINGS

Japanese Scripts (Hiragana & Katakana) – Daily greetings and expressions – Introduction to grammar particles – N₁ wa N₂ desu - N₁ wa N₂ ja arimasen – Phrase/Sentence ka – N₁ mo N₂ desu - N₁ no N₂ desu – Honorific suffixes (san, kun, chan) – Demonstrative words (Ko, So, A & Do series) – Soudesu – Sôudesuka – Soudesune – Sou ja arimasen/Chigaimasu – S₁ ka S₂ ka - N₁(noun) wa N₂(place) desu – Numbers – Days of the week – Days of the month

Unit-II: INTRODUCTION TO CONCEPT OF TIME

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Ji, fun, pun – Ima wa nan ji desuka – Introduction to verbs (group I, group II, group III verbs)
– Verb tense forms – V masu – V mashita – V masen – V masendeshita – N(time) ni V - N₁ kara N₂ made - N₁ to N₂ – N to V – S ne – N(place) e ikimasu/kimasu/kaerimasu – Doko(e) mo ikimasen/ikimasendeshita – itsu – S yo - Introduction to de particle – N(place) de V – N(vehicle) de ikimasu/kimasu/kaerimasu – N(tool) de V – N o V(transitive) – N o Shimasu – Usage of nan and nani – V masenka – V mashou, mashouka – Honorific prefixes(o/go) – “word/sentence” wa ~go de nan desuka – N(person) ni agemasu/moraimasu/kuremasu – V mou mashita.

Unit-III: INTRODUCTION TO ADJECTIVES

I ending adjectives – na ending adjectives – forms of adjectives(negative form, past form) – I ending adjective →ku/Na ending adjective→ni narimasu – degrees of adjectives – S₁ ga S₂ – N ga adjective – N ga arimasu/wakarimasu – degrees of adverbs – degrees of quantity – S₁ kara S₂ – Doushite – N₁(place) ni N₂(noun) ga arimasu – N₁(noun) wa N₂(place) ni arimasu/imasu – N₁(noun) no N₂(position) – N₁ ya N₂ nado.

Unit-IV: INTRODUCTION TO COUNTERS

Counters for objects – Counters for person – Ikutsu – nan+counter suffix – kurai and gurai – Quantifier(period) ni frequency counter(kai) – Quantifier/Noun+dake - N₁ wa N₂ yori “adjective” desu - N₁ to N₂to Dochira ga “adjective” desuka – N no naka de nani/doko/dare/itsu ga “adjective” desuka – Interrogatives ka/mo/demo.

Unit-V: VERB CONJUGATIONS AND THEIR USAGES

5.1: V masu form and its usages

N ga hoshii desu – V masu form tai desu – V masu form ni ikimasu/kimasu/kaerimasu – V masu form mashouka.

5.2: V te form and its usages

V te form kudasai – V te form imasu – V te form mo iidesu – V te form wa ikimasen – shirimasu, shirimaten, shitte imasu – te form of adjectives – V₁ te form kara V₂ – douyatte – V te form agemasu/kuremasu/moraimasu

5.3: V nai form and its usages

V nai form de kudasai – V nai form kereba narimasen – V nai form to – V nai form kutemo iidesu – N(time) madeni V.

5.4: V dictionary form and its usages

V dictionary form koto ga dekimasu – Shumi wa N suru/V dictionary form koto desu – N no/Quantifier(time)/V₁ dictionary form maeni V₂ – nakanaka – zehi/zettai/mochiron – V dictionary form jikan/youji/yakusoku.

5.5: V ta form and its usages

V ta form koto ga arimasu – V ta ri, V ta ri Shimasu – usage of plain form and polite form – kedo – noun modification using V plain form – V plain form/N no toki ~.

5.6: If clause

V dictionary form to~ - V ta form ra~ - V te form/I adj→kute/Na adj→de/N de mo~ - moshi/ikura~.

Total: 30 (Theory) + 30 (Practical) Hours

Text Books:

- Minna no Nihongo, Japanese for Everyone: Elementay main textbook 1-1 & 1-2". 1st edition, Goyal Publishers and Distributors Pvt. Ltd., Delhi, 2007.
- “Basic Kanji 320”, published by Meguro Language Centre, Tokyo.

Reference Books:

- “Genki: An Integrated course in elementary Japanese” authored by Eri Banno, Yoko Ikeda, and Yutaka Ohno, latest edition published in 2011 by The Chairman – Board of Studies

2. "Nihongo So-matome: JLPT N5 grammar" authored and published by Ask Publications, latest edition 2021.

Web Resources:

1. www.japaneselifestyle.com
2. www.learn-japanese.info/
3. www.kanjisite.com/
4. www.learn-hiragana-katakana.com/typing-hiragana-characters/

4. Course Outcomes:

CO. No.	Course Outcome	BTL	POs	PSOs
U23HS184.1	Recognize and write the Japanese alphabets without errors	K2	9, 10, 12	-
U23HS184.2	Extend the conversation using basic sounds in the Japanese language	K2	9, 10, 12	-
U23HS184.3	Explain the concept of time by learning verbs, tenses and vocabularies.	K3	9, 10, 12	-
U23HS184.4	Make use of the appropriate vocabularies required for simple conversations in Japanese language.	K3	9, 10, 12	-
U23HS184.5	Comprehend the conversation and give the correct meaning	K3	9, 10, 12	-
U23HS184.6	Develop the ability to accurately pronounce the Japanese sounds, syllables and vocabularie through guided pronunciation exercises and feedback.	K3	9, 10, 12	-
U23HS184.7	Enhance the students ability to understand spoken Japanese through exposure to various audio materials including dialouges, interviews and recordings of native speakers.	K3	9, 10, 12	-
U23HS184.8	Develop their reading skills in Japanese by engaging with written texts such as articles, short stories, and excerpts from newspapers or books.	K3	9, 10, 12	-
U23HS184.9	Improve their Japanese writing skills by completing writing assignments, such as essays, journal entries, and compositions.	K3	9, 10, 12	-
U23HS184.10	Learn to utilize digital tools and resources effectively for language learning, including online dictionaries, language learning apps, and interactive multimedia materials	K3	9, 10, 12	-

5. Course Articulation matrix:

CO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02
U23HS184.1	-	-	-	-	-	-	-	-	2	3	-	2	18-	-
U23HS184.2	-	-	-	-	-	-	-	-	2	3	-	2	18-	-
U23HS184.3	-	-	-	-	-	-	-	-	2	3	-	2	18-	-

CO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02
U23HS184.4	-	-	-	-	-	-	-	-	2	3	-	2	-	-
U23HS184.5	-	-	-	-	-	-	-	-	2	3	-	2	-	-
U23HS184.6	-	-	-	-	-	-	-	-	2	3	-	2	-	-
U23HS184.7	-	-	-	-	-	-	-	-	2	3	-	2	-	-
U23HS184.8	-	-	-	-	-	-	-	-	2	3	-	2	-	-
U23HS184.9	-	-	-	-	-	-	-	-	2	3	-	2	-	-
U23HS184.10	-	-	-	-	-	-	-	-	2	3	-	2	-	-
Course to PO	-	-	-	-	-	-	-	-	2	3	-	2	-	-

"3"—High, "2"—Medium, "1"—Low, “—”—No Correlation

U23HS185	BASIC GERMAN	L	T	P	J	C
		2	0	2	0	3

1. Course Description:

To acquire fundamental proficiency in basic German language skills, enabling effective communication in common everyday situations and laying the groundwork for further language learning and cultural exploration.

2. Course Objectives:

1. Basic German introduces learners to essential language components such as vocabulary, grammar, pronunciation, and basic conversational phrases.
2. Through interactive lessons and practical exercises, students develop the ability to communicate in basic German for everyday scenarios including greetings, introductions, shopping, dining, and navigating daily life situations.
3. Additionally, learners become familiar with the German alphabet, basic sentence structure, and common expressions, facilitating basic reading and writing skills.

3. Syllabus:

Unit-I: Basic Introduction to German Scripts

Theme and Text (Introduction to German - German script, Deutsche Namen, Daily Greetings and Expressions) – Grammar ('wh' questions, das Alphabet)– Speak Action (Buchstabieren, sich und andere vorstellen nach Namen und Herkunft fragen, internationale Wörter auf Deutsch verstehen, jemanden begrüßen)– pronunciation (Buchstabieren J,V,W,Y, - Long vowels A,E,I,O,U - Pronunciation of Ä,Ü,Ö) – To learn (internationale Wörter in Texten finden, Wörter sortieren)

Theme and Text (Gespräche im caf'e, Getränkekarte, Telefon-buch, Namen, Rechnungen) – Grammar (Fragesätze mit wie, woher, wo, was Verben in präsens Singular und Plural, das Verb Sein, Personalpronomen und Verben)– Speak Action (eine Gespräch beginnen sich und andere vorstellen zählen, etwas bestellen und bezahlen Telefonnummern und verstehen)– pronunciation (Wortakzent in Verben und in Zahlen) – To learn (Grammatiktabelle ergänzen, mit einem Redemittelkasten arbeiten)

Unit-II: Numbers and Nominative Case

Theme and Text (Numbers – 1 to 12 (Eins bis Zwölf) – 20, 30, 40, 90 (zwanzig-Neunzig) – All Numbers (1-10000) – German Currency (Euro) – Basic Mathematics (plus, Minus, Malen, Geteilt durch)) – Grammar (Introduction of verbs –Have Verb – To Come, To Speak, To Read, To Drive, To Fly, To write, To Eat, To sleep, To take etc.,)

Theme and Text (Communication in course) – Grammar (Singular and Plural Artikel: der,das,die/ ein,eine, verneinung: kein, keine, Komposita: das Kursbuch) – Speak Action

(Gegenständen fragen/ Gegenstände benennen im kurs:) – pronunciation (word accent Marking, Umlaute ö ä ü hören und sprechen) – To learn (Lernkarten schreiben, Memotipps, eine Regel selbst finden)

Theme and Text (City, Town, Language: Nachbar, Sprachen, Sehenswürdigkeiten in Europa) – Grammar (Past tense for Sein, W-Frage, Aussagesatz und Satzfrage) – Speak Action (about city and siteseeing) – pronunciation (Satzakzent in Frage- und Aussagesätzen) – To learn (eine Regel ergänzen, eine Grammatiktabelle erarbeiten, Notizen machen)

Unit-III: Akkusative Case and Prepositions

Theme and Text (Menschen und Hauser, Furniture catalogue, E-Mail, House information) – Grammar (possessivartikel im Nominativ, Artikel im Akkusativ, Adjektive im satz, Graduierung mit zu) – Speak Action (Whonung beschreiben about perons and things) – pronunciation (consonant - ch) – To learn (wortschatz systematisch)

Theme and Text (Termine - Appointment and punctuality in Germany) – Grammar (questions with wann?, Preposition (am, um, von... bis), verneinung mit nicht, trennbare verben, präteritum von haben) – Speak Action (Daily plan making, time commitment, excuse for late coming) – pronunciation (consonants- p,b,t,d / k,g) – To learn (Rollenkarten arbeiten)

Theme and Text (orientation in working area, go for work, floor plan city plan, office and computer) – Grammar (preposition: in,neben, unter, auf, vor, hinter, an, zwischen, bei und mit + Datic) – Speak Action (work place, work, giving appointments) – pronunciation (consonants: f,w und v) – To learn (Making notice in calender)

Unit-IV: Dativ Case and Prepositions

Theme and Text (Holiday and Party, holiday plan, party plan in Germany) – Grammar (regular and irregular verbs) – Speak Action (holiday speak, accident, Ich-Text schreiben) – pronunciation (lange und kurze vokale markieren) – To learn (Text Order)

Theme and Text (organising an Excursion to Berlin through city orientation, Bus plan, City plan, post card, Excursion programme) – Grammar (preposition: in, durch, über + Akkusativ: zu, an... vorbei + Dativ, Modalverb wollen) – Speak Action (Tourism, culture, postcard· preparation, travel description) – pronunciation (r and l) – To learn (plaket making)

Theme and Text (Beruf und all Tag, Visiten karten, wörterbuch) – Grammar – Speak Action (profession, statistic speaking) – pronunciation (n,ng and nk) – To learn (wörterbuch , text information in tabel)

Unit-V: Adjectives and Pronunciation

Theme and Text (Haushaltstipp, kochrezept, maße und gewichte, Mahlzeiten und Gerichte) – Grammar (jeden Tag, manchmal, nie, Question - welche, Comparison – viel, gut, gern) – Speak Action (about eat, drink question and answers) – pronunciation (e,en,el,er) – To learn (Text auswerten und zusammenfassen)

Theme and Text (Clothing , colour, weather) – Grammar (Adjecktive im Akkusativ, unbestimmar Artikel) – Speak Action (weather, dress and colour understanding) – pronunciation (e-o- ö and ie-u- ü) – To learn (wetter and Farben interkulturelle)

Theme and Text (in super market,purchase, House Maintainence, Emotion, Sports, Body parts) – Grammar (Modal Verb) – Speak Action (Body parts) – To learn (Rollenkarten arbeiten)

Text Books:

1. Funk, Kuhn, Demme, "Studio D A1 Deutsch als Fremdsprache" Goyal Publishers and Distributors; 2016
2. Hueber, "Fit for Goethe- Zertifikat A1 (Start Deutsch 1)" Goyal Publishers and Distributors; 2016

Reference Books

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1. Stefanie Dengler, "Netzwerk Deutsch Als Fremdsprache A1" by Goyal Publishers & Distributors Pvt Ltd;
2. Fran Martin, "Grammar Tables for Student of German" by Independently Published, 2017

Web Resources:

1. www.memrise.com/courses/english/german/
2. www.deutsch-lernen.com/
3. www.duolingo.com

4. Course Outcomes:

CO. No.	Course Outcome	BTL	POs	PSOs
U23HS185.1	Recognize and write the German alphabet	K2	9, 10, 12	-
U23HS185.2	Speak using basic sounds of the German language	K2	9, 10, 12	-
U23HS185.3	Apply appropriate vocabulary needed for simple conversation in the German language	K3	9, 10, 12	-
U23HS185.4	Apply appropriate grammar to write and speak in the German language	K3	9, 10, 12	-
U23HS185.5	Comprehend the conversation and give the correct meaning	K3	9, 10, 12	-
U23HS185.6	Improve speaking skills in German by practicing pronunciation, intonation, and conversational fluency through interactive exercises, role-plays, and speaking tasks.	K3	9, 10, 12	-
U23HS185.7	Develop listening comprehension skills in German by accurately understanding spoken language at a beginner level, including dialogues, short passages, and audio recordings.	K3	9, 10, 12	-
U23HS185.8	Enhance students reading comprehension skills in German by reading and understanding simple texts, such as short stories, advertisements and extracting key information.	K3	9, 10, 12	-
U23HS185.9	Improve students writing skills in German by composing short texts, such as emails, letters, and simple narratives, using appropriate vocabulary, grammar, and sentence structures.	K3	9, 10, 12	-
U23HS185.10	Cultivate effective strategies for independent language learning, including vocabulary acquisition, grammar study, self-assessment, and utilizing resources such as dictionaries, language learning software, and online materials.	K3	9, 10, 12	-

5. Course Articulation matrix:

CO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02
U23HS185.1	-	-	-	-	-	-	-	-	2	3	-	2	-	-
U23HS185.2	-	-	-	-	-	-	-	-	2	3	-	2	-	-
U23HS185.3	-	-	-	-	-	-	-	-	2	3	-	2	-	-
U23HS185.4	-	-	-	-	-	-	-	-	2	3	-	2	-	-
U23HS185.5	-	-	-	-	-	-	-	-	2	3	-	2	-	-
U23HS185.6	-	-	-	-	-	-	-	-	2	3	-	2	-	-
U23HS185.7	-	-	-	-	-	-	-	-	2	3	-	2	-	-
U23HS185.8	-	-	-	-	-	-	-	-	2	3	-	2	-	-
U23HS185.9	-	-	-	-	-	-	-	-	2	3	-	2	-	-
U23HS185.10	-	-	-	-	-	-	-	-	2	3	-	2	-	-
Course to PO	-	-	-	-	-	-	-	-	2	3	-	2	-	-

“3”—High, “2”—Medium, “1”—Low, “—”—No Correlation

U23AD491	PYTHON FOR AI	L	T	P	J	C
		2	0	2	2	4

1. Course Description

This course equips students with essential skills in Python programming tailored for applications in Artificial Intelligence (AI). Through a combination of theoretical learning and hands-on practice, students will gain proficiency in leveraging Python's capabilities to address real-world challenges in various domains. The course covers fundamental concepts of Python programming, explores data structures, delves into object-oriented programming, and introduces scientific computing and Natural Language Processing (NLP) techniques.

2. Course Objectives:

1. To gain mastery in Python fundamentals tailored for AI applications.
2. To effectively employ various data structures within Python for AI tasks.
3. To adeptly apply object-oriented programming principles to the design and implementation of AI systems.
4. To proficiently analyze and extract insights from textual data through the application of NLP techniques within Python.
5. To develop the skills necessary to tackle real-world AI challenges using Python as the primary toolset.

3. Syllabus

Unit-I: Introduction To Python

Python basics: Introduction, IDE, identifiers, keywords; variables and expressions, literals, comments, I/O statements; Operators: arithmetic, relational, logical, assignment, bitwise, identity and membership operators; Conditional statements: if, else, and elif statements; Iteration: for, while, while-else; String operations: indexing, slicing, concatenation; File handling: open and close files, read, write and delete files.

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Unit-II: Python Data Structures

Basic data-types, mutability; List: Introduction to list, accessing list, list operations, aliasing and cloning, list as arrays; Tuples: Introduction to tuple, accessing tuples, tuple operations; Dictionary: Introduction to dictionaries, operations and methods; Set: Creating sets, performing set operations: union, intersect and difference.

Unit-III: Functions And Object-Oriented Programming

Python functions: Function definition, function call, variable scope, types, arguments, lambda functions. Recursive function; Object Oriented Programming: Class, object, attributes, methods, methods vs functions, constructor, encapsulation, inheritance, abstraction, polymorphism; exception handling.

Unit-IV: Scientific Computing With Numpy, Pandas, and Matplotlib

Modules and packages: Introduction; Numpy Library: Numpy basics, indexing and slicing, shape manipulation, array iteration, array join and split, search, sort, filter; Pandas Library: Pandas introduction, series, dataframe, grouping, merging, filtering, list comprehension, concatenating and transforming data; Matplotlib Library: Line plot, scatter plot, histogram, bar plot and subplots.

Unit-V: Natural Language Processing (NLP) and Data Mining

NLP: Introduction, NLTK, textblob, tokenization, stemming and lemmatization, stopwords, visualising word frequency using pandas and wordclouds, spaCy, applications; Data mining in Twitter: Overview, introduction to tweepy cursors, pre-processing, API, tweet sentiment analysis, geocoding and mapping.

List of Experiments

1. Design a Python program that can perform basic arithmetic operations and scientific functions such as square root, exponentiation and trigonometric functions.
2. Apply Python's regular expressions to efficiently identify and tally the occurrences of targeted words within a provided text document, facilitating precise text parsing and analysis.
3. Develop a Python program using basic datatypes that manages a student database, allowing users to add, update, delete, and search for student records.
4. Analyze a dataset containing user preferences and identify common preferences among users using python sets.
5. Design a library management system in Python using classes to represent books, users, and transactions, and implement methods for borrowing and returning books.
6. Compare the performance of recursive and iterative solutions for calculating factorials in Python, and analyze the results in terms of execution time and memory usage.
7. Develop a Python tool for data analysis using Numpy to calculate statistical measures in a dataset.
8. Analyze historical stock market data using Pandas to identify trends and patterns, and visualize the trends using Matplotlib.

9. Develop a sentiment analysis tool in Python using NLTK to analyze the sentiment of product reviews and evaluate the accuracy of the classifier.
10. Design a Python program to generate a word cloud visualization from a given text corpus, highlighting the most frequent words.
11. Develop a Python program that fetches tweets related to a specific topic using the Twitter API, performs sentiment analysis on the retrieved tweets, and visualizes the sentiment distribution.
12. Mini Project.

Text Books:

1. Reema Thareja, "Python Programming Using Problem Solving Approach", Oxford University Press 2018.
2. Paul Deitel, Harvey Deitel, "Python for Programmers with introductory AI case studies", Pearson Education, 2019.
3. Anurag Gupta, G.P. Biswas, "Python Programming: Problem Solving, Packages and Libraries", McGrawHill, 2020.
4. John V. Guttag, "Introduction to Computation and Programming Using Python", 2nd edition, The MIT Press, 2016.
5. Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python - Revised and updated for Python 3.2", Network Theory Ltd., 2011.
6. Liang Y. Daniel, "Introduction to Programming Using Python", Pearson Education, 2017.

References:

Reference Books:

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", Second edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016
2. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach", Pearson India Education Services Pvt. Ltd., 2016.
3. Timothy A. Budd, "Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 2015.
4. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.
5. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem-Solving Focus", Wiley India Edition, 2013.
6. Paul Gries, Jennifer Campbell and Jason Montojo, "Practical Programming: An Introduction to Computer Science using Python 3", Second edition, Pragmatic Programmers, LLC, 2013.

Web Resources:

1. <https://www.coursera.org/learn/python-for-applied-data-science-a1>
2. <https://greenteapress.com/wp/think-python/>
3. <https://www.docs.python.org>

NPTEL courses:

1. <https://nptel.ac.in/courses/106106212>
2. <https://nptel.ac.in/courses/110107129>
3. <https://nptel.ac.in/courses/106107220>
4. <https://nptel.ac.in/courses/106/106/106106182/>

4. Course Outcomes

CO. No.	Course Outcome	BTL	POs	PSOs
U23AD481.1	Apply the concepts of python programming for solving real-world problems.	K3	1,2,3,4,5,6, 7,8,9,10,12	1,2
U23AD481.2	Develop python programs that effectively utilize built-in data structures to address practical challenges encountered in various applications.	K6	1,2,3,4,5,6, 7,8,9,10,12	1,2
U23AD481.3	Analyze complex problems and develop modular and reusable solutions by applying python functions and classes.	K4	1,2,3,4,5,6, 7,8,9,10,12	1,2
U23AD481.4	Analyze data and visualize trends Using Numpy, Pandas, and Matplotlib libraries.	K4	1,2,3,4,5,6, 7,8,9,10,12	1,2
U23AD481.5	Analyze textual data from social media platforms using advanced NLP techniques.	K4	1,2,3,4,5,6, 7,8,9,10,12	1,2
U23AD481.6	Apply Python programming to solve real-world problems, incorporating appropriate data structures and algorithms to optimize performance and scalability.	K3	1,2,3,4,5,6, 7,8,9,10,12	1,2
U23AD481.7	Create Python applications that effectively utilize built-in data structures and external libraries to address practical challenges encountered in various domains, ensuring code reusability and maintainability.	K6	1,2,3,4,5,6, 7,8,9,10,12	1,2
U23AD481.8	Analyze and debug Python code efficiently, utilizing debugging tools and techniques to identify and rectify errors in programs.	K4	1,2,3,4,5,6, 7,8,9,10,12	1,2
U23AD481.9	Evaluate and analyze data trends using Numpy, Pandas, and Matplotlib libraries within Python scripts, generating informative plots and charts to aid in data interpretation.	K5	1,2,3,4,5,6, 7,8,9,10,12	1,2
U23AD481.10	Create meaningful insights and trends by interpreting textual data extracted from	K6	1,2,3,4,5,6, 7,8,9,10,12	1,2

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	social media platforms using advanced NLP techniques.														
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5. Course Articulation matrix

CO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02
U23AD481.1	3	3	3	2	3	1	2	2	1	1	-	2	3	3
U23AD481.2	3	3	3	2	3	1	2	2	1	1	-	2	3	3
U23AD481.3	3	3	3	2	3	1	2	2	1	1	-	2	3	3
U23AD481.4	3	3	3	3	3	2	2	2	2	1	-	2	3	3
U23AD481.5	3	3	3	2	3	2	2	3	2	1	-	3	3	3
U23AD481.6	3	3	3	2	3	1	2	2	1	1	-	2	3	3
U23AD481.7	3	3	3	2	3	1	2	2	1	1	-	2	3	3
U23AD481.8	3	3	3	2	3	1	2	2	1	1	-	2	3	3
U23AD481.9	3	3	3	3	3	2	2	2	2	1	-	2	3	3
U23AD481.10	3	3	3	2	3	2	2	3	2	1	-	3	3	3
Course to PO	3	3	3	2.2	3	1.4	2	2.2	1.4	1	-	2.2	3	3

"3"—High, "2"—Medium, "1"—Low, "-"—No Correlation

U23CS451	Data Structures Laboratory	L 0	T 0	P 4	J 0	C 2
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1. Course Description:

The Data Structure Laboratory is a hands-on course designed to complement theoretical knowledge with practical implementation skills in data structures. Through a series of lab sessions, students will work on implementing code and projects focusing on lists, stacks, queues, sorting algorithms, searching techniques, hashing, trees and graph data structures. By actively engaging in coding exercises and projects, students will deepen their understanding of the course, enhance their programming skills, and gain valuable experience applicable across various domains of computer science and engineering.

2. Course Objectives:

1. To implement linear and nonlinear data structures
2. To learn to apply the data structures to various real world
3. To implement graph algorithms
4. To implement sorting, searching and hashing techniques

List of Laboratory Experiments / Exercises:

1. Develop a Multimedia Library Management System that organizes and manages various types of multimedia content such as audio, video, and images. Each type of content requires a different approach in terms of databases structure for efficient management. Choose a suitable linked list operation for each multimedia category's specific needs.
2. Demonstration of applications of Linked List (Reversal Problems, Segregation of Even and Odd nodes in Linked List, Palindrome checking using Linked List, Insertion, Deletion of Studies Sorting the biotonic using doubly linked list)

3. Build a critical software project for a large healthcare organization that processes and manages a high volume of patient data, requiring efficient and reliable data structures for task management, resource allocation, and communication. Select appropriate data structures (stacks and queues) for specific use cases, considering their performance characteristics, flexibility, and memory usage.
4. Demonstration of applications of Stack and Queue (Evaluating Postfix Expressions, Infix to Postfix conversion, Balancing symbols and Postfix evaluation, Wild card pattern matching)
5. Develop a movie recommendation system for a popular streaming platform that recommends movies to users based on their past watching history and preferences. Use a binary tree data structure to store and search for movies based on different criteria efficiently.
6. Build an online book store with a vast collection of books to manage the inventory efficiently and provide a seamless user experience with the help of a Binary Search Tree (BST) data structure.
7. Demonstration of applications of Trees (Segment Tree and Range Minimum Query on the Constructed Segment Tree, Maximum depth of Binary tree)
8. Design a network for any food delivery partner to understand how people are connected, how information flows through the network and identify influential users using graph traversal algorithms.
9. Construct a travel management system that aims to streamline the planning and organization of travel itineraries for a travel agency. The system utilizes various graph algorithms (Topological Sort, Connected Graph and Ticket Itinerary) to efficiently manage the complexities of travel planning.
10. Design a food delivery app for a bustling city. Thousands of orders flow daily, and ensuring fast and efficient delivery is crucial for customer satisfaction. Use Dijkstra's algorithm to find the shortest paths for delivery drivers, optimizing their routes and minimizing delivery times.
11. Design an optimized network infrastructure of an organization that connects the various departments within the organization using the minimum amount of cabling to reduce costs and enhance network efficiency. Implement Prim's and Kruskal's algorithms for finding the Minimum Spanning Tree (MST) for the network.
12. Create a Student Grade Management System for a university that efficiently organizes and displays student grades for various courses. The system should employ different sorting algorithms to cater to diverse requirements and optimize the display of grades. Choose the suitable sorting algorithms (Bubble Sort, Insertion Sort, Quick Sort, Merge Sort) for quick grade overview, mark entry, course ranking and overall grade report.
13. Develop a Product Inventory Management System for a retail company that handles a large number of products to implement efficient searching techniques to retrieve information about products in the inventory quickly. Select the appropriate searching technique (Linear Search, Binary Search) for quick product lookup, inventory sorting, and retrieval.
14. Demonstration of applications of hashing (Single swap sorted array, Anagram Checking and Range Minimum Query Using Sparse Table, Merge two sorted arrays)

References:

Reference Books:

1. Reema Thareja, "Data Structures Using C", Second Edition, Oxford University Press, 2019

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|---|
| <ol style="list-style-type: none"> 2. Narasimha Karumanchi "Data Structures and Algorithms Made Easy" Fifth Edition, Career Monk publications, 2017 3. Seymour Lipschutz, "Data Structures using C", First Edition, McGraw Hill Education, 2017 |
|---|

Web Resources:

- | |
|--|
| <ol style="list-style-type: none"> 1. https://www.geeksforgeeks.org/data-structures 2. https://www.javatpoint.com/data-structure-tutorial 3. https://www.udemy.com/course/datastructurescncpp/ 4. https://in.coursera.org/learn/data-structures?action=enroll |
|--|

4. Course Outcomes

CO. No.	Course Outcome	BTL	POs	PSOs
U23CS451.1	Demonstrate the ability to identify, define, and analyze complex problems using appropriate algorithms, data structures, methodologies and	K3	1, 2, 3, 4, 5, 8, 12	1, 2
U23CS451.2	Design effective visual representations (UML diagrams/Flowchart) to solve the identified problems	K3	1, 2, 3, 4, 5, 8, 12	1, 2
U23CS451.3	Create solutions and implement them using suitable programming platforms	K6	1, 2, 3, 4, 5, 8, 12	1, 2
U23CS451.4	Develop effective presentation skills to present and defend the designs and solution	K4	1, 2, 3, 4, 5, 8, 12	1, 2
U23CS451.5	Understand issues related to privacy, security and accessibility and adhere to coding standards	K2	1, 2, 3, 4, 5, 8, 12	1, 2

5. Course Articulation matrix

CO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02
U23CS451.1	3	3	2	1	2	-	-	1	-	-	-	2	2	2
U23CS451.2	3	3	2	1	2	-	-	1	-	-	-	2	2	2
U23CS451.3	3	3	2	1	2	-	-	1	-	-	-	2	2	2
U23CS451.4	3	3	2	1	2	-	-	1	-	-	-	2	2	2
U23CS451.5	3	3	2	1	2	-	-	1	-	-	-	2	2	2
Course to PO	3	3	2	1	2	-	-	1	-	-	-	2	2	2

"3"—High, "2"—Medium, "1"—Low, “—”—No Correlation

U23CS452	Object-Oriented Programming using C++ Laboratory	L	T	P	J	C
		0	0	2	0	1

1. Course Description:

Object-Oriented Programming (OOP) Using C++ Laboratory is a practical course aimed at reinforcing theoretical concepts through implementation and real-world applications. Students will engage in coding assignments and projects focusing on core OOP principles, including inheritance, polymorphism, encapsulation and abstraction implemented in the C++

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programming language. Additionally, students will explore common data structures and containers, leveraging their understanding of OOP to design and implement efficient solutions. Through a series of real-time application projects, students will apply their knowledge to solve complex problems, gaining valuable experience in software development and engineering practices.

2. Course Objectives:

1. To understand the foundations of C++
2. To understand the Object-Oriented Programming Concepts in C++
3. To know inheritance and polymorphism in C++
4. To implement common data structures and containers in C++
5. To develop concurrent C++ applications

3. List of Laboratory Experiments / Exercises:

Data types, variables, and constants:

1. Compose a C++ program that demonstrates proficient utilization of various data types, variables, and constants to ensure efficient and purposeful data handling within the program.

Control Flow Statements:

2. Develop a C++ program that simulates the modern warehouse automation system. It demonstrates its ability to monitor inventory levels, process incoming and outgoing shipments to effectively manage the execution flow, and generate real-time reports to optimize warehouse operations.

Operators and Expressions:

3. Create a comprehensive C++ program that allows users to perform various operations on their stock holdings. The program should provide functionality for buying and selling stocks, calculating portfolio performance metrics, and making investment decisions based on given criteria.

Functions, Pointers and Arrays:

4. Implement a bank management system with C++ functions to handle transactions, account balances, and user authentication, thereby enhancing modularity, code reusability, and the overall efficiency of the program.
5. Develop a C++ program that uses pointers to swap the values of two integers. Use type casting to access and manipulate the values through pointers.
6. Develop a C++ program to implement a student grade tracker using arrays. Create an array to store the grades of multiple students and implement functions to calculate the average, find the highest and lowest grades, and display the overall performance.

String Handling:

7. Design a C++ program that generates personalized greeting strings based on user input. The greeting system requires creating a string consisting of a user's chosen greeting phrase replicated multiple times. If the chosen greeting is less than three characters, then the program should return n copies of the entire phrase.
8. Develop a secure access card generation system using string manipulation functions. Build a C++ program that generates a string consisting of four copies of the first two characters of the employee's name functions and produces a clear identification code.
9. Design a C++ program for a dynamic blogging platform with an advanced content management system: Implement a feature that generates unique content identifiers for blog posts based on the author's name and the topic of the post.

Object-Oriented Concepts:

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10. Develop a C++ program to create a library catalog system using classes and objects. Implement member functions to display book information and manage the catalog.
11. Develop a C++ program to simulate an online shopping cart using classes and objects. Define a class Implement member functions to add products to the cart, calculate the total cost, and display the items in the cart.
12. Develop a C++ program that showcases inheritance by creating a hierarchy of vehicles. Implement a base class Vehicle and derive two classes, Car and Motorcycle, from it. Each derived class should have specific attributes and extended functionalities.
13. Create a C++ program that demonstrates polymorphism by implementing a shape hierarchy and calculating the area of different shapes through a common interface.
14. Standard Template Library (STL):
15. Develop a C++ program that uses dynamic memory allocation and a linked list structure to manage an Employee Database. Implement operations such as inserting a new employee, deleting an employee, and updating employee information. Ensure proper memory management to avoid memory leaks.
16. Create a C++ program that uses dynamic memory allocation to implement a stack for managing Undo/Redo history. Implement operations such as pushing a state onto the stack (undo) and popping a state off the stack (redo).
17. Develop a C++ program that uses dynamic memory allocation to implement a queue for managing a print queue. Implement operations such as enqueueing a print job and dequeuing a print job.
18. Design a C++ program to manage product inventory using a vector of product objects. Sort products based on their prices using a sort operation and allow users to search for a product by name using binary search.
19. Design a C++ program for managing course enrolments in an online learning platform using a tree data structure implemented with map operation. This program should allow users to add new courses, enrol students in courses, and efficiently search for available courses based on enrolment status and capacity using the lower bound algorithm.

File handling:

20. Design a C++ program that reads a given text file, counts the number of words present, and displays the result.

Project work:

21. Design and implement a practical application using C++ and OOP concepts.

References:

1. C++20 - The Complete Guide by Nicolai M. Josuttis, 2022
2. The C++ Standard Library - A Tutorial and Reference, 2nd Edition by Nicolai M. Josuttis ,2012
3. Modern C++ Tutorial: C++11/14/17/20 On the Fly by Changkun Ou , 2023
4. Effective Modern C++: 42 Specific Ways to Improve Your Use of C++11 and C++14 by Scott Meyers, 2015

4. Course Outcomes

CO. No.	Course Outcome	BTL	POs	PSOs
U23CS402.1:	Demonstrate the ability to identify, define, and analyze complex problems using appropriate algorithms, data structures, methodologies and	K3	1, 2, 3, 4, 5, 8, 12	X, 2 <i>Sunmali</i>

U23CS402.2:	Design effective visual representations (UML diagrams/Flowchart) to solve the identified problems	K3	1, 2, 3, 4, 5, 8, 12	1, 2
U23CS402.3:	Create solutions and implement them using suitable programming platforms	K6	1, 2, 3, 4, 5, 8, 12	1, 2
U23CS402.4:	Develop effective presentation skills to present and defend the designs and solution	K4	1, 2, 3, 4, 5, 8, 12	1, 2
U23CS402.5	Understand issues related to privacy, security and accessibility and adhere to coding standards	K2	1, 2, 3, 4, 5, 8, 12	1, 2

5. Course Articulation matrix

CO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02
U23CS451.1	3	3	3	-	3	-	-	1	2	1	3	3	2	2
U23CS451.2	3	3	3	-	3	-	-	1	2	1	3	3	2	2
U23CS451.3	3	3	3	-	3	-	-	1	2	1	3	3	2	2
U23CS451.4	3	3	3	-	3	-	-	1	2	1	3	3	2	2
U23CS451.5	3	3	3	-	3	-	-	1	2	1	3	3	2	2
Course to PO	3	3	3	-	3	-	-	1	2	1	3	3	2	2

"3"—High, "2"—Medium, "1"—Low, "-"—No Correlation

U23EM752		Logical Thinking				L	T	P	J	C				
						0	0	2	0	1				
1. Course Description														
This course is to cultivate in engineering students a solid foundation in basic logical thinking, reasoning, and problem solving skills. This includes the ability to analyse and evaluate arguments, identify logical fallacies, and construct clear and cogent arguments. Through a combination of theoretical lectures and practical exercises, students will develop the critical thinking skills necessary to approach engineering problems systematically, with clarity and precision. Additionally, they will gain an understanding of the importance of logical thinking in the design and implementation of engineering solutions, thereby enhancing their overall effectiveness as engineers.														
2. Course Objectives:														
<ol style="list-style-type: none"> To create a transformation in thought process. To enhance problem solving ability. Realizing the importance of aptitude in real life, why it is frequently tested and how it should be learnt and discovered from within. Understand the difference between some of the important concepts like - Method memorization, Understanding, forced belief, and realized truth. To provide exposure on frequently asked problems and puzzles in various placement and competitive exams through understanding the algorithms and concepts associated in the backend. 														
3. Syllabus														
Unit-I: Foundation														

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Understanding Vs Method Memorizations: Zero Knowledge Approach and Pattern Finding Approach; Foundational approach: AI Models, Numbers, Prime Numbers, OTP logic; Factors: Equal distribution, HCF, Tiles factory, Cost optimization problems and Case Studies.

Unit-II: Finance and Technology

Fundamentals of Finance: Percentages, Profit & Loss, Pricing Logics; Interest: Cash Flow and Taxes; Programming Logic: Introduction to digital ledger, Decentralized banking, Block chain, crypto currencies and Case Studies.

Unit-III: Human Resources, Work Planning & Dynamic Programming

Fundamentals of Human Resources & Operations: Resources allocation, Time & Work, Einstein's Puzzle, Backtracking, All possible routes, Stanford programming and Case Studies.

Unit-IV: Statistics and Geometry

Fundamentals of statistics: Mean, Median and Mode, Real life application of statistics, Application of Ratios and Proportions in business problems, Partnerships; Geometry: 2D, 3D Visualizations, Tools, Applications; Introduction to AR, VR and Tools like Unity and Unreal Engine and Case Studies.

Unit-V: AI & DS - Insights & Visualization

Real life application of Linear algebra, Calculus, Probability and Statistics, Graph theory and information theory; Important mathematical subtopics applied in AI and DS; Data representation and understanding; Analyzing the data: Introduction to basic visualization and dash boarding tools; Creating insights using data: AI tools and Case Studies.

References:

Reference Books:

1. Dr. R S Aggarwal, Quantitative Aptitude, Revised Edition, S. Chand Publishing Company Ltd(s), 2022
2. Arun Sharma, How to prepare for Quantitative Aptitude for the CAT, 10th Edition, Tata McGraw-Hill Publishing Company Ltd, 2022

Web References:

1. <https://www.hackerearth.com/>
2. <https://www.geeksforgeeks.org/>
3. <https://www.indiabix.com>

4. Course Outcomes

CO. No.	Course Outcome	BTL	POs	PSOs
U23EM752.1	Understand the importance and impact created by aptitude concepts in real life.	K2	1, 2, 3, 6	-
U23EM752.2	Understand a lot of learning methods and will be able to apply them in real life problems.	K2, K3	1, 2, 4, 12	-
U23EM752.3	Able to apply and solve problems based on application of aptitude concepts in real life	K3	1, 2, 3, 4	-
U23EM752.4	Analyze, evaluate, and compare different scenarios given in a problem and find the strategically best solutions.	K4, K5	2, 4	-
U23EM752.5	Creating own questions based on parameters and constraints given.	K6	2, 3	-
U23EM752.6	Create shortcut formulas by self.	K6	2, 5	<i>Chairman</i> -

5. Course Articulation matrix

CO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02
CO 1	3	3	2	-	-	1	-	-	-	-	-	1	-	-
CO 2	3	3	-	2	-	-	-	-	-	-	-	1	-	-
CO 3	3	3	2	1	-	-	-	-	-	-	-	1	-	-
CO 4	3	3	-	2	-	-	-	-	-	-	-	1	-	-
CO 5	3	3	2	-	-	-	-	-	-	-	-	1	-	-
CO 6	3	3	-	-	2	-	-	-	-	-	-	1	-	-
Course to PO	3	3	2	1.6	2	1	-	-	-	-	-	1	-	-

"3"—High, "2"—Medium, "1"—Low, "—" — No Correlation



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U23MC902	Tamils and Technology / தமிழரும்தொழில்நுட்பமும்	L 1	T 0	P 0	J 0	C 1

1. Course Description:

The intersection of Tamils and technology refers to the field of agricultural technology, focusing on the use of modern tools and techniques to enhance farming practices and increase agricultural productivity.

2. Course Objectives:

- To increase agricultural productivity and profitability by implementing innovative solutions that optimize resource usage, minimize losses, and enhance crop yields.
- To automate the irrigation systems to adjust water usage based on real-time data on soil moisture levels, weather forecasts, and crop water requirements.

3. Syllabus:

Unit-I: Weaving and Ceramic Technology / நெசவு மற்றும் பானைத் தொழில்நுட்பம்

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

சங்க காலத்தில் நெசவுத் தொழில் - பானைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள்.

Unit-II: Design and Construction Technology / வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்

Designing and Structural construction of Houses & Designs in household materials during the 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.

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

Unit-III: Manufacturing Technology / உற்பத்தித் தொழில் நுட்பம்

Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and gold- Coins as source of history - Minting of Coins – Beads making-industries Stone beads -

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Glass beads - Terracotta beads - Shell beads/ bone beads - Archeological evidences - Gem stone types described in Silappathikaram.

கப்பல் கட்டும் கலை - உலோகவியல் - இரும்புத் தொழிற்சாலை -இரும்பை உருக்குதல், எஃகு - வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் - நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் தொழிற்சாலைகள் - கல்மணிகள், கண்ணாடி மணிகள் - சுடுமண் மணிகள் - சங்கு மணிகள் - எலும்புத்துண்டுகள் - தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

Unit-IV: Agriculture and Irrigation Technology / வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்

Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.

அணை, ஏரி, குளங்கள், மதகு - சோழர்காலக் குழுழித் தூம்பின் முக்கியத்துவம் - கால்நடை பராமரிப்பு - கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் - வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு- மீன்வளம் முத்து மற்றும் முத்துக்குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம்.

Unit-V: Scientific Tamil and Tamil Computing / அறிவியல் தமிழ் மற்றும் கணித்தமிழ்

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.

அறிவியல் தமிழின் வளர்ச்சி -கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம்- தமிழ் இணையக் கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத் திட்டம்.

Text Books:

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

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4. பொருநெந - 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.

References:

Reference Books:

1. Journey of Civilization Indus to Vaigai - R. Balakrishnan, Published by: RMRL.
2. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).

4. Course Outcomes/ பாடநெறி முடிவுகள்:

CO. No.	Course Outcome / பாடநெறி முடிவுகள்	BTL	POs	PSOs
U23MC902.1	Describe about the weaving industry in sangam age and ceramic technology. சங்க காலத்தில் நெசவுத் தொழில் மற்றும் பீங்கான் தொழில்நுட்பம் பற்றி விரிவாக அறிந்து கொள்ளுதல்.	K2	10, 12	-
U23MC902.2	Observe the design of houses, sculptures and construction of temples. வீடுகளின் வடிவமைப்பு, சிற்பங்கள் மற்றும் கோவில்களின் கட்டுமானத்தைப் பற்றி தெரிந்து கொள்ளுதல்.	K2	10, 12	-
U23MC902.3	Relate the various manufacturing materials and stone types in Silappathikaram. சிலப்பதிகாரத்தில் உள்ள பல்வேறு உற்பத்திப் பொருட்கள் மற்றும் கல் வகைகளைப் பற்றி புரிந்து கொள்ளுதல்.	K2	10, 12	-
U23MC902.4	Understand the significance of agriculture and irrigation technology in the ancient period.	K2	10, 12	-

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	பண்டைய காலத்தில் விவசாயம் மற்றும் நீர்ப்பாசன தொழில்நுட்பத்தின் முக்கியத்துவத்தை புரிந்து கொள்ளுதல்.		
U23MC902.5	Explain the growth of scientific Tamil, Tamil computing and the digitization of Tamil books. அறிவியல் தமிழின் வளர்ச்சி, தமிழ்க் கணினி, தமிழ் நூல்களின் டிஜிட்டல் மயமாக்கல் ஆகியவற்றை விரிவாக தெரிந்து கொள்ளுதல்.	K2	10, 12

5. Course Articulation matrix:

CO	P O 01	P O 02	P O 03	P O 04	P O 05	P O 06	P O 07	P O 08	P O 09	P O 10	P O 11	P O 12	PS 01	PS 02
	O	O	O	O	O	O	O	O	O	O	O	O	O	O
	01	02	03	04	05	06	07	08	09	10	11	12	01	02
U23MC902.1	-	-	-	-	-	-	-	-	-	1	-	1	-	-
U23MC902.2	-	-	-	-	-	-	-	-	-	1	-	1	-	-
U23MC902.3	-	-	-	-	-	-	-	-	-	1	-	1	-	-
U23MC902.4	-	-	-	-	-	-	-	-	-	1	-	1	-	-
U23MC902.5	-	-	-	-	-	-	-	-	-	1	-	1	-	-
Course to PO	-	-	-	-	-	-	-	-	-	1	-	1	-	-

"3"—High, "2"—Medium, "1"—Low, “—”—No Correlation

SEMESTER III

U23MA204	Discrete Mathematics	L	T	P	C
		3	1	0	4

1. Course Description

Discrete Mathematics is a foundational course that explores mathematical structures and concepts fundamental to computer science, information technology, AI, cryptography, and other fields. The course covers wide range of foundational concepts and techniques in discrete mathematics, emphasizing both theoretical understanding and practical problem-solving skills. This course helps to analyze and solve problems using discrete mathematical techniques such as propositional calculus, Counting techniques, combinatorial principles, graphical representations and residual classes in number theory.

2. Course Objectives:

1. To verify the correctness of an argument using symbolic logic and truth tables.
2. To solve problems using counting techniques.
3. To introduce various techniques in combinatorics and solving recurrence relations.
4. To understand the basic concepts of graphs and isomorphism between graphs.
5. To apply effectively the concepts and results of congruence.

3. Syllabus

Unit-I: Logics and Proofs

Propositional logic: Propositional equivalences, Normal forms; Predicates and quantifiers; Rules of inference.

Unit-II: Counting Principles

Well ordering principle; Basics of counting; Balls and Bins problems; The pigeonhole principle; Inclusion and exclusion principle.

Unit-III: Combinatorics

Mathematical induction; Permutation and combination; Recurrence relations: Formation of Recurrence relation, Generating functions, Solving linear recurrence relation.

Unit-IV: Introduction to Graph Theory

Graphs:Types of graphs, Matrix representation of graphs, walk, path, Circuit, Graph isomorphism using adjacency matrix and circuits, Euler graph, Hamiltonian graph.

Unit-V: Introduction to Number Theory

Linear Diophantine equations; Congruence: Linear congruence, Simultaneous linear congruences, Chinese remainder theorem (statement only), Wilson's theorem, Fermat's theorem, Euler's theorem.

Lab Components for Assignments/Tutorials:

1. Construction of truth tables.
2. Solving recurrence equations.
3. Finding Permuations and combinations.
4. Construction of graphs and digraphs.
5. Matrix representstion of graphs.
6. Tracing Traversals, shortest path and cycles in a graph.
7. Solving Linear Diophantine equation
8. Solving linear congruence and system of linear congruences.

Text Books:

1. Rosen. K.H., "Discrete Mathematics and its Applications", 7th Edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2017.
2. James Strayer, Elementary Number Theory, Waveland Press, 2002.

References:**Reference Books:**

1. Grimaldi. R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", 5th Edition, Pearson Education Asia, Delhi, 2013.
2. Koshy. T. "Discrete Mathematics with Applications", Elsevier Publications, 2006.
3. Lipschutz. S. and Mark Lipson., "Discrete Mathematics", Schaum's Outlines, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 3rd Edition, 2010.
3. Tremblay. J.P. and Manohar. R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Pub. Co. Ltd, New Delhi, 30th Reprint, 2011.

Journals:

1. SIAM Journal on Discrete mathematics.
2. Journal of Combinatorial Theory
3. International of Number Theory.

Video References:

1. <https://www.youtube.com/watch?v=xIUFkMKSB3Y>
2. <https://www.youtube.com/playlist?list=PL1-gb0E4MII0sGLCJeqDB3y63HZ6lM5LJ>
3. <https://www.youtube.com/playlist?list=PL5J6K3znOvOmzBUoxlk-W0N4j7L1Y9yfW>
4. <https://www.youtube.com/watch?v=HipVU5vz3Q8>
5. <https://www.youtube.com/watch?v=1zFFnvyEgVU>

NPTEL:

1. <https://npTEL.ac.in/courses/106106094>
2. <https://npTEL.ac.in/courses/106108051>
3. <https://archive.nptel.ac.in/courses/111/106/111106155/>
4. <https://archive.nptel.ac.in/courses/111/106/111106102/>
5. <https://archive.nptel.ac.in/courses/111/101/111101137/>

4. Course Outcomes

CO. No.	Course Outcome	BTL	POs	PSOs
U23MA204.1	Apply the fundamental concepts of logics and inference theory in proving and testing the logics.	K3	1, 2, 3, 4, 12	1,2
U23MA204.2	Use induction techniques, generating functions and basics of counting principle to solve mathematical statements.	K3	1, 2, 3, 4, 12	1,2
U23MA204.3	Examine the types of circuits in a graph, the existence of isomorphism and sketch the Euler and Hamiltonian paths and circuits in a graph.	K4	1, 2, 3, 4, 12	1,2
U23MA204.4	Apply the concept of algebraic structures with one or more binary operations.	K3	1, 2, 3, 4, 12	1,2
U23MA204.5	Estimate the errors while identification numbers using residue classes, an enormously useful and powerful tool in number theory	K5	1, 2, 3, 4, 12	1,2

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5. Course Articulation matrix

CO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02
U23MA204.1	3	3	2	2	-	-	-	-	-	-	-	-	2	-
U23MA204.2	3	3	2	2	-	-	-	-	-	-	-	-	2	-
U23MA204.3	3	3	2	2	-	-	-	-	-	-	-	-	2	-
U23MA204.4	3	3	2	2	-	-	-	-	-	-	-	-	2	-
U23MA204.5	3	3	3	2	-	-	-	-	-	-	-	-	2	-
Course to PO	3	3	2.2	2	-	-	-	-	-	-	-	-	2	-

"3"—High, "2"—Medium, "1"—Low, "-"—No Correlation

U23CS403	Design And Analysis of Algorithms	L	T	P	J	C
		3	0	0	0	3

1. Course Description

This course explores the fundamental principles of algorithmic design and analysis, equipping students with the essential tools to tackle complex computational problems efficiently. Through a comprehensive exploration of various algorithmic techniques, including Brute Force, Divide-and-Conquer, Dynamic Programming, Greedy Approach, Backtracking, and Branch and Bound, students will gain a profound understanding of how to formulate, analyze and optimize algorithms for diverse applications. Through hands-on exercises, projects and theoretical discussions, students will develop the skills necessary to design algorithms, assess their efficiency, and make informed decisions regarding algorithm selection for real-world problems.

2. Course Objectives

1. To understand the algorithm analysis techniques
2. To learn to the efficiency of alternative algorithmic solutions for the same problem
3. To understand different algorithm design techniques
4. To understand the limitations of Algorithmic Power

3. Syllabus

Unit-I: Algorithm Analysis Techniques

Notion of an algorithm , Importance & role of algorithms in computing , Important problem types ; Analysis of algorithmic efficiency , Time and Space Complexity , Asymptotic notations and their properties ; Analysis framework: Mathematical analysis for recursive and non-recursive algorithms; String Algorithms: Naïve algorithm , Rabin Karp Algorithm , KMP Algorithm , Manachers algorithm

Unit-II: Brute Force and Divide-And-Conquer

Brute force: Selection sort , String matching , Exhaustive search , Boyer Moore algorithm, Travelling salesman problem , Knapsack problem , Assignment problem , Huffman codes and data compression;
 Divide and Conquer: Binary search , Quick sort , Heap sort , Multiplication of large integer

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Unit-III: Dynamic Programming

Ugly numbers ; Coin changing problem ; Friends pairing problem ; Golomb sequence ; Warshall's algorithm , Floyd's algorithm , Multi stage graph , Optimal binary search trees , Fractional Knapsack Problem , K Knight's tour on chess board

Unit-IV: Greedy Approach

Definition , Activity selection problem , Longest common subsequence , Sieve of Sundaram , Assign mice to holes; Huffman trees , Sparse matrix , Bloom filter

Unit-V: Backtracking and Branch and Bound

Backtracking , Rat in maze , Permutation and Combination , N Queen problem , Hamiltonian circuit problem , Knight's tour problem , Subset sum problem , Graph Coloring ; Branch and Bound: Assignment problem , Knapsack problem , Travelling salesman problem

Text Books:

1. Anany Levitin, — Introduction to the Design and Analysis of Algorithms, Third Edition, Pearson Education, 2017

References:**Reference Books:**

1. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Computer Algorithms/ C++, Second Edition, Universities Press, 2008
2. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, —Introduction to Algorithms, Third Edition, PHI Learning Private Limited, 2022

4. Course Outcomes:

CO. No.	Course Outcome	BTL	POs	PSOs
U23CS403.1	Understand the importance of designing strategies, time and space complexity	K2	1, 2, 3, 4, 5, 7, 12	1,2
U23CS403.2	Apply brute force and divide and conquer strategies in solving problems	K3	1, 2, 3, 4, 5, 7, 12	1,2
U23CS403.3	Apply dynamic programming in solving complex problems	K3	1, 2, 3, 4, 5, 7, 12	1,2
U23CS403.4	Apply greedy algorithms in solving problems	K3	1, 2, 3, 4, 5, 7, 12	1,2
U23CS403.5	Compare the time and space complexities of different types of algorithms	K3	1, 2, 3, 4, 5, 7, 12	1,2

5. Course Articulation Matrix:

CO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02	PSO 03
U23CS403.1	3	3	3	3	1	-	1	-	-	-	Chairman – Board of Studies	2	1	1	1

CO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02	PSO 03	
U23CS403.2	3	3	3	3	1	-	1	-	-	-	-	-	2	1	1	-
U23CS403.3	3	3	3	3	1	-	1	-	-	-	-	-	2	1	1	-
U23CS403.4	3	3	3	3	1	-	1	-	-	-	-	-	2	1	1	-
U23CS403.5	3	3	3	3	1	-	1	-	-	-	-	-	2	1	1	-
Course to PO	3	3	3	3	1	-	1	-	-	-	-	-	2	1	1	-

"3"—High, "2"—Medium, "1"—Low, "-—"No Correlation

U23CS404	Database Management Systems	L	T	P	J	C
		3	0	0	0	3

1.Course Description:

This course offers a comprehensive exploration of Database Management Systems (DBMS) theory, focusing on essential concepts and principles underlying the design, implementation and optimization of databases. Students will explore into various topics, including an Introduction to Databases, Structured Query Language (SQL) & Procedural Language/SQL (PL/SQL), Transaction and Concurrency Control, Storage & Indexing, and NoSQL databases. The students will gain a deep understanding of database architectures, data modelling techniques, query languages, transaction management strategies, storage mechanisms, indexing methods and the role of NoSQL databases in modern data management.

2.Course Objectives:

1. To learn about data models and fundamentals of database system
 2. To develop queries with SQL
 3. To understand the internal storage structures using different file and indexing techniques
 4. To understand the basics of transaction processing- concurrency control techniques and recovery procedures
 5. To learn the principles of non-structured database systems

3.Syllabus:

Unit-I: Introduction to Databases

Purpose of Database , Types and examples of Databases (RDBMS, NOSQL, In-memory Databases & Distributed SQL databases) , Relational Database System Architecture ; Views of Data , Schema architecture , Data Independence , Schema and instance ; Data Models , Benefits and Phases of Data Model ; ER Diagram: Symbols , Components , Relationships , Weak entities , Attributes , Cardinality , Extended ER Diagram , Examples ; Relational Data Model ; Keys ; Relational Algebra ; Normalization: 1NF, 2NF, 3NF, BCNF,4NF,5NF;

Case Study: ER Diagram on Online Streaming, Movie Ticket Recommendation, Bike Tracking

Unit-II: SOL & PL/SOL

SQL Fundamentals : DDL Commands , Create, Drop, Alter, Truncate, Rename ; Keys : Primary Key, Candidate Key, Foreign Key
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Key, Super Key, Foreign Key ;DML Commands , DQL Commands : Select, Insert, Update, Delete, Any, All, In, Exists, Non-Exists, Union, Intersection ; Advanced SQL Features , Aggregate Functions : SUM, COUNT, AVG, MIN, MAX, EXPLAIN, COALESCE ; Clauses , Order By , Group By, Having, CASE, LIMIT, WITH Clause, Date Functions, String Functions ; Subqueries , Nested, Correlated, Joins : Inner, Outer, and Equi-Joins ; Order of Execution, Embedded SQL , Dynamic SQL ; Creation and Dropping of Views, Types of Views , Creation and Execution of Stored Procedures , Cursors : Opening, Fetching, and Closing ; Triggers : Creation, Insertion, Deletion, and Updating Database ; Exception Handling ; MySQL JDBC Connectivity
Case Study: Online Streaming, Movie Ticket Recommendation, Bike Tracking, Import/Export Random records from CSV file to MYSQL

Unit-III: Transaction and Concurrency Control

Transaction processing: ACID Properties , Failure and Recovery , Schedules , Serializability , Concurrency Control , Lock-based protocol , Isolation levels ; SQL Facilities for concurrency and recovery , Database Integrity, Security and Authorization

Case Study: ACID Properties in Online Streaming Database

Unit-IV: Storage & Indexing

Overview of Storage Techniques : File organization , RAID ; Indexing : Types of ordered indices , B & B+ tree ; Hashing : Static & Dynamic Hashing , Query Processing & Optimization , SQL Performance Tuning
Case Study: Indexing in Online Streaming Database to optimize the retrieval of data

Unit-V: NOSQL

Need for NO SQL , Characteristics of NOSQL , Key-value database , Columnar Databases , Apache Cassandra , Click House , Document Databases , MongoDB : CRUD operations with MongoDB , MongoDB JDBC Connectivity , MongoDB Testing , Graph Databases , Metabase

Case study: Conversion of Online Streaming Database (RDBMS) to MongoDB

Text Books:

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, — "Database System Concepts", Seventh Edition, Tata McGraw Hill, 2019
2. RamezElmasri, Shamkant B. Navathe, —"Fundamentals of Database Systems", Sixth Edition, Pearson Education, 2014

References:

References Books:

1. C.J.Date, A.Kannan, S.Swamynathan, —"An Introduction to Database Systems", Eighth Edition, Pearson Education, 2013
2. KrisitnaChodorow, "MongoDB – The Definitive Guide", O' Reilly, 2013

Video References:

1. <https://www.youtube.com/playlist?list=PLsjUcU8CQXGFFAhJI6qTA8owv3z9jBbp>
2. <https://www.youtube.com/watch?v=c5HAWKX-suM>
3. <https://youtu.be/FNYdBLwZ6cE>
4. <https://youtu.be/qEhNHOEa5sE>

NPTEL /Online Courses:

1. https://onlinecourses.NPTEL.ac.in/noc23_cs41/preview
2. <https://codewithmosh.com/p/complete-sql-mastery>
3. <https://www.udemy.com/course/nosql-databases-for-beginners/>

4. Course Outcomes:

CO. No.	Course Outcome	BTL	POs	PSOs
U23CS404.1	Use data models and depict a database system	K3	1, 2, 3, 4, 5, 9, 12	1,2,3
U23CS404.2	Design relations for various business requirements	K3	1, 2, 3, 4, 5, 9, 12	1,2,3
U23CS404.3	Understand the properties of the database and recovery process	K2	1, 2, 3, 4, 5, 9, 12	1,2,3
U23CS404.4	Understand the optimization techniques in database storage	K2	1, 2, 3, 4, 5, 9, 12	1,2,3
U23CS404.5	Design non-structured database systems in application development	K3	1, 2, 3, 4, 5, 9, 12	1,2,3

5. Course Articulation Matrix:

CO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02	PSO 03
U23CS404.1	3	3	3	2	3	-	-	-	2	-	-	2	3	2	1
U23CS404.2	3	3	3	2	3	-	-	-	2	-	-	2	3	2	1
U23CS404.3	3	3	3	2	3	-	-	-	2	-	-	2	3	2	1
U23CS404.4	3	3	3	2	3	-	-	-	2	-	-	2	3	2	1
U23CS404.5	3	3	3	2	3	-	-	-	2	-	-	2	3	2	1
Course to PO	3	3	3	2	3	-	-	-	2	-	-	2	3	2	1

"3"—High, "2"—Medium, "1"—Low, “—”—No Correlation

U23CS491	Java Programming	L	T	P	J	C
		2	0	2	2	4

1.Course Description:

This course provides a comprehensive understanding of Java programming language and its application development capabilities. Through theoretical discussions and hands-on lab exercises, students will learn the foundational concepts of Java, object-oriented programming principles, advanced features of Java 8, exception handling, multithreading, JavaFX for GUI development, and JDBC for database connectivity. By the end of the course, students will have the knowledge and skills to develop robust Java applications and graphical user interfaces.

2.Course Objectives:

1. To understand object oriented programming concepts and the basics of java programming language
2. To know the principles of packages, inheritance and interfaces
3. To understand strings & collections with java 8 features
4. To develop a Java application with exception handling and threads

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Sri Eshwari College of Engineering & Technology
Minalnukkadavu, Coimbatore - 641 402

5. To develop windows-based applications with jdbc

3.Syllabus:

Unit-I: Foundations of Java

Overview of OOP , Object oriented programming paradigms , Features of Object Oriented Programming , Java Buzzwords ; Overview of Java : JVM , JDK , Programming Structures in Java , Classes & its types in Java , Data Types , Variables , Operators , Keywords , Control Statements , Wrapper Classes , Constructors , Methods , Access specifiers ; Arrays & its types , java.util.Arrays , Java Doc comments , I/O classes

Unit-II: Object Oriented Mechanisms

Association , Aggregation , Composition , Polymorphism , Overloading Vs Overriding , Static and Dynamic Binding , Inheritance: Basics , Types of Inheritance , Super, static & final keywords with inheritance and polymorphism , Abstraction , Abstract Classes and Interfaces , Encapsulation , Packages , Access modifiers

Unit-III: Strings, Collections & Java 8 Features

Strings, creation, declaration of a string, storage structure of a string and its methods, StringBuilder, String Buffer, regex , Collection ; Interface , Generics , List, Set, Map interfaces and classes, Comparable , Comparator , Java lambda expressions , Date & time Object in java 1.8 and its functions , Streams

Unit-IV: Exception Handling and Multithreading

Exception handling , Hierarchy, Types of exception, Mechanisms , try , catch , throw , throws and finally , Exception Propagation - Exception in Inheritance - Introduction to Multiprocessing - threads vs process – threads - Creation of thread - Thread states - Thread Lifecycle and its methods, Executor Framework, Concurrency API, Synchronization Blocks

Unit-V: Javafx & Jdbc

JAVAFX Events and Controls: Event Basics , Handling Key and Mouse Events ; Controls: Checkbox, ToggleButton , RadioButtons , ListView , ComboBox , ChoiceBox , Text Controls , ScrollPane , Layouts , FlowPane , HBox and VBox , BorderPane , StackPane , GridPane; Menus: Basics , Menu bars , MenuItem , JDBC , drivers, Steps to create a JDBC application , DB Connection Pool

List of Laboratory Experiments / Exercises:

1. Implement class, objects, data types, operators, control statements, wrapper classes and scanner classes using java
2. Implement command line arguments with i/o packages using java
3. Implement sequential search, binary search and quadratic sorting algorithms using java
4. Implement encapsulation, abstraction, polymorphism and inheritance using java
5. Implement interface by accessing super class constructors and methods using java
6. Implement string, string functions, string builder, string buffer and regex using java
7. Implement lambda expression & for each() method using java
8. Implement generics-wildcard expression using java
9. Implement stack and queue data structures using java
10. Implement list, map, set, date and time using java
11. Implement exception handling by creating user-defined exceptions using java
12. Implement multithreading and inter-thread communication using java

13. Develop applications using javafx controls, layouts and menus

Projects:

Develop a Java application for any real word problem

Text Books:

1. Herbert Schildt., "Java: The Complete Reference", 12th Edition, McGraw Hill Education, New Delhi, 2019
2. Cay S.Horstmann., "Core Java Fundamentals", Volume 1, 11th Edition, Prentice Hall, 2018

References:

1. Deitel P and Deitel H, "Java: How to Program", 11th Edition, Prentice Hall, 2018.
2. James Gosling, Bill Joy, Guy Steele, Gilad Bracha, Alex Buckley and Daniel Smith, "The Java Language Specification – Java SE", 13th Edition, Oracle America Inc., USA, 2019.
3. Matt Weisfeld, "The Object-Oriented Thought Process", 5th Edition, Addison-Wesley Professional, US, 2019.
4. Daniel Liang L, "Introduction to Java Programming", 10th Edition, Pearson Education, New Delhi, 2015

4. Course Outcomes:

CO. No.	Course Outcome	BTL	POs	PSO's
U23CS491.1	Understand the core concepts of Java programming at a conceptual level.	K2	5,8,9,12	1, 2
U23CS491.2	Explain the principles of object-oriented programming (OOP) and apply them to develop Java applications.	K3	5,8,9,12	1, 2
U23CS491.3	Analyze and apply the concepts of strings, collections, and Java 8 features to solve programming problems efficiently.	K4	5,8,9,12	1, 2
U23CS491.4	Develop Java applications with effective exception handling mechanisms and implement multithreading concepts to improve program efficiency.	K3	5,8,9,12	1, 2
U23CS491.5	Design and develop windows-based applications using JavaFX, incorporating various GUI components and event handling mechanisms.	K3	5,8,9,12	1, 2

5. Course Articulation Matrix:

CO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02	PSO 03
U23CS491.1	-	-	-	-	2	-	-	2	3	-	-	3	2	1	-
U23CS491.2	-	-	-	-	2	-	-	2	3	-	-	3	2	1	Chairman – Board of Studies Department of CSE - A& M

CO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02	PSO 03
U23CS491.3	-	-	-	-	2	-	-	2	3	-	-	3	2	1	-
U23CS491.4	-	-	-	-	2	-	-	2	3	-	-	3	2	1	-
U23CS491.5	-	-	-	-	2	-	-	2	3	-	-	3	2	1	-
Course to PO	-	-	-	2	2	-	-	2	3	2	-	3	2	1	-

"3"—High, "2"—Medium, "1"—Low, "-"—No Correlation

U23AD493	ARTIFICIAL INTELLIGENCE	L	T	P	J	C
		3	0	0	2	4

1. Course Description

This course offers a comprehensive exploration of the foundational principles and core concepts in Artificial Intelligence (AI). Beginning with an introduction to the history and applications of AI, the course progressively delves into intelligent agents, problem-solving, search algorithms, and extends to encompass knowledge representation and planning. Through a structured journey, students will delve into the origin of Artificial Intelligence (AI), covering a spectrum of topics crucial for understanding and equipping them with the problem-solving skills essential for the broader field of AI.

2. Course Objectives:

1. To study about structure of agents and the nature of environments
2. To learn the search algorithms of AI in different environments
3. To Learn and apply adversarial search techniques to solve problems in dynamic environments.
4. To study and infer the logical and probabilistic inference mechanisms.
5. To study the knowledge representation and planning algorithms.

3. Syllabus

Unit-I: INTELLIGENT AGENTS

Introduction to artificial intelligence; Intelligent agents: agents & environment, concept of rationality, nature of environments, structure of agents.

Case Study: Autonomous Delivery Robots which interact with their surroundings and navigate through dynamic environments to deliver packages.

Unit-II: PROBLEM SOLVING AGENTS

Uninformed search strategies, Heuristic search strategies, heuristic functions; Local search and optimization problems, local search in continuous space, search with nondeterministic actions, search in partially observable environments, online search agents and unknown environments.

Case Study: Autonomous vehicle Navigation in Unknown Environments

Unit-III: GAME PLAYING AND CSP

Adversarial search: Games, optimal decisions in games, alpha - beta pruning, stochastic games, partially observable games; Constraint satisfaction problems; constraint propagation, backtracking search for CSP, local search for CSP, structure of CSP

Case Study: Artificial intelligence system plays chess to make optimal moves in a partially observable and dynamic environment.

Unit-IV: LOGICAL AGENTS

Knowledge-based agents, propositional logic, propositional theorem proving, propositional model checking, agents based on propositional logic; First-order logic, syntax and semantics, knowledge

representation and engineering; Inferences in first-order logic: forward chaining, backward chaining, resolution

Case Study: Automated personal assistant to assist users in managing their daily tasks, scheduling, and information retrieval.

Unit-V: KNOWLEDGE REPRESENTATION AND PLANNING

Ontological engineering, categories and objects, events, mental objects and modal logic, reasoning systems for categories, reasoning with default information; Classical planning, algorithms for classical planning; time, schedule, and resources analysis, hierarchical planning, planning and acting in non-deterministic domains

Case Study: Autonomous Warehouse Management System (WMS) for efficient planning, scheduling, and resource allocation within a warehouse environment.

Total Hours (Theory): 30

List of Laboratory Experiments / Exercises

1. Identify and discuss the distinctive features that set PROLOG apart as a declarative programming language. Break down the essential elements, delving into the role of facts, rules, and queries. Examine how these components work together to facilitate logical reasoning.
2. Imagine you are working on an AI system for an automated chessboard configuration. One of the challenges is placing four queens on a 4x4 chessboard in such a way that no two queens threaten each other. Provide the Prolog code and demonstrate the solution by showing the positions of the queens on the 4x4 grid.
3. Imagine a scenario in a computer game where a character needs to navigate through various cities to complete a quest. The goal is to design a Prolog program that solves the Traveling Salesman Problem for the character, finding the optimal route to visit each city exactly once and return to the starting point while minimizing the total distance traveled. The cities in the game are connected by different types of paths, each with its own associated cost.
4. Assume you are playing the Pac-Man game where the maze is represented as a grid with Pac-Man, ghosts, walls, and empty spaces. Implement Breadth-First Search (BFS) for Pac-Man navigation, considering the presence of ghosts as obstacles in the exploration process.
5. Imagine a Real-Time Strategy game (Age of Empires) where you command a battalion of futuristic units navigating a dynamic battlefield. The terrain is diverse, including open fields, mountains, and urban areas. Your mission is to implement the A* search algorithm for unit path finding, considering the real-time movements of enemy units and dynamically changing obstacles. Describe how you would model the game environment as a grid, incorporating varying traversal costs for different terrains. Discuss the heuristic function you would employ to guide unit movements, considering factors such as the proximity of enemies, defensive structures, and the goal of reaching specific objectives on the map.
6. Implement the Alpha-Beta Pruning algorithm to determine the best move for a player in a Tic-Tac-Toe game tree. The game tree must represent all possible moves and countermoves, creating an extensive search space.
7. Consider a scenario where you are developing an AI-driven robotic system for package delivery in a city. The challenge is to evolve the optimal set of parameters that enable the robotic fleet to navigate efficiently through urban environments, considering factors such as traffic, pedestrian density, and delivery deadlines. Design a genetic algorithm to evolve the optimal parameters for route planning and execution in the robotic package delivery system. Describe the genetic operators (crossover and mutation) you would implement in your genetic algorithm. How do these operators enable the exploration and exploitation of the

	solution space, and how are they tailored to the specific challenges of route planning in urban environments?
8.	In a telecommunications company, the network infrastructure team is faced with the challenge of optimizing the design of their communication network. The team has decided to apply Simulated Annealing to address this complex optimization problem. The goal is to create an efficient layout of network nodes and connections that minimizes latency, maximizes data throughput, and ensures resource utilization is optimized.
9.	Imagine a smart home automation system that utilizes sensors and actuators to control various devices in a household. The system is equipped with motion sensors, door/window sensors, and temperature sensors. Implement propositional logic inferences to make decisions and take actions based on the information gathered by these sensors. The system needs to adapt for handling dynamic situations like sudden drop in temperature, changes in occupancy patterns, or the introduction of new devices.
10.	Design a knowledge base for the medical diagnosis system, including predicates representing symptoms, diseases, and treatments. Create classes or functions to represent predicates, clauses, and resolution-based inference operations. Formulate resolution-based inference rules for diagnosing diseases based on reported symptoms and recommending treatments for diagnosed diseases.
11.	<p>Mini project:</p> <p>Design an AI-powered route optimization system for the logistics company that utilizes Prolog programming language and incorporates various search algorithms and optimization techniques covered in the lab syllabus. Your system should be able to handle real-time constraints such as vehicle capacities, delivery time windows, and varying traffic conditions. Additionally, it should continuously adapt and optimize delivery routes using evolutionary algorithms to improve efficiency over time.</p> <p>Provide a detailed design and implementation plan for the system, including how you will model the problem using Prolog, the search algorithms you will implement, and how you will integrate logical inferences to handle complex delivery constraints. Evaluate the effectiveness of your system using real-world data and performance metrics such as route efficiency, delivery timeliness, and customer satisfaction.</p>

Total Hours (Lab + Project): $30+30 = 60$

Total Hours ($30+30+30$) = 90

Text Books:

1. Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Fourth Edition, Pearson Education, 2020.
2. Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw Hill Publishing Company, New Delhi, 2014.

References:

Reference Books:

1. I. Bratko, "Prolog: Programming for Artificial Intelligence", Fourth edition, Addison-Wesley Educational Publishers Inc., 2015.
2. Deepak Khemani, "A First Course in Artificial Intelligence", McGraw Hill Education, New Delhi, 2017

Journals (Reference):

1. Journal of Artificial Intelligence Research (JAIR) - <https://www.jair.org/index.php/jair>
2. Artificial Intelligence - <https://www.techscience.com/journal/jai>
3. Journal of Artificial Intelligence in Education - <https://link.springer.com/journal/40593>

Video references:

- https://www.youtube.com/watch?v=4jmsHaj7xEA&list=PL9ooVrPThQOGHNaCT7_fwe9AabjZI1RjI&index=1
- https://www.youtube.com/watch?v=8Pyy2d3SzU&list=PLEiEAq2VkJUlyr_ftxpHB6DumOq1Zz2hq&index=2

NPTEL Courses:

- https://onlinecourses.nptel.ac.in/noc20_cs81/preview
- <https://www.udemy.com/course/searching-algorithms-in-ai/>

4. Course Outcomes

CO. No.	Course Outcome	BTL	POs	PSOs
U23AD493.1	Implement a study of agents' structures and diverse environments in AI.	K3	1, 2, 3,5,6	1, 2
U23AD493.2	Apply various AI search algorithms for different environmental scenarios using the knowledge and skills acquired.	K3	1, 2, 3, 5, 6	1, 2
U23AD493.3	Implement a comprehensive study of adversarial search techniques and resolving constraint satisfaction problems	K3	1, 2, 3, 5, 6	1, 2
U23AD493.4	Apply logical and probabilistic inference mechanisms to improve decision-making in AI systems.	K3	1, 2, 3, 5, 6	1, 2
U23AD493.5	Analyze knowledge representation techniques and planning algorithms vital for Artificial Intelligence	K4	1, 2, 3, 5, 6	1, 2

5. Course Articulation matrix

CO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO
	01	02	03	04	05	06	07	08	09	10	11	12	01	02	
U23AD493.1	2	3	3	-	-	1	1	-	-	-	-	-	-	2	1
U23AD493.2	2	3	3	-	-	2	1	-	-	-	-	-	-	3	2
U23AD493.3	2	3	3	-	-	2	2	-	-	-	-	-	-	3	1
U23AD493.4	3	3	3	-	-	1	2	-	-	-	-	-	-	3	1
U23AD493.5	3	3	3	-	-	2	2	-	-	-	-	-	-	3	2
Course to PO	2.4	3	3	-	-	1.6	1.6	-	-	-	-	-	-	2.8	1.4

"3"—High, "2"—Medium, "1"—Low, "-"—No Correlations

U23CS453	Design and Analysis of Algorithms Laboratory	L 0	T 0	P 4	J 0	C 2
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1.Course Description:

In this practical course students will immerse themselves in the application of foundational algorithmic techniques to real-world problems. Through hands-on exercises, coding assignments and project work, students will gain practical experience in Algorithm Analysis Techniques, including Brute Force, Divide-and-Conquer, Dynamic Programming, Greedy Approach, Backtracking and Branch and Bound. By implementing these algorithms in various programming languages, students will develop a deep understanding of their operation, efficiency and applicability across different problem domains. Through iterative refinement and experimentation, students will hone their algorithmic design skills, learning to optimize solutions for performance and scalability.

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1. To understand the techniques for analyzing algorithms
2. To learn the paradigms for designing the algorithms
3. To analyze the efficiency of various algorithm design techniques
4. To understand the limitations of algorithmic power

3. List of Laboratory Experiments / Exercises:

1. Implementation of string algorithms
2. Demonstration of applications of string algorithms (Naïve algorithm, Rabin Karp Algorithm, KMP Algorithm and Manachers algorithm)
3. Implementation of brute force and divide-and-conquer techniques
4. Demonstration of applications of brute force and divide and conquer techniques (Boyer Moore algorithm, Travelling salesman problem, Knapsack problem, Assignment problem, Jump game, Maximum subarray, Merge Intervals, Tiling problem, Karatsuba algorithm)
5. Implementation of dynamic programming
6. Demonstration of applications of dynamic programming (Warshall's algorithm, Floyd's algorithm, Knapsack Problem, Longest Common Subsequence, Levenshtein distance (Edit distance) problem, Longest palindrome, Longest common substring, Longest happy string, Palindrome partitioning, Minimum coin change, Equal subset sum partition, Wildcard matching, longest repeated subsequence)
7. Implementation of Greedy approach
8. Demonstration of applications of Greedy approach (Activity Selection Problem, Graph Colouring Problem, Huffman coding compression algorithm, shortest superstring problem, Flip the world, Dials algorithm, Minimum spanning tree, Sieve of sundaram, Remove invalid parenthesis, Maximum ribbon cut)
9. Implementation of backtracking and branch & bound
10. Demonstration of applications of backtracking and branch & bound (Queen problem, Hamiltonian circuit problem, Knight's tour problem, Subset sum problem, Sudoku Solver, Letter combinations of a phone number, Combinatorial optimization problems, Zigzag conversion, Valid Sudoku, People holding hands, Reverse pairs)

Mini project: Create a simple gaming application

References:

1. Anany Levitin, —Introduction to the Design and Analysis of Algorithms!, Third Edition, Pearson Education, 2012
2. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, —Introduction to Algorithms, Third Edition, PHI Learning Private Limited, 2012

4. Course Outcomes:

CO. No.	Course Outcome	BTL	POs	PSOs
U23CS453.1	Demonstrate the ability to identify, define, and analyze complex problems using appropriate algorithms, data structures, methodologies and tools	K6	1, 2, 3, 4, 5, 7, 9, 11, 12	2, 3
U23CS453.2	Design effective visual representations (UML diagrams/Flowchart) to solve the identified problems	K3	1, 2, 3, 4, 5, 7, 9, 11, 12	2, 3
U23CS453.3	Develop and analyze algorithms and implement them using suitable programming platforms	K3	1, 2, 3, 4, 5, 7, 9, 11, 12	2, 3
U23CS453.4	Develop effective presentation skills to present and defend the designs and solutions	K3	1, 2, 3, 4, 5, 7, 9, 11, 12	2, 3
U23CS453.5	Understand issues related to privacy, security and accessibility and adhere to coding standards	K2	1, 2, 3, 4, 5, 7, 9, 11, 12	2, 3

5. Course Articulation matrix:

CO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02	PSO 03
U23CS453.1	3	3	3	3	2	-	1	-	1	-	2	2	-	1	2
U23CS453.2	3	3	3	3	2	-	1	-	1	-	2	2	-	1	2
U23CS453.3	3	3	3	3	2	-	1	-	1	-	2	2	-	1	2
U23CS453.4	3	3	3	3	2	-	1	-	1	-	2	2	-	1	2
U23CS453.5	3	3	3	3	2	-	1	-	1	-	2	2	-	1	2
Course to PO	3	3	3	3	2	-	1	-	1	-	2	2	-	1	2

"3"—High, "2"—Medium, "1"—Low, “—”—No Correlation

U23CS454	Database Management Systems Laboratory	L 0	T 0	P 2	J 0	C 1
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1.Course Description:

This practical course offers hands-on experience in essential database concepts and technologies. Students will explore into Introduction to Databases, mastering the fundamentals of data modelling and relational database design. They will then explore Structured Query Language (SQL) and Procedural Language/SQL (PL/SQL), acquiring skills in querying and manipulating data. Through practical exercises, students will learn Transaction and Concurrency Control techniques, ensuring data integrity and consistency in multi-user environments. Additionally, they will gain proficiency in Storage & Indexing, optimizing database performance through efficient data storage and retrieval strategies. Finally, students will explore NoSQL databases, understanding their unique characteristics and applications in modern data management scenarios

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1. To provide knowledge on designing databases using proper data modelling techniques
2. To inculcate knowledge of SQL queries using various database tools and techniques
3. To learn the Advanced SQL queries for the relational databases
4. To impart SQL and procedural interfaces to SQL comprehensively
5. To enable the students to develop an application using database concepts

3.List of Laboratory Experiments / Exercises:

Design a project for the following application using JDBC Connectivity

- Online Food Ordering System
- Online Movie Ticket Booking System
- Online Parking System
- Online Hotel Room Booking System

1 ER Diagrams

Create an Entity Relationship model for the above applications

2 SQL Queries

Develop the SQL Queries using the following commands for the database

- a. DDL commands - Create, alter (Add, Modify, Rename), Truncate, Drop commands
- b. DML commands - Insert, Update, and Delete commands
- c. DQL commands - Select and its basic operations
- d. DCL commands - Commit, Rollback, and Savepoint operations
- e. TCL commands - Grant and Revoke operations for the different users

3 Implementation of Key constraints

- a. Build the Integrity Constraints - Unique, NOT NULL, Auto Increment, Primary Key, Foreign Key, Check, Default constraints for the given databases

4 Advanced SQL Queries

Implementation of Aggregate Functions

- a. Find the total count of all the records in the table
- b. Find the average value of a specific column in the table
- c. Find the maximum/min/sum value of a specific column in the table
- d. Find the count of all distinct values in a specific column in the table

5 Implementation of Group By Clause

- a. Find the average/max/min/sum of all values of a specific column for each group records in the table
- b. Find the count/average/max/min of all records in the table grouped by multiple columns

6 Implementation of OrderBy Clause

- a. Sort the list of all records in the table by multiple columns/specific columns in ascending or descending order

- b. Find the top/ bottom 10 records in the table sorted by a specific column/multiple columns
- c. Find the list of all records in the table sorted by a specific column/multiple columns and limited to a certain range

7 Implementation of String Functions

- a. Find the length of characters in a specific string
- b. Find the leftmost/rightmost portion of a specific string up to a certain character or length
- c. Find the specific portion of a string extracted using a regular expression pattern
- d. Find the specific string with all occurrences of a certain character or pattern replaced with another character or string
- e. Find the specific string converted to uppercase or lowercase
- f. Find the specific string with leading or trailing whitespace characters removed
- g. Find the specific string with a certain character or substring removed or replaced
- h. Find the specific string with a certain character or substring added at a certain position
- i. Find the specific string with all occurrences of a certain substring concatenated with another substring

8 Implementation of Date function

- a. Find the current date and time in MySQL
- b. Find the day of the week for a specific date in MySQL
- c. Find the month/year for a specific date in MySQL
- d. Find the difference between two specific dates in MySQL
- e. Find the date in MySQL after adding/subtracting a specific number of days to a specific date.
- f. Find the number of days/average time between two specific dates in MySQL
- g. Find the earliest or latest date in a specific column of the table in MySQL

9 Implementation of Nested queries

- a. Find the maximum/min/count/sum/average/distinct count value of a specific column in the table for a specific subset of records selected using a nested query
- b. Find the average/max/sum/count/min value of a specific column in the table where the value of another column is equal to a specific value selected using a nested query
- c. Find the maximum value of a specific column in the table for a specific subset of records selected using a nested query within another nested query

10 Implementation of Joins

- a. Find the result of an inner/left/right/full outer/cross joins between

two/multiple tables on a specific column in MySQL

11 Construction of Index

- h. Create an index for the database and show the comparative analysis of Query execution time with and without using an index for the given scenario

12 Implementation of views

- a. Perform the DDL, DML, and DQL operations on the views and check the consistency of the relations
- b. Create different types of views and their categories of the REFRESH command.
- c. Implement the materialized views with Aggregate and Join queries

13 PLSQL

Develop a program in PLSQL using Before/After trigger, row, and statement trigger and instead of trigger

- a. Develop a program in PLSQL using Before/After trigger, row, and statement trigger and instead of trigger.
- b. Create a trigger and check for the before/after insertion, update, and deletion operations in the table.

14 NOSQL

Implementation of MongoDB application and run through CRUD operations

- a. Command to create a collection and a document in MongoDB
- b. Command to insert/update/delete a document in a MongoDB collection
- c. Command to query a MongoDB collection to retrieve documents that meet certain criteria
- d. Command to use aggregation pipelines to perform more complex queries in MongoDB
- e. Command to create an index in MongoDB to improve query performance

15 Create tables and execute the queries using Click House

- a. Command to create a table, view, and functions
- b. Command to insert the data in a table from compressed files, Infiles, and multiple files
- c. Command to query the data using the SELECT, WHERE, JOIN, GROUPBY, HAVING clauses
- d. Command to query the data using the Regular, Aggregate, and Table functions

References:

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, —"Database System Concepts", Sixth Edition, Tata McGraw Hill, 2013
2. Ramez Elmasri, Shamkant B. Navathe, —"Fundamentals of Database Systems", Sixth Edition, Pearson Education, 2014

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3. NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence – “Sadalage, P. & Fowler, Pearson Education, 2013

4. Course Outcomes:

CO. No.	Course Outcome	BTL	POs	PSOs
U23CS454.1	Demonstrate the ability to identify, define, and analyze complex problems using appropriate methodologies, queries and tools	K3	1, 2, 3, 4, 5, 7, 12	1, 2, 3
U23CS454.2	Design effective visual representations to solve the identified problems	K3	1, 2, 3, 4, 5, 7, 12	1, 2, 3
U23CS454.3	Develop database-oriented solutions and write queries to perform various operations	K3	1, 2, 3, 4, 5, 7, 12	1, 2, 3
U23CS454.4	Develop effective presentation skills to present and defend the designs and solutions	K3	1, 2, 3, 4, 5, 7, 12	1, 2, 3
U23CS454.5	Understand issues related to privacy, security and accessibility and adhere to coding standards	K3	1, 2, 3, 4, 5, 7, 12	1, 2, 3

5. Course Articulation Matrix:

CO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02	PSO 03
	3	3	3	3	1	-	1	-	-	-	-	2	1	1	-
U23CS454.1	3	3	3	3	1	-	1	-	-	-	-	2	1	1	-
U23CS454.2	3	3	3	3	1	-	1	-	-	-	-	2	1	1	-
U23CS454.3	3	3	3	3	1	-	1	-	-	-	-	2	1	1	-
U23CS454.4	3	3	3	3	1	-	1	-	-	-	-	2	1	1	-
U23CS454.5	3	3	3	3	1	-	1	-	-	-	-	2	1	1	-
Course to PO	3	3	3	3	1	-	1	-	-	-	-	2	1	1	-

“3”—High, “2”—Medium, “1”—Low, “—”—No Correlation

U23EM753	Advanced Logical Thinking	L 0	T 0	P 2	C 1
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1. Course Description

The objective of this course is to equip engineering students with a robust grasp of fundamental logical thinking concepts. Through a comprehensive exploration of essential theories and their intricate relationships, students will gain a deep understanding of how these principles are relevant across various fields. They will learn to effectively utilize these concepts to address diverse problems, mastering the ability to dissect complex issues into manageable parts and evaluate the accuracy and efficacy of their problem-solving approaches. Furthermore, students will be encouraged to devise innovative problems and scenarios that demand the application of these foundational principles, demonstrating their command and stimulating imaginative mathematical reasoning.

2. Course Objectives:

- To recall and define key concepts related to fundamentals of aptitude.
- To develop a thorough understanding of the principles and theories, including their significance and interrelationships.

3. To become proficient in applying the concepts to solve a wide range of problems across various contexts and disciplines.
4. To develop the skills to analyze complex problems, deconstructing them into manageable components for effective problem-solving.
5. To evaluate the validity and effectiveness of their problem solving strategies, as well as the accuracy and reliability of their solutions.
6. To create original problems and scenarios that require the application of fundamentals, showcasing mastery and fostering creativity in mathematical thinking.

3. Syllabus

Unit-I: Permutations & Combinations

Fundamental Principles of Counting: Permutations & Combination, Number Generation Fundamentals; Digit repeater concepts: All possible ways; Recursion and Backtracking: N step Problems, Chess oriented problems and Case Studies.

Unit-II: Probability

Introduction to Probabilities, Application of Probability; Power of Compounding: Rule of 72, Start Investing: Different asset class data set and Programming and Case Studies.

Unit-III: Time, Speed and Distance

Definition and Basics of Time, Speed and Distance; Relative speed: Problems based on Trains; Effective Speed: Problems based on Boats and Streams; Problems based on Races, Escalator problems; Case Studies.

Unit-IV: Mixtures & Allegations

Introduction to Mixtures: Multi variable mixing, Profit and Loss concept based on mixing; Liquid mixing concepts: Replacement problems and Repetitive iteration problems.

Unit-V: Clocks & Calendars

Introduction to design of clocks; Formula creation: Speed clock and Slow clock problems; Angle calculation; Calendars design: Concept of odd days, Day of a date and Calendar repetition logic; Data Arrangements; Data Sufficiency; Directions; Number series and Puzzles.

References:

Reference Books:

1. Dr. R S Aggarwal, Quantitative Aptitude, Revised Edition, S.Chand Publishing Company Ltd(s), 2022
2. Arun Sharma, How to prepare for Quantitative Aptitude for the CAT, 10th Edition, Tata McGraw-Hill Publishing Company Ltd, 2022

Online References:

1. <https://www.hackerearth.com/>
2. <https://www.geeksforgeeks.org/>
3. <https://www.indiabix.com/>

4. Course Outcomes

CO. No.	Course Outcome	BTL	POs	PSOs
U23EM753.1	Demonstrate the ability to recall and define fundamental concepts in logical thinking, facilitating effective communication and comprehension in professional settings.	K1 Chairman – Board of Studies	PO1 Chairman – Board of Studies	-

U23EM753.2	Develop a comprehensive understanding of logical principles and theories, recognizing their significance and interrelationships in real world scenarios.	K2	PO1, PO2, PO3	-
U23EM753.3	Become proficient in applying logical concepts to solve diverse problems across disciplines, fostering adaptability and versatility in professional problem solving.	K3	PO1, PO4, PO5	-
U23EM753.4	Develop the skills to analyze complex problems, deconstructing them into manageable components for systematic and efficient problem solving approaches.	K4	PO2, PO4, PO9	-
U23EM753.5	Ability to evaluate the validity and effectiveness of problem solving strategies, as well as the accuracy and reliability of solutions, promoting continuous improvement and quality assurance.	K5	PO4, PO6, PO8	-
U23EM753.6	Able to create original problems and scenarios that necessitate the application of logical fundamentals, fostering creativity and innovation in problem formulation and solution.	K6	PO2, PO3, PO1 2	-

5. Course Articulation Matrix

CO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PS O 01	PS O 02	
U23EM753.1	3	2	-	-	-	-	-	-	-	-	-	-	1	-	-
U23EM753.2	3	3	2	-	-	-	-	-	-	-	-	-	1	-	-
U23EM753.3	3	-	-	2	2	-	-	-	-	-	-	-	1	-	-
U23EM753.4	-	3	-	3	-	-	-	-	2	-	-	-	1	-	-
U23EM753.5	-	-	-	3	-	2	-	2	-	-	-	-	1	-	-
U23EM753.6	-	3	2	-	-	-	-	-	-	-	-	-	1	-	-
Course to PO	3	2.2	2	1.6	2	2	-	2	2	-	-	-	1	-	-

"3"—High, "2"—Medium, "1"—Low, "—" — No Correlation

U23MC903	Environmental Science				L	T	P	J	C				
1. Course Description													
Environmental Science for Engineering Students offers a focused exploration of key environmental concepts tailored to the needs and interests of engineering students. This course provides a comprehensive understanding of environmental issues relevant to engineering practice, emphasizing the application of scientific principles and engineering solutions to address environmental challenges. Students will develop the knowledge, skills, and perspectives necessary to integrate environmental considerations into engineering design, planning, and decision-making processes.													
2. Course Objectives													
<ol style="list-style-type: none"> To impart knowledge on the principle of environmental science and engineering. To make students understand the ecosystems and natural resources. To enable students understand the various causes for environmental degradation. To create awareness on pollution, value education, population growth and social issues. 													

3. Syllabus

Unit-I: Environment and Ecosystem

Scope and importance; concept of sustainability and sustainable development: concept of an ecosystem, structure and function of an ecosystem; producers, consumers and decomposers; Energy flow in the ecosystem, food chains and food webs.

Unit-II: Environmental Pollution and Analysis

Environmental pollution: types, causes, effects and controls, Air, Water, soil and noise Pollution, Role of individual in control of pollution; Nuclear hazards and human health risks.

Unit-III: Natural Resources

Land resources and land use change: Land degradation, soil erosion and desertification; Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations; Water: Use and over-exploitation of surface and ground water.

Unit-IV: Social Issues and Environmental Polices

Environmental Issues; Environmental ethics; Climate change: global warming, ozone layer depletion and acid rain; Environment Laws: Environment Protection Act, Air (Prevention & Control of Pollution) Act, Water (Prevention and Control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act.

Unit-V: Human Population and the Environment

Population growth: variation among nations, Population explosion, Family Welfare Programmes; Environment and human health: Human Rights, Value Education; Women and Child Welfare; Role of Information Technology in Environment and Human Health.

Text Books:

1. Gilbert M. Masters, Introduction to Environmental Engineering and Science, 2nd Edition, Pearson Education, 2004.
2. Dr. A. Ravikrishnan, Environmental Science and Engineering, Sri Krishna Hi-Tech Publishing Company Pvt. Ltd., 10th Edition, 2014.
3. M. Davis, S. Masten, Principles of Environmental Engineering and Science, McGraw hill publisher, 3rd Edition, 2013.
4. G.M. Masters, W. Ela, Introduction to Environment Engineering and Science, Prentice Hall Publisher, 2008.

References:

1. R. K. Trivedy and P. K. Goel, An Introduction to Air Pollution, BS Publications, 2003.
2. G. Tyler Miller and Scott E. Spoolman, Environmental Science, 15th Edition, Cengagelearning, 2016.
3. Miller T. G. and Spoolman S. E., "Environmental Science", Cengagelearning 16th Edition, 2017.
4. Sinha J., "Environmental Science", Galgotia Publications, 2nd Edition, 2011.
5. P. J. Vesilind, J. J. Peirce, R.F. Weiner, Environmental Pollution and Control. Butterworth-Heinemann, USA, 1990.
6. S. Divan, A. Rosencranz, Environmental Law and Policy in India: Cases, Materials and Statutes (2nd edition). Oxford University Press, 2002.

Journal References:

1. RSC Advances (<https://pubs.rsc.org/en/content/articlehtml/2012/ra/c2ra20340e>)
2. International journal of Hydrogen Energy (<https://www.sciencedirect.com/science/article/abs/pii/S0360319916309478>)

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3. Nano Energy journal

(<https://www.sciencedirect.com/science/article/abs/pii/S2211285518305755>)

4. International Journal of Electrochemical Science.

(<http://www.electrochemsci.org/papers/vol11/111210628.pdf>)

Video References:

1. <https://www.youtube.com/watch?v=Y5B1nWYle40>
2. <https://study.com/academy/lesson/what-is-environmental-science-definition-and-scope-of-the-field.html>
3. <https://www.youtube.com/watch?v=CXCT2R1K6Ts>
4. <https://www.youtube.com/watch?v=89B9IT0Tl-Q>
5. <https://www.youtube.com/watch?v=p-lSPDDdVtc>

NPTEL Lectures:

1. https://onlinecourses.nptel.ac.in/noc23_hs155/preview
2. https://onlinecourses.nptel.ac.in/noc19_ge22/preview
3. https://onlinecourses.nptel.ac.in/noc20_ge16/preview

4. Course Outcomes

CO. No.	Course Outcome	BTL	POs	PSOs
U23MC903.1	Outline the structure and functions of an eco-system	K3	1,2,7,12	-
U23MC903.2	Categorize the different types of pollution and its preventive measures	K3	2,3,6,7,11	-
U23MC903.3	Interpret the importance of natural resources in environment	K3	2,3,6,7,11, 12	-
U23MC903.4	Identify the social issues and to utilize the environmental policies	K3	2,3,7,11	-
U23MC904.5	Apply role of IT in human population and environment	K3	2,3,6,7,11, 12	-

5. Course Articulation matrix

CO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02	PSO 03
U23MC903.1	2	1	-	-	-	-	3	-	-	-	-	3	-	-	-
U23MC903.2	-	2	2	-	-	1	3	-	-	-	1	-	-	-	-
U23MC903.3	-	1	2	-	-	2	3	-	-	-	1	1	-	-	-
U23MC903.4	-	2	2	-	-	-	3	-	-	-		1	-	-	-
U23MC904.5	-	2	2	-	-	1	3	-	-	-	2	1	-	-	<i>Sri Eshwar</i>
Course to PO	2	1.6	1.6	-	-	0.8	3	-	-	-	0.8	1.2	<i>Chairman – Board of Stu</i>	<i>Chairman – Board of Stu</i>	<i>Chairman – Board of Stu</i>

SEMESTER IV

U23MA209	Probability and Statistics	L	T	P	C
		3	1	0	4

1. Course Description

This course provides a foundational understanding of probability theory and statistical methods, essential for making informed decisions in diverse fields such as science, engineering, business and social sciences. The curriculum encompasses both theoretical principles and practical applications, enabling students to analyze data, draw meaningful inferences, and make informed decisions in uncertain situations.

2. Course Objectives:

1. To quantify the outcomes of random occurrences.
2. To acquire the knowledge of various distributions and its applications.
3. To describe the difference between correlation and regression also to calculate and interpret the linear regression equation.
4. To make an inference about the population on the basis of a random sample taken from that population.
5. To learn how to approximate the value of a population parameter on the basis of sample statistics.

3. Syllabus

Unit-I: Random Variables

Probability axioms; Conditional probability; Baye's theorem statement only; Discrete and continuous random variables; Moments, moment generating functions.

Unit-II: Standard Probability Distributions

Discrete distributions: Binomial distribution, poisson distribution; Continuous distributions: Normal distribution, exponential distribution.

Unit-III: Two Dimensional Random Variables

Joint probability distributions; marginal and conditional distributions; covariance; correlation and regression for discrete case.

Unit-IV: Testing of Hypothesis

Introduction, Critical region and level of significance; Types of Errors; Large sample tests: Z-test for single mean and difference of means; Small sample tests: Student's t-test for testing significance of single mean and difference of means; F-test for comparison of variances; Chi-square test: Test of goodness of fit, Test of independence of attributes.

Unit-V: Design of Experiments

Analysis of variance, One way classification: Completely Randomized Design; Two way classification: Randomized Block Design; Three way classification: Latin Square Design.

Lab Components For Assignments/Tutorials

1. Using statistical software R data numerically to perform data analysis.
2. Introduction: Understanding Data types; importing/exporting data.

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3. Computing Summary Statistics /plotting and visualizing data using Tabulation and Graphical representations.
4. Generation of poisson and uniform random variables.
5. Generation of gaussian and exponential random variables.
6. Computation of the probability distributions.
7. Fitting of Normal distribution.
8. Estimation of mean and variance.
9. Implementation of various statistical measures like mean, median, mode.
10. Applying correlation and simple linear regression model to real dataset.
11. Testing of hypothesis for large sample tests.
12. Applying the t-test for independent and dependent samples.
13. Testing of hypothesis for Small Sample tests for F-test.
14. Applying Chi-square test Contingency test to real dataset
15. Performing ANOVA for real dataset for one way, two way and three way classifications.

Text Books:

1. Douglas C. Montgomery and George C. Runger, Applied Statistics and Probability for Engineers, (2005) John Wiley and Sons Inc.
2. Walpole R. E., Myers S.L. and Keying Ye, "Probability and Statistics for Engineers and Scientists", 9th Edition, Pearson Education Inc, 2012.

References:

1. Johnson R. A., Miller and Freund's, "Probability and Statistics for Engineers", 8th Edition, Pearson Education, Delhi, 2015.
2. Devore. J. L., "Probability and Statistics for Engineering and the Sciences", 8th Edition, Cengage Learning, New Delhi, 2014.

Video Reference:

1. <https://www.youtube.com/watch?v=bpKarwfDRIk>
2. https://freevideolectures.com/course/3746/statistics-110-probability#google_vignette
3. <https://www.youtube.com/watch?v=32CuxWdOl0w>
4. https://www.youtube.com/watch?v=I_dhPETvll8

NPTEL:

1. nptel.ac.in/courses/111104079/
2. [https://nptel.ac.in/noc/courses/noc22/SEM1/noc22-ma30/](http://nptel.ac.in/noc/courses/noc22/SEM1/noc22-ma30/)
3. [https://onlinecourses.nptel.ac.in/noc22_mg31/](http://onlinecourses.nptel.ac.in/noc22_mg31/)

4. Course Outcomes

CO. No.	Course Outcome	BTL	POs	PSOs
U23MA209.1	Formulate and solve problems involving random variables.	K3	PO 1,2, 3, 4,12	1, 2
U23MA209.2	Apply the basic concepts of random variables and find an appropriate distribution for analyzing data specific to an experiment.	K3	PO 1,2, 3, 4,12	1, 2
U23MA209.3	Apply statistical methods like correlation, regression analysis in analyzing, interpreting experimental data.	K3	PO 1,2, 3, 4,12	1, 2

U23MA209.4	Analyze the concept of various test statistics used in hypothesis testing for mean and variances of large and small samples.	K4	PO 1,2, 3, 4,12	1, 2
U23MA209.5	Evaluate the factors controlling the value of a parameter through conducting, planning, analysing and interpreting controlled tests.	K5	PO 1,2, 3, 4,12	1, 2

5. Course Articulation Matrix

CO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02
R19MA206.1	3	3	2	1	0	0	0	0	0	0	0	2	2	2
R19MA206.2	3	3	2	1	0	0	0	0	0	0	0	2	2	2
R19MA206.3	3	3	2	2	0	0	0	0	0	0	0	2	2	2
R19MA206.4	3	3	2	2	0	0	0	0	0	0	0	2	2	2
R19MA206.5	3	3	2	2	0	0	0	0	0	0	0	2	2	2

"3"—High, "2"—Medium, "1"—Low, "-"—No Correlation

U23NCC002	NCC CREDIT COURSE LEVEL II	L 3	T 0	P 2	C 4
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1. Course Description

This course provides comprehensive training and knowledge in various aspects of disaster management, health and hygiene, communication and map reading, armed forces structure, and field craft and battle craft techniques. Students will gain practical skills and theoretical understanding necessary to effectively manage disasters, maintain health and hygiene standards, utilize communication tools and maps, understand the organization and entry modes of armed forces, and apply field and battle craft strategies in real-world scenarios.

2. Course Objectives:

1. Foster students' comprehensive understanding of the roles and operational strategies of Civil Defence Organizations, NDMA, and NDRF for effective disaster management.
2. Equip students with essential skills in hygiene, sanitation, water purification, first aid, and casualty evacuation techniques.
3. Develop students' proficiency in reading and interpreting various types of maps, understanding conventional signs, and correlating them to ground features.
4. Introduce students to the organization and role of an Infantry Battalion in the Armed Forces, including honors, awards, and entry modes.
5. Build students' awareness about different types of terrain and their application in Battle Craft through practical exercises and simulations.

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6. Cultivate students' discipline, coordination, teamwork, weapon handling, navigation, shooting skills, and physical fitness through basic drill exercises, safety procedures, marksmanship, map reading, and obstacle training.

3. Syllabus

Unit-I: Disaster Management

Civil Defence Organizations, Natural Disaster Management Authority (NDMA), National Disaster Responsive Force (NDRF), Types of Disaster, Fire Fighting, Traffic Control, Methods of NCC Assistance, Relief Camp, Collection & Distribution of Aid Material.

Unit-II: Health & Hygiene

Hygiene & Sanitation, Cleanliness, Water supply and its purification, Physical and Mental Health, First Aid: Common Medical Emergencies, Dressing of Wounds, Fracture & Treatment, Evacuation of Casualties, Methods of Carrying a Patient.

Unit-III: Communication & Map Reading

Communication, Introduction to types of maps & conventional signs, Scales & Grid System, Relief, Contours & Gradients, Cardinal points & Types of North, Types of Bearing, Service Protractor, Prismatic Compass.

Unit-IV: Armed Forces

Basic organization of Armed forces & Army, Modes of Entry to Army, Honours & Awards, Concept of Integrated Defence staff.

Unit-V: Field Craft & Battle Craft

Introduction to FC&BC, Judging Distance, Description of ground, Observation camouflage & concealment, Field Signal, Section Formation, Fire Control Orders, Fire & Movement.

LIST OF EXPERIMENTS:

1. Evaluate basic drill exercises to enhance discipline, coordination, and teamwork among cadets
2. Provide cadets with basic weapon handling skills, safety procedures, and marksmanship fundamentals.
3. Analyse the basics of map reading, including understanding map symbols, using a compass, and determining coordinates, to enhance their navigation skills.
4. Demonstrate the fundamentals of firing, including safety procedures, weapon handling, and marksmanship, to enhance their shooting skills and discipline.
5. Enhance physical fitness, agility, and confidence among cadets by training them to overcome various obstacles training

Text Books:

1. National Cadet Corps "Cadets Hand Book – Army(Common Subjects)".

References: (Reference Books, Journals, Magazines, and Supplementary materials like videos and MOOC references (preferably NPTEL/Udemy)

Web Reference:

1. <https://indiancc.nic.in/>

4. Course Outcomes

CO. No.	Course Outcome	BTL	POs	PSOs
U23NCC002.1	Analyze the organizational structure and operational strategies of Civil Defence Organizations, NDMA, and NDRF to develop effective disaster management plans.	K4	6,7,9,10	-
U23NCC002.2	Evaluate various health and hygiene practices, including first aid techniques, to optimize community health and emergency response efforts.	K5	7,10	-
U23NCC002.3	Apply advanced map reading and communication skills to accurately interpret and utilize various types of maps and navigational tools in field operations.	K3	1,5,6	-
U23NCC002.4	Create strategic plans for career entry into the Armed Forces by synthesizing information on organizational structure, honors, awards, and integrated defense staff.	K6	10,12	-
U23NCC002.5	Design and implement field and battle craft techniques, including camouflage, observation, and fire control orders, to enhance tactical effectiveness in diverse environments.	K6	2,3,4	-

5. Course Articulation matrix

CO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02
U23NCC002.1						3	3		3	3			-	-
U23NCC002.2							2			3			-	-
U23NCC002.3	2				3	2							-	-
U23NCC002.4										3	2		-	-
U23NCC002.5		1	2	3									-	-

"3"—High, "2"—Medium, "1"—Low, "-"—No Correlation

U23EC384	Computer Networks	L	T	P	J	C
		2	0	2	0	3

1. Course Description:

Computer Networks examines the principles and protocols that enable communication between devices across networks, encompassing topics such as TCP/IP, routing algorithms, and network security. Students learn about network design, implementation, and management, preparing them to understand and troubleshoot modern networking environments. Practical exercises and case studies enhance comprehension of real-world network challenges and solutions.

2. Course Objectives:

1. To learn core networking and layering structures
2. To study the services, standards and access controls of Physical and data link layers
3. To learn the protocols and services layer 3 and 4 for routing and socket programming
4. To build a network for an application with security features

3. Syllabus:

Unit-I: Introduction

Basic Network Components – Transmission Modes –Network Topology – Message Delivery – Network Types –IEEE Standards -Basic Network commands – Network Performance parameters –Switching Techniques – Layering in Networks- OSI Architecture- TCP/IP Architecture.

Unit-II: Physical and Data Link Layer

Physical Layer: Functions - Data and signals –Transmission Impairments -Transmission Media –Data Link Layer: Services – Link Layer addressing – Error Detection- Flow control – Link layer protocols - Media Access Control – Random Access – Ethernet – Types- VLAN - Network Function Virtualization.

Unit-III: Network Layer

Services – IPV4 Addressing – sub netting- Protocols - Routing - Unicasting – multicasting – Inter domain and Intra domain routing –Distance vector routing – link state routing –Next generation IP – IPV6- addressing – protocol- transition from IPV4 to IPV6.

Unit-IV: Transport Layer

Services – TCP – Three ways Handshake -protocols – congestion control – UDP – services –applications- Socket Programming with TCP and UDP.

Unit-V: Application Layer and Security

Services - Client server protocols- Email- DNS –Security – Goals- CIA Triad-OSI Security architecture - Firewalls- Securing E-mail-IP security-wireless security.

List of Experiments

1. Verification of Boolean theorems using logic gates.
2. Implementation of half adder and full adder using logic gates
3. Implementation of Multiplexer and De-multiplexer using logic gates.
4. Verification of JK and D Flip-flops.
5. Implementation of SISO and PIPO 4-bit shift register using Flip- flops.
6. Construction and verification of 4 bit ripple counter.
7. Design and implementation of 2 bit ALU using various combinational circuits

Text Books:

1.	Behrouz A Forouzan, "Data Communications and Networking", McGraw Hill Education, 6 th edition, 2022.
2.	Andrew S. Tanenbaum "Computer Networks", Pearson Education India, 6th Edition, 2022.

References:

Reference Books:

1. Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Morgan Kaufmann Publishers, sixth Edition, 2021
2. William Stallings, "Data and Computer Communications", Pearson Education, Tenth Edition, 2017.
3. James F. Kurose, Keith W. Ross, "Computer Networking, A Top-Down Approach Featuring the Internet", Pearson Education, Sixth Edition, 2017
4. Ethical hacking and countermeasures v11 – Professional Series - CEH Handbook, 2021
5. Richard Fox, Wei Hao, "Internet Infrastructure Networking, Web Services, and Cloud Computing", T& F, CRC Press, 2018.

Web Resources:

1. <https://www.nesoacademy.org/cs/06-computer-networks/03-logical-addressing-and-subnetting/14-subnetting>
2. <https://www.youtube.com/watch?v=qZLPq5mebFM>
3. https://www.cisco.com/c/en_in/products/security/vpn-endpoint-security-clients/what-is-vpn.html#~how-a-vpn-works
4. <https://www.checkpoint.com/cyber-hub/network-security/what-is-firewall/>

NPTEL Courses:

1. Swayam –NPTEL –Computer Networks and Internet Protocol
2. Swayam –NPTEL - Demystifying Networking

4. Course Outcomes:

CO. No.	Course Outcome	BTL	POs	PSOs
U23EC384.1	Understand the core network requirements and layering structure of OSI and TCP/IP	K2	1,2,3,4,5,9	1
U23EC384.2	Interpret the services, standards, access control mechanism in physical and data link layer	K2	1,2,3,4,5,9	1
U23EC384.3	Use the addressing schemes and protocols for routing the information in networks	K3	1,2,3,4,5,9	1
U23EC384.4	Apply the services offered by Transport layer protocols for socket programming	K3	1,2,3,4,5,9	1
U23EC384.5	Develop a network and support an application with security features	K3	1,2,3,4,5,9	1

5. Course Articulation matrix:

CO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02
U23EC382.1	3	1	3	3	1	-	-	-	2	-	-	-	2	-
U23EC382.2	3	1	3	3	2	-	-	-	2	-	-	1	2	-
U23EC382.3	3	1	3	3	3	-	-	-	2	-	-	2	2	-

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CO	PO	PSO	PSO											
	01	02	03	04	05	06	07	08	09	10	11	12	01	02
U23EC382.4	3	1	3	3	3	-	-	-	2	-	-	3	3	-
U23EC382.5	2	3	3	3	3	-	2	2	2	-	3	3	3	-
Course to PO	3	2	3	3	3	-	2	2	2	2	2	2	2	-

"3"—High, "2"—Medium, "1"—Low, “-”—No Correlation

U23EC382	Digital Principles and Computer Organization	L	T	P	J	C
		2	0	2	0	3

1. Course Description:

This course explores foundational concepts in digital systems, covering binary arithmetic, logic gates, and sequential circuits. Emphasis is placed on computer organization, including CPU architecture, memory systems, and input/output mechanisms. Students gain insights into how these components interact to form modern computing systems.

2. Course Objectives:

5. To understand the working of logic gates and Apply minimization techniques
6. To design of combinational logic circuits
7. To comprehend the operation of sequential logic circuits
8. To understand the basic computer organization.

3. Syllabus:

Unit-I: Logic Gates and Minimization Techniques

Basic Theorems and properties of Boolean algebra – canonical form and standard forms – digital logic gates – Minimization Techniques: K-Map (up to 4 variables) – Don't care condition - NAND & NOR Implementation.

Unit-II: Combinational Logic Circuits

Combinatorial Logic Circuits: Design Procedure – Half adder and Full adder – Half Subtractor and Full Subtractor – Magnitude comparator – Encoder and Decoder - Multiplexer and Demultiplexer – code converter (binary to gray, BCD to excess-3 and vice versa)

Unit-III: Sequential Logic Circuits

Sequential Circuits: Flip-flops-Triggering of Flip-flops- Registers – Shift Registers – Ripple Counters - Synchronous counters (up and down counter) – Random Access Memory (RAM)

Unit-IV: Basic Computer Organization

Data Representation: Fixed and Floating Point – Micro operations: Arithmetic, Logic, shift – Arithmetic Logic Shift Unit – Instruction Codes – Computer registers – Computer Instructions – Timing and control – Instruction Cycle – Design of Basic computer

Unit-V: Performance Enhancement Techniques

Parallel processing - Pipelining – Arithmetic and Instruction pipeline – RISC pipeline - Memory hierarchy Main memory - Cache memory – Characteristics and Multiprocessors – Interconnection Structures.

List of Experiments

8. Verification of Boolean theorems using logic gates.
9. Implementation of half adder and full adder using logic gates

- | |
|---|
| 10. Implementation of Multiplexer and De-multiplexer using logic gates. |
| 11. Verification of JK and D Flip-flops. |
| 12. Implementation of SISO and PIPO 4-bit shift register using Flip-flops. |
| 13. Construction and verification of 4 bit ripple counter. |
| 14. Design and implementation of 2 bit ALU using various combinational circuits |

Text Books:

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| 3. M. Morris Mano, Michael D Ciletti, "Digital Design", Pearson, 6/e, 2018 (Module I, II, III) |
| 4. Computer System Architecture, M. Morris Mano, Pearson Education, 3/e, 2017 (Module IV & V) |

References:

Reference Books:

- | |
|--|
| 6. Donald P. Leach and Albert Paul Malvino, "Digital Principles and Applications", MGH, 8/e, 2014 |
| 7. Thomas L. Floyd, "Digital Fundamentals", Pearson, 11/e, 2017 |
| 8. John L. Hennessy, David A. Patterson, "Computer Architecture A Quantitative Approach", Morgan Kaufmann Press, 5/e, 2012 |
| 9. William Stallings, "Computer Organization and Architecture: Designing for Performance", Pearson, 10/e, 2016 |

Web Resources:

- | |
|--|
| 1. https://www.geeksforgeeks.org/architecture-of-8085-microprocessor/ |
| 2. https://www.elprocus.com/embedded-system-programming-using-keil-c-language/ |
| 3. https://www.circuitbasics.com/introduction-to-the-raspberry-pi/ |
| 4. https://www.circuitbasics.com/getting-started-with-the-arduino/ |
| 5. https://projectacrn.github.io/1.6/tutorials/up2.html |

NPTEL Courses:

- | |
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| 1. https://onlinecourses.nptel.ac.in/noc20_ee42/preview |
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4. Course Outcomes:

CO. No.	Course Outcome	BTL	POs	PSOs
U23EC382.1	Understand the working of logic gates and Apply minimization techniques	K3	1, 2, 5, 9	1
U23EC382.2	Design of combinational logic circuits	K3	1, 2, 5, 9, 12	1, 2
U23EC382.3	Comprehend the operation of sequential logic circuits	K2	1, 2, 5, 9, 12	1, 2
U23EC382.4	Understand the basic computer organization	K2	1, 2, 5, 9, 12	1, 2
U23EC382.5	Understand the various performance enhancement techniques	K2	1, 2, 3, 4, 5, 7, 8, 9, 11, 12	1, 2

5. Course Articulation matrix:

CO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02
U23EC382.1	3	1	-	-	1	-	-	-	2	-	-	-	2	-

CO	PO	PSO	PSO												
	01	02	03	04	05	06	07	08	09	10	11	12	01	02	
U23EC382.2	3	1	-	-	2	-	-	-	2	-	-	1	2	1	
U23EC382.3	3	1	-	-	3	-	-	-	2	-	-	2	2	1	
U23EC382.4	3	1	-	-	3	-	-	-	2	-	-	3	3	2	
U23EC382.5	2	3	3	3	3	-	2	2	2	-	3	3	3	2	
Course to PO	3	2	3	2	3	-	2	2	2	2	2	2	2	2	

"3"—High, "2"—Medium, "1"—Low, "--"—No Correlation

U23AM491	Machine Learning	L	T	P	J	C
		2	0	2	2	4

1. Course Description

This course provides an introduction to the fundamental concepts, techniques, and applications of machine learning. Machine learning is a branch of artificial intelligence that enables systems to learn from data and improve their performance over time without being explicitly programmed. Through a combination of lectures, hands-on programming assignments, and practical projects, students will gain a solid understanding of various machine learning algorithms, their theoretical underpinnings, and how to apply them to real-world problems.

2. Course Objectives:

1. To understand the basic concepts of machine learning.
2. To understand and build supervised learning models.
3. To understand and build unsupervised learning models.
4. To learn the role of graphical models for machine learning.
5. To understand the basic concepts of neural networks.

3. Syllabus

Unit-I: INTRODUCTION

Machine Learning; Types of Machine Learning: Supervised Learning, Unsupervised Learning; Basic Concepts in Machine Learning, Machine Learning Process, Weight Space, Testing Machine Learning Algorithms, A Brief Review of Probability Theory: Turning Data into Probabilities, The Bias-Variance Trade off.

Unit-II: SUPERVISED LEARNING

Linear Models for Regression: Linear Basis Function Models, The Bias-Variance Decomposition, Bayesian Linear Regression, Common Regression Algorithms, Simple Linear Regression, Multiple Linear Regression, Linear Models for Classification: Discriminant Functions, Probabilistic Generative Models, Probabilistic Discriminative Models, Laplace Approximation, Bayesian Logistic Regression. Common Classification Algorithms: k-Nearest Neighbours, Decision Trees, Random Forest model, Support Vector Machines.

Unit-III: UNSUPERVISED LEARNING

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Mixture Models and EM: K-Means Clustering, Dirichlet Process Mixture Models, Spectral Clustering, Hierarchical Clustering. The Curse of Dimensionality: Dimensionality Reduction, Principal Component Analysis, Latent Variable Models (LVM), Latent Dirichlet Allocation (LDA).

Unit-IV: GRAPHICAL MODELS

Naive Bayes Classifiers, Bayesian Networks, Markov Model, Markov Random Fields, Learning, Hidden Markov Model Conditional Independence.

Unit-V: ADVANCED LEARNING

Reinforcement Learning: Representation Learning, Neural Networks, Active Learning, Ensemble Learning, Bootstrap Aggregation. Boosting: Gradient Boosting Machines. Vector Database.

Total Hours (Theory):30

List of Laboratory Experiments / Exercises

Total Hours (lab): 30

1.	Given the famous Iris dataset containing measurements of iris flowers, build a classifier to predict the species of iris based on sepal and petal dimensions. Explore basic classification algorithms such as logistic regression, k-nearest neighbours, and decision trees to classify the iris flowers into their respective species.
2.	Work with a dataset from a financial institution containing information about loan applicants, including demographics, credit history, and repayment status. Develop a probabilistic model to predict the probability of loan default based on applicant characteristics.
3.	Given a dataset of emails labelled as spam or non-spam, build a classifier to automatically classify new emails. Explore supervised classification algorithms such as logistic regression, support vector machines, and naive Bayes classifiers to distinguish between spam and non-spam emails.
4.	Work with a dataset of medical records containing patient information and diagnostic test results. Develop a classification model to predict the presence or absence of a medical condition (e.g., disease diagnosis) using algorithms such as support vector machines, neural networks, or ensemble methods.
5.	Work with a dataset of customer demographics and purchase history for a retail company. Use clustering algorithms such as k-means clustering or hierarchical clustering to segment customers into distinct groups based on their purchasing behavior and demographic attributes.
6.	Work with a dataset of high-dimensional images (e.g., from the CIFAR-10 dataset). Apply dimensionality reduction techniques such as principal component analysis (PCA) or autoencoders to compress the images while preserving important features.
7.	Analyze a dataset of user preferences and item interactions in an e-commerce platform. Build a graphical model to represent user-item relationships and dependencies, enabling personalized recommendations and product suggestions.
8.	Analyze a dataset of financial transactions, including information such as transaction amount, time, and location. Build a graphical model, such as a Bayesian network or Markov random field, to represent the dependencies between transaction features and detect fraudulent activities.

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9.	Work with a dataset of medical images, such as MRI scans or histopathology slides. Develop an image segmentation model using advanced techniques such as convolutional neural networks (CNNs) with architectures like U-Net or Deep Lab, to segment and identify specific structures or abnormalities in medical images.
10.	Analyse a dataset of customer reviews or social media posts labelled with sentiment. Develop an RNN-based model, such as LSTM (Long Short-Term Memory) or GRU (Gated Recurrent Unit), to perform sentiment analysis and classify the text into positive, negative, or neutral sentiment categories.
11.	Mini project: 1. Scenario 1: Healthcare Fraud Detection 2. Scenario 2: Sentiment Analysis for Social Media Marketing
Total Hours (Project):30	
Total Hours (Theory + Lab + Project):30+30+30=90	

Text Books:

1. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Fourth Edition, 2020.
2. Tom Mitchell, "Machine Learning", McGraw-Hill, 2017.
3. Stephen Marsland, "Machine Learning: An Algorithmic Perspective, "Second Edition", CRC Press, 2014.

References:

Reference Books:

1. Christopher Bishop, "Pattern Recognition and Machine Learning", Springer, 2006.
2. Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012.
3. Stephen Marsland, "Machine Learning – An Algorithmic Perspective", Second Edition, CRC Press, 2014.
4. Fabio Nelli, "Python Data Analytics with Pandas, Numpy, and Matplotlib", Second Edition, Apress, 2018.

Journals (Reference):

1. Sarker, I.H. Machine Learning: Algorithms, Real-World Applications and Research Directions. SN COMPUT. SCI. 2, 160 (2021). <https://doi.org/10.1007/s42979-021-00592-x>
2. Çelik, Ö., 2018. A research on machine learning methods and its applications. Journal of Educational Technology and Online Learning, 1(3), pp.25-40.
3. Pugliese, R., Regondi, S. and Marini, R., 2021. Machine learning-based approach: Global trends, research directions, and regulatory standpoints. Data Science and Management, 4, pp.19-29.

NPTEL Courses:

1. <https://nptel.ac.in/courses/106106139>
2. https://onlinecourses.nptel.ac.in/noc23_cs87/preview

4. Course Outcomes

CO. No.	Course Outcome	BTL	POs	PSOs
U23AM491.1	Apply the basic concepts of Machine Learning to real-world problems.	K3	1, 2, 3,4,5,6,8,12	1, 2
U23AM491.2	Apply supervised learning models to make predictions on new data.	K3	1, 2, 3,4,5,6,8,12	1, 2
U23AM491.3	Apply appropriate unsupervised learning algorithms for specific tasks	K3	1, 2, 3,4,5,6,8,12	1, 2
U23AM491.4	Analyse the performance of graphical models	K4	1, 2, 3,4,5,6,8,12	1, 2
U23AM491.5	Interpret the behaviour of neural network models	K3	1, 2, 3,4,5,6,8,12	1, 2

5. Course Articulation matrix

CO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02
U23AM491.1	2	2	1	2	2	2	-	1	-	-	-	1	3	3
U23AM491.2	2	2	3	2	2	2	-	1	-	-	-	1	3	3
U23AM491.3	2	2	3	2	2	2	-	1	-	-	-	1	3	3
U23AM491.4	2	2	3	2	2	2	-	1	-	-	-	1	3	3
U23AM491.5	2	2	3	2	2	2	-	1	-	-	-	1	3	3
Course to PO	2	2	2.8	2	2.1	1.8	-	1	-	-	-	1	3	3

"3"—High, "2"—Medium, "1"—Low, “-”—No Correlation

U23AD492	DATA SCIENCE	L 2	T 0	P 2	J 2	C 4
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1. Course Description

The course aims to provide students with a comprehensive understanding of data science, covering key concepts, methodologies, and tools essential for data analysis, interpretation, and decision-making. Students will learn to collect, preprocess, and analyze data from various sources using statistical techniques and machine learning algorithms. Students will gain practical experience in applying data science methods to real-world problems. By the end of the course, students will be equipped with the knowledge and proficiency needed to extract valuable insights from data, make informed decisions, and contribute effectively to the rapidly evolving field of data science.

2. Course Objectives:

- Gain a foundational understanding of data science concepts and methods.
- Develop the ability to collect, clean, and manage data.
- Learn how to analyse data using statistical and machine learning techniques.
- Develop the ability to solve real-world problems using data science.
- Develop an understanding of the ethical implications of data science

3. Syllabus

Unit-I: INTRODUCTION TO DATA SCIENCE AND DATA ACQUISITION

Data science: definition, scope, importance of data-driven decision making, interdisciplinary nature of data science, stages of data science life cycle; overview of data science tools and techniques, applications

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of data science; Data acquisition: Sources of data, data collection and API, web scraping: extracting data from websites, accessing different sources of data.

Unit-II: STATISTICAL CONCEPTS FOR DATA SCIENCE

Role of Statistics in Data Science; Population vs. Sample; Descriptive vs. Inferential statistics; Probability distributions: Poisson, Normal, Binomial, Uniform; Bayes' theorem and conditional probability; Descriptive statistics: Measures of central tendency: Mean, median, mode; Measures of dispersion: Variance, standard deviation; Inferential statistics: Hypothesis testing: Null and alternative hypotheses, p-values; Confidence intervals, ANOVA, Chi-square test, T-test; Correlation and Covariance.

Unit-III: DATA VISUALIZATION

Tableau: Introduction, Overview of Tableau interface and workspace; Features and advantages, connecting to data sources, importing data from local files and cloud storage services, creating basic visualizations in Tableau: Bar charts, line charts, scatter plots, pie charts, histograms, heatmaps, advanced visualization techniques in Tableau: Treemaps, bubble charts, box plots, dual-axis charts, combination charts, adding filters and parameters, building interactive dashboards in Tableau.

Power BI: Overview, connecting to data Sources in Power BI, Importing data from local files, databases, and web sources; creating basic visualizations in Power BI: Bar charts, line charts, scatter plots, pie charts, histograms, heatmaps; advanced visualization techniques in Power BI: Treemaps, bubble charts, box plots, dual-axis charts, combination charts, building interactive dashboards in Power BI.

Unit-IV: DATA EXPLORATION AND FEATURE ENGINEERING

Data analytics: descriptive analysis, diagnostic analytics, predictive analytics, predictive analytics; Data pre-processing: handling missing values – imputation techniques, dealing with outliers; Exploratory Data Analysis (EDA); Feature Engineering: One-hot encoding, label encoding, creating new features, dimensionality reduction techniques.

Unit-V: TOOLS FOR DATA SCIENCE

Microsoft Excel for data analysis: Introduction to Excel for basic data manipulation and analysis, data cleaning and formatting techniques in Excel, creating charts and graphs, pivot tables and pivot charts for summarizing and analyzing data, advanced Excel features for statistical analysis; Python packages for data science: NumPy for statistical analysis, data manipulation with Pandas data frames, data visualization using Matplotlib and Seaborn library.

Total Hours (Theory): 30 Hours

LIST OF EXPERIMENTS:

1. Web Scrapping

Use Case: Perform Web-Scrapping, create DataFrame by collecting the data from the website.

2. Exploratory Data Analysis: Perform Data Preprocessing & Data Wrangling on Netflix International Dataset

3. Exploratory Data Analysis: Perform EDA on Netflix International Dataset.

4. Fraud Detection in Financial Transactions

Use Case: A banking institution aims to detect fraudulent transactions by analyzing historical transaction data.

Experiment: Explore the dataset to identify patterns and anomalies indicative of fraudulent behavior. Develop new features such as transaction frequency, transaction amount, and geographical location. Apply anomaly detection techniques to flag suspicious transactions for further investigation.

5. Predictive Maintenance for Industrial Equipment

Use Case: A manufacturing plant wants to implement predictive maintenance strategies to minimize downtime and optimize equipment performance.

Experiment: Explore sensor data collected from industrial equipment to identify patterns associated with equipment failures. Engineer features such as equipment usage, temperature, and vibration levels. Train machine learning models to predict equipment failures before they occur based on historical sensor data.

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| 1. https://www.youtube.com/watch?v=-ETQ97mXXF0 |
| 2. https://www.youtube.com/watch?v=dcXqhnMqhZUo&t=2s |

NPTEL Courses:

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| 1. https://onlinecourses.nptel.ac.in/noc21_cs69/preview |
| 2. https://onlinecourses.nptel.ac.in/noc22_cs32/preview |

4. Course Outcomes

CO. No.	Course Outcome	BTL	POs	PSOs
U23AD492.1	Apply the fundamentals of data science for effective contribution to real-world.	K3	1-10, 12	1, 2
U23AD492.2	Analyze the distribution of data using various statistical techniques.	K4	1-10, 12	1, 2
U23AD492.3	Design interactive dashboards using suitable data science tools to reveal the insights of data.	K6	1-10, 12	1, 2
U23AD492.4	Apply the various data collection and exploration techniques to analyze the data.	K3	1-10, 12	1, 2
U23AD492.5	Analyze datasets using Python packages and Microsoft Excel to derive actionable.	K4	1-10, 12	1, 2

5. Course Articulation matrix

CO	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02
U23AD492.1	3	3	3	2	3	1	2	2	1	1	-	2	3	3
U23AD492.2	3	3	3	2	3	1	2	2	1	1	-	2	3	3
U23AD492.3	3	3	3	2	3	1	2	2	1	1	-	2	3	3
U23AD492.4	3	3	3	3	3	2	2	2	2	1	-	2	3	3
U23AD492.5	3	3	3	2	3	2	2	3	2	1	-	3	3	3
Course to PO	3	3	3	2	3	1	2	2	1	1	-	2	3	3

“3”—High, “2”—Medium, “1”—Low, “—”—No Correlation

U23MC904	Universal Human Values	L 2	T 0	P 0	J 0	C 1
1. Course Description	Universal Human Values explores fundamental ethical principles and humanistic values across cultures. The course encourages critical reflection on compassion, integrity, respect, and empathy, fostering personal growth and societal responsibility. Through interdisciplinary readings and discussions, students gain insights into the universal aspects of human dignity and moral conduct.					
2. Course Objectives:	1. Equip students with comprehensive knowledge and understanding of core concepts, theories, and practices within the subject area. 2. Develop students' practical skills and competencies necessary for professional practice, including critical thinking, problem-solving, and technical skills. 3. Enable students to apply theoretical knowledge to real-world scenarios through projects, case studies, and experiential learning opportunities.					

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6. Market Segmentation Analysis- Tableau	Use Case: A beverage company is planning to launch a new health drink targeted towards health-conscious consumers. However, they recognize that the health-conscious market is diverse, with varying preferences and needs. To ensure the success of their product, they decide to conduct a market segmentation analysis..
7. Covid-19 Trends- Power BI	Use Case: During the COVID-19 pandemic, public health authorities and policymakers need accurate and timely information to respond effectively to the evolving situation. Market segmentation analysis can be a valuable tool to understand how different population segments are affected by the virus, which can inform targeted interventions and resource allocation.
8. Exploring COVID-19 Data Trends	Use Case: Health authorities want to visualize and analyze trends in COVID-19 cases to inform public health policies. Experiment: Collect COVID-19 data from reliable sources such as government health departments. Use data visualization tools to create interactive dashboards displaying trends in case counts, testing rates, and vaccination coverage. Analyze the data to identify hotspots and patterns over time.
9. Visualizing Stock Market Volatility	Use Case: Financial analysts want to visualize and analyze stock market volatility to make informed investment decisions. Experiment: Gather historical stock market data from financial databases. Use data visualization techniques to create candlestick charts and volatility plots showing price fluctuations and trading volumes. Apply technical analysis indicators such as moving averages and Bollinger Bands to identify potential trading opportunities.
10. Sales Performance Analysis	Use Case: Analyze sales data to identify top-performing products and regions for strategic decision-making. Experiment: Analyze sales data using Microsoft Excel to uncover insights into sales performance and trends. Utilize Excel's data manipulation, visualization, and analysis tools to examine total sales revenue, product performance, regional sales distribution, and sales trends over time.
11. Mini-Project	Total Hours (Lab + Project): 30+30=60 Total Hours 30+30+30=90

Text Books:

1. Avrim Blum, John Hopcroft, and Ravindran Kannan, "Foundations of Data Science", Springer-2018
2. Suresh Kumar Mukhiya, Usman Ahmed, "Hands-On Exploratory Data Analysis with Python", O'Reilly, 2013.
3. Cathy O'Neil, Rachel Schutt, "Doing Data Science, Straight Talk from The Frontline", O'Reilly, 2013.
4. Chandraish Sinha, "Tableau 10 for Beginners: Step by Step Guide to Developing Visualizations in Tableau 10", Createspace Independent Pub, 2017.

References:

Reference Books:

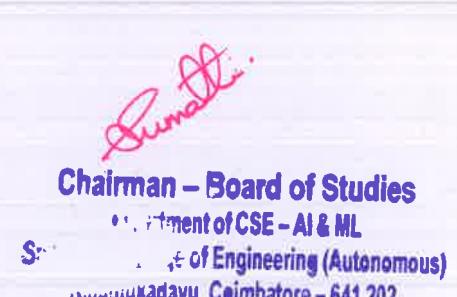
1. Dean J, "Big Data, Data Mining and Machine learning", Wiley publications, 2014.
2. Provost F and Fawcett T, "Data Science for Business", O'Reilly Media Inc, 2013.
- 3: https://onlinecourses.nptel.ac.in/noc21_cs69/
4. <https://pli.harvard.edu/course/data-science-visualization>

Journals (Reference):

1. <https://jds-online.org/journal/JDS>
- 2: <https://link.springer.com/journal/41060>
3. <https://epjdatascience.springeropen.com/>

Video references:

	4. Foster the ability to critically analyze information, evaluate evidence, and make informed decisions, preparing students for advanced study or professional careers
	Unit-I: Introduction to Value Education Understanding Value Education, Self – exploration as the process for Value Education, Continuous Happiness and Prosperity - the Basic Human Aspirations, Happiness and Prosperity – Current Scenario, method to fulfil the Basic Human Aspirations
	Unit-II: Harmony in the Human Being Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health
	Unit-III: Harmony in the Family and Society Harmony in the Family – the Basic Unit of Human Interaction, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Other Feelings, Justice in Human-to-Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order
	Unit-IV: Harmony in the Nature/Existence Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfillment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence
	Unit-V: Implications of the Holistic Understanding – a Look at Professional Ethics Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics Holistic Technologies, Production Systems and Management Models-Typical Case Studies, Strategies for Transition
	Text Books: <ol style="list-style-type: none"> 1. The Textbook A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034- 47-1 2. The Teacher's Manual for A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G
	References: (Reference Books, Journals, Magazines, and Supplementary materials like videos and MOOC references (preferably NPTEL/Udemy)



1.	<p>Journals:</p> <p>1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999.</p> <p>2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.</p> <p>3. The Story of Stuff (Book).</p> <p>4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi</p> <p>Video References:</p> <p>Value Education websites,</p> <ul style="list-style-type: none"> • https://www.uhv.org.in/uhv-ii, • http://uhv.ac.in, • http://www.uptu.ac.in • http://www.storyofstuff.com • https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw • https://fdp-si.aicte-india.org/8dayUHV_download.php • https://www.youtube.com/watch?v=8ovkLRYXIjE • https://www.youtube.com/watch?v=OgdNx0X923I • https://www.youtube.com/watch?v=nGRcbRpvGoU • https://www.youtube.com/watch?v=sDxGXOgYEKM
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