Francis Xavier Engineering College

(An Autonomous Institution)
Tirunelveli 627 003
Department of Computer Science and Business Systems

Curriculum and Syllabi – R 2024-UG

CHOICE BASED CREDIT SYSTEM AND OBE

Vision of the Department

To become a center of excellence in Computer Technology and to generate young Engineers with enriched knowledge to serve industries with high values and social responsibilities.

Mission of the Department

- To provide world class teaching learning environment and to offer computing education programs.
- To inculcate varied skill sets that meets global industry standards and to practice moral values.
- To enrich moral and ethical values to lead and serve the society.

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Programme Educational Outcomes (PEOs)

PEO1**:** To apply problem solving skills in Computer science and Business Management by applying Engineering fundamentals.
PEO2: To improve communication skills, business management skills, professional ethics, team work and to innovate technologies for the betterment of society.
PEO3: To exhibit leadership qualities, interpersonal skills and adapting to a rapidly changing environment by applying knowledge in technology abstraction and common business principles.
PEO4: To develop professional and ethical attitude, effective communication skills, moral values and an ability to relate engineering issues to social welfare in contemporary areas in Computer Science and Business systems.

Programme Specific Objectives (PSOs)

PSO1: Enriched knowledge in Business Management and human ethics.
PSO2: The students will have effective knowledge in software engineering principles and solving scientific and business problems.
PSO3: The students will explore **e**merging technologies in Information and Communication Technologies (ICT), Business Analytics and Machine Learning to innovate ideas and solutions to existing/novel Business applications.

Programme Outcomes (POs)

Engineering Graduates will be able to:

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

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

3. 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 the public health and safety, and the cultural, societal, and environmental considerations.

4. 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.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. 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.

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

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

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. 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.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one‟s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. 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.

Mapping with PO Vs PEO, PSO

PO	PEO1	PEO2	PEO3	PEO4
1	3	3	3	3
2	3			
3	3			2
4	3			
5		3		
6		3		3
7				3
8				3
9		2	3	
10		3		2
11		3	2	
12		3	2	2
PSO1	2	2	3	
PSO2	3	2		2
PSO3		3		

FRANCIS XAVIER ENGINEERING COLLEGE

B.Tech – COMPUTER SCIENCE AND BUSINESS SYSTEMS REGULATIONS 2024

S. No	CATEGORY	CREDITS PER SEMESTER								TOTAL CREDITS	CREDITS IN %
		I	II	III	IV	V	VI	VII	VIII		
1	HSSM	4	3	3	2					12	7.3
2	BS	10		4	4					22	13.3
3	ES	7	12							19	11.5
4	PC		8	13	12	11	7	11		62	37.6
5	PE					6	6	6		18	10.9
6	OE			3	3	3	3			12	7.3
7	EEC			1	2	2	3	2	9	20	12.1
TOTAL		21	24	24	23	22	23	19	9	165	100

Minimum Number of Credits to be acquired:165

HSSM - Humanities and Social Sciences Including Management
BS - Basic Science
ES - Engineering Science
EEC - Employability Enhancement Course
PC - Professional Core
OE - Open Elective
PE - Professional Elective
MC - Mandatory Course

FRANCIS XAVIER ENGINEERING COLLEGE
B.Tech – COMPUTER SCIENCE AND BUSINESS SYSTEMS REGULATIONS 2024
Choice Based Credit System and Outcome Based Education
I-VIII Semester Curriculum and Syllabi

SEMESTER I

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	24MA1202	Linear Algebra and Calculus	BS	4	3	1	0	4
2	24CS1501	Introduction to Programming with C	ES	3	3	0	0	3
3	24PH1301	Applied Physics	BS	2	2	0	0	2
4	24CY1401	Applied Chemistry	BS	2	2	0	0	2
Theory cum Practical Courses								
1	24HS1102	Business Communication and Value Science-I	HSSM	4	2	0	2	3
Practical								
1	24PC1311	Applied Physics and Chemistry Laboratory	BS	4	0	0	4	2
2	24GE1511	Engineering Practices Laboratory	ES	2	0	0	2	2
3	24CS1511	Programming Practice Laboratory Using C	ES	4	0	0	4	2
Mandatory Course								
1	24HS1103	Tamil Heritage/தமிழர் மரபு	HSSM	1	1	0	0	1
Total				26	13	1	12	21

SEMESTER II

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	24HS2101	Business Communication and Value Science – II	HSSM	2	2	0	0	2
2	24CB2601	Fundamentals of Economics	PC	2	2	0	0	2
3	24EE2501	Fundamentals of Electrical and Electronics Engineering	ES	3	3	0	0	3
4	24ME1501	Engineering Graphics	ES	6	2	0	4	4
5	24CS2501	Introduction to Computing Using Python	ES	3	3	0	0	3
6	24GE2901	Design Thinking	EEC	1	1	0	0	1
Theory cum Practical Courses								
1	24CB2602	Digital principles and Computer Organization	PC	5	3	0	2	4
Practical Courses								
1	24AI2611	Artificial Intelligence Tools Laboratory	PC	4	0	0	4	2

2	**24CS2511**	**Python Programming Laboratory**	**ES**	**4**	**0**	**0**	**4**	**2**
Mandatory Courses								
1	**24HS2103**	**Technology In Tamil Culture/ தமிழரும் தொழில்நுட்பமும்**	**HSSM**	**1**	**1**	**0**	**0**	**1**
Total				**31**	**17**	**0**	**14**	**24**
SEMESTER III								
S.No	**Course Code**	**Course Name**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
Theory								
1	**24MA3205**	**Probability and Statistical Techniques**	**BS**	**4**	**3**	**1**	**0**	**4**
2	**24CS3602**	**Object Oriented Programming using Java**	**PC**	**3**	**3**	**0**	**0**	**3**
3	**24AI3601**	**Data Structures and Algorithm Analysis**	**PC**	**3**	**3**	**0**	**0**	**3**
4	**24OEXXX**	**Open Elective – I**	**OE**	**3**	**3**	**0**	**0**	**3**
5	**24HS3101**	**Introduction to Business Systems**	**HSSM**	**3**	**3**	**0**	**0**	**3**
6	**24CB3602**	**Entrepreneurship and Innovation**	**PC**	**3**	**3**	**0**	**0**	**3**
Practical Courses								
1	**24CS3612**	**Object Oriented Programming Laboratory using Java**	**PC**	**4**	**0**	**0**	**4**	**2**
2	**24AI3611**	**Data Structures and Algorithm Analysis Laboratory**	**PC**	**4**	**0**	**0**	**4**	**2**
3	**24PT3902**	**Soft skills –Verbal Ability**	**EEC**	**1**	**0**	**0**	**2**	**1**
Total				**28**	**18**	**1**	**10**	**24**
SEMESTER IV								
S.No	**Course Code**	**Course Name**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
Theory Courses								
1	**24IT4602**	**Automata Theory and Compiler Design**	**PC**	**4**	**3**	**1**	**0**	**4**
2	**24CS4601**	**Database and SQL Programming**	**PC**	**3**	**3**	**0**	**0**	**3**
3	**24MA4201**	**Mathematical Structure for Engineers**	**BS**	**4**	**3**	**1**	**0**	**4**
4	**24HS4101**	**Professional Ethics and Human values**	**HSSM**	**2**	**2**	**0**	**0**	**2**
5	**24OE4XXX**	**Open Elective – II**	**OE**	**3**	**3**	**0**	**0**	**3**
Theory cum Lab courses								
1	**24IT4603**	**Operating Systems**	**PC**	**4**	**2**	**0**	**2**	**3**
Practical Courses								
1	**24CS4611**	**Database and SQL Programming Laboratory**	**PC**	**4**	**0**	**0**	**4**	**2**
2	**24CB4911**	**Design Thinking Project**	**EEC**	**2**	**0**	**0**	**2**	**1**

3	24PT3901	Soft skills –Aptitude I	EEC	1	0	0	2	1
Total				27	16	2	10	23
SEMESTER V								
S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	24IT5601	Data Communication and Computer Networks	PC	3	3	0	0	3
2	24CB57XX	Professional Elective I	PE	3	3	0	0	3
3	24CB57XX	Professional Elective II	PE	3	3	0	0	3
4	24OE5XXX	Open Elective III	OE	3	3	0	0	3
Theory cum Practical								
1	24IT5603	Software Engineering and Testing	PC	4	2	0	2	3
1	24CB5601	Legal Aspects of Information Security	PC	4	2	0	2	3
Practical Courses								
1	24IT5611	Networks Laboratory	PC	4	0	0	4	2
2	24HS5911	Communication and Soft Skills Laboratory	EEC	2	0	0	2	1
3	24PT5901	Soft skills –Reasoning	EEC	1	0	0	2	1
Total				27	16	0	12	22
SEMESTER VI								
S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	24CB6601	Business Strategy	PC	2	2	0	0	2
2	24CB6602	Artificial Intelligence and Logical Thinking	PC	3	3	0	0	3
3	24CB67XX	Professional Elective III	PE	3	3	0	0	3
4	24CB67XX	Professional Elective IV	PE	3	3	0	0	3
5	24OE6XXX	Open Elective IV	OE	3	3	0	0	3
Theory cum Practical Courses								
1	24CB6603	Computational Statistics	BS	5	3	0	2	4
Practical Course								
1	24CB6611	Generative Artificial Intelligence Lab	PC	4	0	0	4	2
2	24CB6911	Internship	EEC	4	0	0	4	2
3	24PT5901	Soft skills –Aptitude II	EEC	1	0	0	2	1
Mandatory Courses								
1	24GE6M01	Environmental and Sustainable Engineering	MC	2	2	0	0	0
Total				30	17	0	14	23

SEMESTER VII								
S.No	**Course Code**	**Course Name**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
Theory Courses								
1	**24CB7601**	**Financial Management**	**PC**	**3**	**3**	**0**	**0**	**3**
2	**24CB77XX**	**Professional Elective V**	**PE**	**3**	**3**	**0**	**0**	**3**
3	**24CB77XX**	**Professional Elective VI**	**PE**	**3**	**3**	**0**	**0**	**3**
Theory cum Practical Courses								
1	**24CB7602**	**Statistical Modelling**	**PC**	**5**	**3**	**0**	**2**	**4**
2	**24CB7603**	**Machine Learning for Financial Applications**	**PC**	**5**	**3**	**0**	**2**	**4**
Practical Courses								
1	**24CB7911**	**Creative and Innovative Project**	**EEC**	**4**	**0**	**0**	**4**	**2**
Total				**23**	**15**	**0**	**8**	**19**
SEMESTER VIII								
S.No	**Course Code**	**Course Name**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
1	**24CB8911**	**Project Work**	**EEC**	**18**	**0**	**0**	**18**	**9**
Total				**18**	**0**	**0**	**18**	**9**

Total Credits = 165

Humanities and Social Sciences Including Management

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
1.	24HS1102	Business Communication and Value Science-I	HSSM	4	2	0	2	3
2.	24HS1103	Tamil Heritage/தமிழர் மரபு	HSSM	1	1	0	0	1
3.	24HS2101	Business Communication and Value Science – II	HSSM	2	2	0	0	2
4.	24HS2103	Technology In Tamil Culture/ தமிழரும் தொழில்நுட்பமும்	HSSM	1	1	0	0	1
5.	24HS3101	Introduction to Business Systems	HSSM	3	3	0	0	3
6.	24HS4101	Professional Ethics and Human values	HSSM	2	2	0	0	2
			Total	13	11	0	2	12

List Basic Science Courses

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
1	24MA1202	Linear Algebra and Calculus	BS	4	3	1	0	4
2	24PH1301	Applied Physics	BS	2	2	0	0	2
3	24CY1401	Applied Chemistry	BS	2	2	0	0	2
4	24MA3205	Probability and Statistical Techniques	BS	4	3	1	0	4
5	24MA4201	Mathematical Structure for Engineers	BS	4	3	1	0	4
Theory cum Practical Courses								
6	24CB6603	Computational Statistics	BS	5	3	0	2	4
Practical Courses								
7	24PC1311	Applied Physics and Chemistry Laboratory	BS	4	0	0	4	2
			Total	25	16	3	6	22

List of Engineering Science Courses

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	24CS1501	Introduction to Programming with C	ES	3	3	0	0	3
2	24EE2501	Fundamentals of Electrical and Electronics Engineering	ES	3	3	0	0	3

3	24ME1501	Engineering Graphics	ES	6	2	0	4	4
4	24CS2501	Introduction to Computing Using Python	ES	3	3	0	0	3
Practical Courses								
1	24GE1511	Engineering Practices Laboratory	ES	2	0	0	2	2
2	24CS1511	Programming Practice Laboratory Using C	ES	4	0	0	4	2
3	24CS2511	Python Programming Laboratory	ES	4	0	0	4	2
Total				25	11	0	14	19

List of Employability Enhancement Course

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	24GE2901	Design Thinking	EEC	1	1	0	0	1
Practical Courses								
1	24PT3902	Soft skills –Verbal Ability	EEC	1	0	0	2	1
2	24CB4911	Design Thinking Project	EEC	2	0	0	2	1
3	24PT3901	Soft skills –Aptitude I	EEC	1	0	0	2	1
4	24HS5911	Communication and Soft Skills Laboratory	EEC	2	0	0	2	1
5	24PT5901	Soft skills –Reasoning	EEC	1	0	0	2	1
6	24CB6911	Internship	EEC	4	0	0	4	2
7	24PT5901	Soft skills –Aptitude II	EEC	1	0	0	2	1
8	24CB7911	Creative and Innovative Project	EEC	4	0	0	4	2
9	24CB8911	Project Work	EEC	18	0	0	18	9
Total				35	1	0	38	20

List of Professional Core

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	24CB2601	Fundamentals of Economics	PC	2	2	0	0	2
2	24CS3602	Object Oriented Programming using Java	PC	3	3	0	0	3
3	24AI3601	Data Structures and Algorithm Analysis	PC	3	3	0	0	3

4	24CB3602	Entrepreneurship and Innovation	PC	3	3	0	0	3
5	24IT4602	Automata Theory and Compiler Design	PC	4	3	1	0	4
6	24CS4601	Database and SQL Programming	PC	3	3	0	0	3
7	24IT5601	Data Communication and Networks	PC	3	3	0	0	3
8	24CB6601	Business Strategy	PC	2	2	0	0	2
9	24CB6602	Artificial Intelligence and Logical Thinking	PC	3	3	0	0	3
10	24CB7601	Financial Management	PC	3	3	0	0	3

Practical Courses

11	24AI2611	Artificial Intelligence Tools Laboratory	PC	4	0	0	4	2
12	24CS3612	Object Oriented Programming Laboratory using Java	PC	4	0	0	4	2
13	24AI3611	Data Structures and Algorithm Analysis Laboratory	PC	4	0	0	4	2
14	24CS4611	Database and SQL Programming Laboratory	PC	4	0	0	4	2
15	24IT5611	Networks Laboratory	PC	4	0	0	4	2
16	24CB6611	Generative Artificial Intelligence Lab	PC	4	0	0	4	2

Theory cum Practical Courses

17	24CB2602	Digital principles and Computer Organization	PC	5	3	0	2	4
18	24IT4603	Operating Systems	PC	4	2	0	2	3
19	24IT5603	Software Engineering and Testing	PC	4	2	0	2	3
20	24CB5601	Legal Aspects of Information Security	PC	4	2	0	2	3
21	24CB7602	Statistical Modelling	PC	5	3	0	2	4
22	24CB7603	Machine Learning for Financial Applications	PC	5	3	0	2	4
			Total	80	43	1	36	62

List of Mandatory Courses

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	24GE6M01	Environmental and Sustainable Engineering	MC	2	2	0	0	0

List of Professional Electives Courses

S.No	Course Code	Course Name	Semester	L	T	P	C	Stream/Domain
Professional Elective I								
1	21CB5701	Text Analytics	5	3	0	0	3	Data Analytics
2	21CB5702	Business Analytics	5	3	0	0	3	Business Analytics
3	21CB5703	Marketing Research	5	3	0	0	3	Business Management
4	21CB5704	Virtualization and Cloud Computing	5	3	0	0	3	Virtualized Computing
5	21CB5705	Cognitive Science and Analytics	5	3	0	0	3	Intelligent Systems and Automation
Professional Elective II								
1	21CB5706	Data Analysis and Visualization	5	3	0	0	3	Data Analytics
2	21CB5707	Scrum Agile Technology	5	3	0	0	3	Business Analytics
3	21CB5708	Enterprises Systems	5	3	0	0	3	Business Management
4	21CB5709	Cloud Networking	5	3	0	0	3	Virtualized Computing
5	21CB5710	Quantum Computing	5	3	0	0	3	Intelligent Systems and Automation
Professional Elective III								
1	21CB6701	Data Mining	6	3	0	0	3	Data Analytics
2	21CB6702	Computational finance & modelling	6	3	0	0	3	Business Analytics
3	21CB6703	Industrial Psychology	6	3	0	0	3	Business Management
4	21CB6704	Storage Technologies	6	3	0	0	3	Virtualized Computing
5	21CB6705	Artificial Intelligence in Robotics	6	3	0	0	3	Intelligent Systems and Automation
Professional Elective IV								
1	21CB6706	Big Data Technologies	6	3	0	0	3	Data Analytics

2	21CB6707	Marketing Analytics	6	3	0	0	3	Business Analytics
3	21CB6708	Business Ideas and Pitching	6	3	0	0	3	Business Management
4	21CB6709	Containers and Kubernetes	6	3	0	0	3	Virtualized Computing
5	21CB6710	Recommendation Systems	6	3	0	0	3	Intelligent Systems and Automation
Professional Elective V								
1	21CB7701	Natural Language Processing	7	3	0	0	3	Data Analytics
2	21CB7702	Digital Marketing	7	3	0	0	3	Business Analytics
3	21CB7703	Human Resource Management for Business	7	3	0	0	3	Business Management
4	21CB7704	Security and Privacy in Cloud	7	3	0	0	3	Virtualized Computing
5	21CB7705	Prompt Engineering	7	3	0	0	3	Intelligent Systems and Automation
Professional Elective VI								
1	21CB7706	Business Intelligence and Data Warehousing	7	3	0	0	3	Data Analytics
2	21CB7707	Financial Analytics	7	3	0	0	3	Business Analytics
3	21CB7708	Software project management	7	3	0	0	3	Business Management
4	21CB7709	Cloud Native Security Tools	7	3	0	0	3	Virtualized Computing
5	21CB7710	Augmented Reality and Virtual Reality	7	3	0	0	3	Intelligent Systems and Automation

List of Open Electives

Open Elective - I

S.No	Course Code	Course Name	Sem	L	T	P	C	Offered By
1	21CB3801	Digital Forensics	3	3	0	0	3	CSBS
2	21CB3802	Big Data Technologies	3	3	0	0	3	CSBS
3	21CB3803	Cloud, Microservices and Applications	3	3	0	0	3	CSBS
4	21CB3804	Network Science and Applications	3	3	0	0	3	CSBS
5	21CB3805	Analytics of Things	3	3	0	0	3	CSBS

Open Elective – II

S.No	Course Code	Course Name	Sem	L	T	P	C	Offered By
6	21CB4801	Data mining and analytics	4	3	0	0	3	CSBS
7	21CB4802	Privacy and Security in IoT	4	3	0	0	3	CSBS
8	21CB4803	Fundamentals of Fog and Edge Computing	4	3	0	0	3	CSBS
9	21CB4804	IoT Architectures and Protocols	4	3	0	0	3	CSBS
10	21CB4805	Business process management	4	3	0	0	3	CSBS

Open Elective – III

S.No	Course Code	Course Name	Sem	L	T	P	C	Offered By
11	21CB5801	Software Design Architecture	5	3	0	0	3	CSBS
12	21CB5802	Human Computer Interaction	5	3	0	0	3	CSBS
13	21CB5803	Game Designing	5	3	0	0	3	CSBS
14	21CB5804	Blockchain and cryptocurrency technologies	5	3	0	0	3	CSBS
15	21CB5805	Cryptology and Analysis	5	3	0	0	3	CSBS

Open Elective – IV

S.No	Course Code	Course Name	Sem	L	T	P	C	Offered By
16	21CB6801	Business Project Management	6	3	0	0	3	CSBS
17	21CB6802	Entrepreneurship and Innovation	6	3	0	0	3	CSBS
18	21CB6803	Introduction to Data Science and Machine Learning	6	3	0	0	3	CSBS
19	21CB6804	Information Systems for Engineering Management	6	3	0	0	3	CSBS
20	21CB6805	E-commerce and Digital Marketing Strategies	6	3	0	0	3	CSBS

SEMESTER I

S.No	Course Code	Course Name	Category	Contact Periods	L	T	P	C
Theory Courses								
1	24MA1202	Linear Algebra and Calculus	BS	4	3	1	0	4
2	24CS1501	Introduction to Programming with C	ES	3	3	0	0	3
3	24PH1301	Applied Physics	BS	2	2	0	0	2
4	24CY1401	Applied Chemistry	BS	2	2	0	0	2
Theory cum Practical Courses								
1	24HS1102	Business Communication and Value Science-I	HSSM	4	2	0	2	3
Practical								
1	24PC1311	Applied Physics and Chemistry Laboratory	BS	4	0	0	4	2
2	24GE1511	Engineering Practices Laboratory	ES	2	0	0	2	2
3	24CS1511	Programming Practice Laboratory Using C	ES	4	0	0	4	2
Mandatory Course								
1	24HS1103	Tamil Heritage/தமிழர் மரபு	HSSM	1	1	0	0	1
Total				26	13	1	12	21

Theory Courses

24MA1202	LINEAR ALGEBRA AND CALCULUS	L	T	P	C
		3	1	0	4

Preamble:

The course consists of topics in Matrices, Differential calculus, Differential Equations and Vector spaces with applications to various engineering problems. This course will cover the following main topics: Cayley Hamilton Theorem, Vector spaces, Linear independence and linear dependence Bases and dimensions, Linear transformation, Linear differential equations of second order with constant coefficients,MethodsofVariationparameter,Taylor'sexpansionoftwovariables,MaximaandMinima For two variables.

Prerequisites for the course:

Students should have basic knowledge about Matrices, Group theory and Differentiation.

Objectives

1. To apply advanced matrix knowledge to Engineering problems.
2. To reduce the given matrix into canonical form and to decompose the given matrix
3. To Understand the concepts of subspaces, bases, dimension and Linear Transformation.
4. To familiarize with the applications of differential equations.
5. To familiarize with the functions of several variables

UNIT I	MATRICES	9+3

Introduction- Types of matrices-Matrix operations–Power of a Matrix – Rank of a matrix – Eigen values and Eigen vectors of a matrix–Properties of Eigen values and Eigen vectors of a matrix-Cayley Hamilton

Theorem – Applications of Cayley Hamilton theorem.

UNIT II	DIAGONALIZATION AND QUADRATIC FORMS	9+3

Diagonalization of a matrix by similarity transformation- Diagonalization of a matrix by orthogonal transformation - Quadratic forms - Reduction of Quadratic form to canonical form -LU decomposition – Problems.

UNIT III	VECTOR SPACES AND LINEAR TRANSFORMATION	9+3

Vector spaces — Subspaces — Linear combinations and linear system of equations — Linear independence and linear dependence — Bases and dimensions – Linear transformation-Algebra of linear transformations-Isomorphism-Representation of transformations

By Matrices –Inverse of a linear transformation.

UNIT IV	ORDINARY DIFFERENTIAL EQUATIONS	9+3

Differential Equations - Linear equations of second order with constant coefficients of types exponential, trigonometry, polynomial and its combination forms-Methods of Variation parameter-Linear equations

Of second order with variable coefficients(Cauchy–Euler type)

UNIT V	MULTIVARIABLE CALCULUS	9+3

Function of two variables–Partial derivatives–Taylor's expansion for two variables–Maxima and Minima for two variables–Jacobians of two and three variables–Euler's theorem for homogeneous function(without proof).

Total Periods	45+15=60 Periods

Suggestive Assessment Methods

Continuous Assessment Test (20 Marks)	Formative Assessment Test (20 Marks)	End Semester Exams (60 Marks)
1.DescriptiveQuestions	1.Assignment 2. Online Quizzes	1.Descriptive Questions

Outcomes

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

CO1:Find the eigen values, eigen vectors, inverse and the positive powers of a square matrix**.(Apply)**

CO2:Solve Linear Equations by LU decomposition which is used in Image processing**.(Apply)**

CO3:Apply the concept of vector spaces and Linear transformations in real life problems**(Apply)**

CO4:Identify the suitable method to solve second and higher order differential equations **(Apply)**

CO5:Find the maxima and minima for a given function with several variables, through by finding stationary points **(Apply)**

Text Books

1. Margalit and Rabinoff, Interactive Linear Algebra , Georgia Institute of Technology.
2. David C. Lay, Linear Algebra and its applications, Global Edition, 6th Edition, 2021.
3. B. S. Grewal, "Higher Engineering Mathematics",43rd edition, 2017.
4. James Stewart, Calculus–Early Transcendals, 8thEdition, 2016.

Reference Books

1. N. P. Bali, Dr. Manish Goyal, A Text book of Engineering Mathematics, University Science Press, 9th Edition, 2016.
2. K.Ganesan,SundarammalKesavan,K.S.GanapathySubramanian&V.Srinivasan,"Calculusand Solid Geometry", Revised Edition, 2017

Web Resources

1. https://www.udemy.com/topic/linear-algebra
2. https://www.edx.org/course/introduction-to-linear-models-and-matrix-algebra
3. https://www.deeplearningbook.org/contents/linear_algebra.html
4. https://onlinecourses.nptel.ac.in/noc23_ma88/preview

CO Vs PO Mapping and CO Vs PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3											1		
2	3	3											1		
3	1	3											1		
4	3	3		1									1		
5	3	2		1									1		

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1(CO1): (Apply)

1) Three Football players Messi, Ronaldo and Neymar are throwing a ball to each other. Messi, throwsthe ball to himself by two times, to Neymar one time and never throws to Ronaldo. Ronaldo throws the ball to himself by two times and never throws the ball to Messi and Neymar. Neymar throws the ball toMessi one time and to himself by two times and he never the balls to Ronaldo.

i) Write down the matrix of the above problem
ii) In the characteristic equation $\lambda^3 - S_1\lambda^2 + S_2\lambda - S_3 = 0$. what is S_2?
iii) what is S_3?
iv) Write down the characteristic equationv)Find its eigen value
vi)Find the eigen vectors.

2)A salesperson has the following record of sales for the month of June, July and August 2023 forthree products A, B, and C.

Months	Sales in Units		
	A	B	C
June	2	2	1
July	1	3	1
August	1	2	2

i) Write down the matrix of the above problem
ii) In the characteristic equation $\lambda^3 - S_1\lambda^2 + S_2\lambda - S_3 = 0$ what is S_1,?
iii) what is S_2?
iv) what is S_3?
v) Write down the characteristic equation
vi) Verify Cayley Hamilton theorem for the above situation
vii) Find the inverse of the above matrix.

COURSE OUTCOME 2(CO2): (Apply)

1) Reduce the Quadratic form $3x^2 + 5y^2 + 3z^2 - 2yz + 2zx - 2xy$ to the canonical formand specify the matrix of transformation.

2) Reduce the Quadratic form $6x^2 + 3y^2 + 3z^2 - 4xy - 2yz + 4xz$ into the canonicalform by orthogonal reduction.

COURSE OUTCOME 3(CO3): (Apply)

1) For each of the following list of vectors in R3.Determine whether the first vector can beexpressed as a linear combination of the other two

(i) (-2,0,3),(1,3,0),(2,4,-1)

(ii) (3,4,1),(1,-2,1),(-2,-1,1).

2) Find the matrix [T]e whose linear operator $T(x, y) = (5x + y, 3x - 2y)$.

COURSE OUTCOME 4(CO4): (Apply)

1) Consider the differential equation y'' - 3y' + 4y = 4 and answer the following
   i) The order and degree of the above differential equation is------ & ---- ----
   ii) The auxiliary equation of the above ODE is _
   iii) The roots of the auxiliary equations are
   iv) The complementary function of the above ODE is
   v) The particular integral is

2) Solve by method of variation of parameters$(D^2 + 4)y = tan2x$.

COURSE OUTCOME 5(CO5): (Apply)

1) Expand the given power signal $f(x, y) = e^x \log(1 + y)$ as a Taylor's series in the powers of xand y up to the third degree terms.

NPTEL/SWAYAM Course:

S. No.	NPTEL Course Name	Instructor	Host Institute
1.	Engineering Mathematics - I	Prof. Jitendra Kumar	IIT Kharagpur

Prepared By

Mrs. A. Reshiya, AP/Maths

Verified By

Mr. A. Santiago Stephen, Asso. Prof/ Maths

24CS1501	INTRODUCTION TO PROGRAMMING WITH C	L	T	P	C
		2	1	0	3

Preamble

This course aims to provide the students with a foundation of structured and procedural programming with computer programming and C programming concepts. The focus is to develop the basic programming skills in students, and to improve their proficiency in applying the basic knowledge of programming to solve problems. This will enable the students to develop modular applications related to the field of engineering.

Pre-requisites for the course

- NIL

Objectives

1. To learn the introduction to computing and basics of structured programming with C.
2. To learn Control structures and functions and their implementation in C.
3. To learn arrays and strings concepts & functions in C and use pointers for storing data in the main memory efficiently.
4. To learn structures and union concepts of C Programming
5. To learn file processing functions and further develop applications in C.

UNIT I	INTRODUCTION TO COMPUTING AND C LANGUAGE	6+3

Introduction to Computing - Memory, Registers - Variables, Values, Instructions, Programs - Computer Languages (Machine/Assembly/High level language) - Compilers, Assemblers, Interpreters, Loaders Programming paradigms – Data representation and conversions – Pseudocode - Flowchart

C: Evolution of C, Characteristics and applications of C - Structure of a 'C' program – Compilation and Execution of C Program-Data Types- Variables- Constants, Type Conversion- Type casting, C Tokens- Keywords- Identifiers-Operators – Precedence and Associativity – I/O statements –Simple programs.

SUGGESTED ACTIVITIES

- Demonstrate Algorithms and Flowcharts using tools.
- Demonstrate the use of data types, operators in C.
- Demonstrate simple programs with I/O statements.

SUGGESTED EVALUATION METHODS

- Assignment on algorithm and flowchart
- Quiz on problem solving and basics of C programming
- Questioning with Code snippets

UNIT II	CONTROL STRUCTURES AND FUNCTIONS	7+3

Control structures: Branching and Iterative statements- Decision making - Looping statements - Nested Loops-break and continue statements – Pattern printing.

Functions: Declaration, Definition, function Call, arguments and Return statement- Parameter passing methods- Recursion – Storage Classes – Scope and life time of Variables.

SUGGESTED ACTIVITIES

- Comparison study on the types of decision making and looping statements
- Demonstration on control structures and functions
- Demos on Recursion, Pattern printing.

SUGGESTED EVALUATION METHODS

- Quiz on data types, operators, statements, loops and arrays, Questioning with Code snippets
- Code Walk throughs – Tutorials,
- Coding Assessment – Online platforms – Hackerrank, Leetcode, Code force.

UNIT III	ARRAYS, STRINGS AND POINTERS	7+3

Arrays: Declaration, Initialization - Operations- One dimensional Arrays- Traversal, Searching, Sorting, Merging of arrays - Two Dimensional Arrays- Matrix operations - Multidimensional Arrays- Strings: String operations – Array of Strings.
Pointers: Declaration- Definition- Pointer Arithmetic- Null, Void, Wild / Dangling, constant pointers, - Pointers and Arrays- Pointers and Functions- Pointers and Strings- Pointers to Pointers, Dynamic Memory Allocation.

SUGGESTED ACTIVITIES

- Demonstration of Application of Arrays – Image processing.
- Discussion on array of pointers, function pointers and array of function pointers.
- Demonstration on dynamic memory allocation.
- Solve problems on pointers to arrays, pointers to functions and pointers to pointers.

SUGGESTED EVALUATION METHODS

- Quiz on basics of Arrays, strings and pointers.
- Programming Assignment, Code Walkthroughs.
- Coding Assessment – Online platforms – Hackerrank, Leetcode, Code force.

UNIT IV	STRUCTURES AND UNIONS	5+3

Structure: Declaration and Initialization- Nested Structures- Array of Structures- Structures and functions- Structure pointers- Self-referential structures. Unions: Declaration and Initialization- Structures and unions.

SUGGESTED ACTIVITIES

- Discussion and comparison of Structures and Unions.
- Self-referential structure – Linked list application.
- Write programs using nested structures and union inside structures.

SUGGESTED EVALUATION METHODS

- Demonstration of programs using pointers to structures and self-referential structures
- Simple application development

UNIT V	FILE PROCESSING AND PRE-PROCESSOR DIRECTIVES	5+3

Introduction to Files – Using Files in C- File modes - File operations - Error Handling during file operations- Command line arguments- Pre-processor Directives - Macros - Unconditional directives- Conditional Directives- Error handling in C, Debugging and Testing.

SUGGESTED ACTIVITIES

- Discussion on types of pre-processor directives.
- Demonstration of programs using file operations, pre-processor directives.
- Simple application development.

SUGGESTED EVALUATION METHODS

- Assignment on modes of operations using files in C.
- Simple Applications– File operations.

Total Periods	**45**

Suggestive Assessment Methods

Continuous Assessment Test (30 Marks)	**Formative Assessment Test (10 Marks)**	**End Semester Exams (60 Marks)**
DESCRIPTIVE QUESTIONS 2. PROGRAMING AND PROBLEM SOLVING QUESTIONS 3. Code walkthroughs	1. ASSIGNMENT 2. ONLINE QUIZZES 3. PROBLEM-SOLVING ACTIVITIES	1. DESCRIPTIVE QUESTIONS 2. PROGRAMING AND PROBLEM SOLVING & LOGICAL THNKING QUESTIONS

Course Outcomes

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

CO1 Apply algorithmic thinking to understand, define and solve problems. (Apply)
CO2 Apply code reusability using functions, control structures and solve problems. (Analyze)
CO3 Use strings, arrays and pointers in C to solve complex problems. (Apply)
CO4 choose appropriate construct based on the problem requirements and provide solutions on organizing data. (Apply)
CO5 Develop application with file operations to develop real time solutions. (Analyze)

Text Books

1. Beecher K. Computational Thinking: A beginner's guide to Problem-solving and Programming. BCS Learning & Development Limited, 2017.
2. Stephen G Kochan, Programming in C, Third Edition, 2004.
3. Brian W. Kernighan, The C Programming Language (Ansi C Version), PHI; 2 edition (1990).
4. Brian W. Kernighan, Dennis M. Ritchie, Programming Languages C with Practicals, Margham Publications; 1 edition (2012)

Reference Books

1. Byron Gottfried “Programming With C” Fourth Edition, McGrawHill, 2018.
2. Yashvant P. Kanetkar. “Let Us C”, BPB Publications, 2016.
3. R. G. Dromey, "How to Solve It By Computer", Pearson, 1982

Web Resources

1. https://www.programiz.com/c-programming
2. https://nptel.ac.in/courses/106105171/
3. https://www.javatpoint.com/c-programming-language-tutorial
4. https://www.tutorialspoint.com/cprogramming/index.htm
5. https://www.w3schools.com/c/
6. https://www.cprogramming .com

Prepared By

Dr. T. C. Subbulakshmi, Prof/IT

Verified By

Dr. G. Aravind Swaminathan, HoD/CSE

24PH1301	APPLIED PHYSICS (Common to All Branches)	L	T	P	C
		2	0	0	2

Preamble

The aim of this course is to impart fundamental knowledge in materials and related basic physical concepts which are essential in understanding and explaining engineering devices.It encompasses the application of the basic principles of physics to the development of various engineering fields.

Prerequisites for the course

Nil

Objectives

- To develop a thorough understanding of the fundamental principles and practical applications of semiconductor devices.
- To foster an idea on the significance of nanostructures, quantum confinement, and their implications for nano device applications and quantum computing.
- To introduce the fundamentals of heat transfer through various materials, the thermal performance of buildings, and diverse thermal applications.
- To provide comprehensive knowledge on the principles and practices of building ventilation and air conditioning.
- To impart knowledge on the study of various sensors.

UNIT I	OPTOELECTRONIC DEVICES	6

Introduction to semiconductors - direct and indirect band gap – p-n junction – Transistor - p-n-p and n-p-n transistors - Sources: Solar cell - Light Emitting Diode (LED) - Organic Light Emitting Diode (OLED) - Laser diodes.

UNIT II	NANODEVICES AND QUANTUM COMPUTING	6

Introduction - quantum confinement – quantum structures: quantum wells, wires and dots – band gap of nanomaterials. Tunneling – Single electron phenomena and single electron transistor – quantum cellular automata - Quantum system for information processing - quantum states – classical bits – quantum bits or qubits –CNOT gate - advantage and applications of quantum computing.

UNIT III	THERMAL APPLICATIONS	6

Introduction - Principles of heat transfer - thermal expansion of solids and liquids – expansion joints – bimetallic strips - thermal conductivity – Lee's disc method: theory and experiment - heat transfer through fenestrations, thermal insulation and its benefits - heat gain and heat loss estimation - factors affecting the thermal performance of buildings - thermal measurements, thermal comfort.

UNIT IV	VENTILATION AND REFRIGERATION	6

Introduction – Ventilation - Requirements, principles of natural ventilation - Ventilation Measurements - Air conditioner - window air conditioner - chilled water plant - fan coil systems - Air conditioning systems for different types of buildings - Protection against fire to be caused by A.C. Systems

UNIT V	SENSORS	6

Introduction to sensor - Hall effect sensor - SQUID sensor – Gas sensor – Medical sensor - Ultrasonic sensor - Fiber Optic sensor- Temperature and displacement sensors - liquid level sensing - Fluid flow sensing - microbend Sensors.

Total Periods	30

Suggestive Assessment Methods

Continuous Assessment Test (20 Marks)	Formative Assessment Test (20 Marks)	End Semester Exams(60 Marks)
Descriptive	Assignment Online Quizzes Problem-Solving Activities	Descriptiv e

Outcomes

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

CO 1	Apply the knowledge of semiconductor devices to design and optimize practical electronicsystems. **Apply**
CO 2	Understand the basics of quantum structures and their applications and basics of quantum computing. **Understand**
CO 3	Acquire the knowledge about heat transfer through different materials, thermal performance of building and thermal insulation. **Understand**
CO 4	Acquire the understanding of building ventilation and air conditioning systems. **Understand**
CO 5	Apply the knowledge of sensor technologies to design and implement sensor systems for real-world applications. **Apply**

Text Books

1. S.O. Kasap. Principles of Electronic Materials and Devices, McGraw-Hill Education (Indian Edition), 2011.
2. Thomas L. Floyd, Electronic Devices, Pearson India Education Services Pvt. Ltd, 2021.
3. Parag K. Lala, Quantum Computing: A Beginner's Introduction, McGraw-Hill Education (Indian Edition), 2020.
4. B.Rogers, J.Adams and S.Pennathur, Nanotechnology: Understanding Small Systems, CRC Press, 3rd Edition 2017.
5. Dr. G. Senthil Kumar and Dr. S. Murugavel, Physics for Civil Engineering, VRB Publishers Pvt. Ltd, 2024.
6. Patranabis D, Sensors and Transducers, 2nd Edition, PHI, New Delhi, 2017.

Reference Books

1. G.W. Hanson, Fundamentals of Nanoelectronics, Pearson Education (Indian Edition) 2009.
2. Dr. G. Senthil Kumar and Dr. S. Murugavel, Physics for Information Science, VRB Publishers Pvt. Ltd, 2024.
3. Dr. P. Mani, Physics for Information Science, Dhanam Publications, Fourth Edition, 2022.
4. Dr. R. Sudharsanan and Dr. S. Devashankar, Physics for Civil Engineering, Sri Krishna Hitech Publishing Company Pvt. Ltd, 2024.

Web Resources

1. UNIT 1 - https://www.elprocus.com/difference-between-npn-and-pnp-transistor/ 2.UNIT2-

https://docs.google.com/presentation/d/1u6TSbTaDN972JVuWgzJIIKW5HwouUwzW/edit?usp=drive_link&o uid=110360556588092263393&r pof=true&sd=true

3. UNIT 3- https://vlab.amrita.edu/?sub=1&brch=194&sim=353&cnt=1
4.UNIT 4-https://happho.com/natural-ventilation-principles-to-be-used-for-building-construction/

UNIT 5- https://www.sciencedirect.com/topics/engineering/displacement-sensor

CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
1	3	1						2				1		
2	3	1						2				1		
3	3	1										1		
4	3	1												
5	3	1												

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1: Apply the knowledge of semiconductor devices to design and optimize practical electronic systems. Apply

1. How do the fundamental principles of light emission in LEDs and light absorption in solar cells illustrate the interplay between energy conversion processes in optoelectronic devices.
2. How does the construction and operation of solar cells demonstrate the principles of semiconductor physics and energy conversion, and what advancements in materials sciencecould enhance their efficiency?

COURSE OUTCOME 2: Understand the basics of quantum structures and their applications andbasics of quantum computing. **Understand**

1. In what ways do the dimensional constraints in quantum wells, quantum wires, and quantum dots influence their electronic and optical properties, and what potential applications arise from these unique characteristics in advanced technological fields?
2. How does the operation of a single-electron transistor (SET) manipulate the behavior of individual electrons, and what implications does this have for the development of quantum computing and nanoscale electronics?
3. How does the symbolic representation, physical construction, and resultant truth table of a CNOT gate illuminate the role of controlled operations in quantum computing and its potential for transformative computational paradigms?

COURSE OUTCOME 3: Acquire the knowledge about heat transfer through different materials, thermal performance of building and thermal insulation. **Understand**

1. Imagine a quantity of heat flowing through a metal slab whose faces are kept at two

differenttemperatures. Determine the thermal conductivity of a bad conductor.

2. In what manner does heat transfer occur through fenestration, and how does understandingthis process contribute to the optimization of building energy efficiency and thermal comfort?

COURSE OUTCOME 4: Acquire the understanding of building ventilation and air conditioning systems. **Understand**

1. List out the important points to be considered while designing natural ventilation for buildings.
2. Suppose you are hired as a consultant for a newly constructed hotel that aims to offer optimal climate control in each room. How would you explain the construction and functionality of afan coil unit to the hotel management team?
3. Imagine you are tasked with designing a comprehensive fire safety plan for a commercial building that relies heavily on air conditioning systems. How would you outline measures toprevent fires caused by these AC systems?

COURSE OUTCOME 5: Apply the knowledge of sensor technologies to design and implement sensor systems for real-world applications. **Apply**

1. Imagine you are creating a high-tech medical device that monitors a patient's condition. How would you describe the functions and importance of temperature sensors and displacement sensors in ensuring the device operates effectively?
2. Suppose you are leading a team tasked with designing a cutting-edge magnetometer for detecting anomalies in underground pipelines. How would you lead a discussion about the functionalities and applications of SQUID sensors in this project

Prepared By

Mrs. Sudharthini, AP/Physics

Verified By

Mrs. Christal Simi, AP/Physics

24CY1401	APPLIED CHEMISTRY	L	T	P	C
		2	0	0	2

Preamble

To enable the students to acquire knowledge in the concepts of chemistry for engineering applications and to familiarize the students with different application oriented topics like sensors, batteries, electrodes, materials for memory and display systems, corrosion prevention methods, and processes in electronics manufacture etc., which enable them to develop abilities and skills that are relevant to the study and practice of engineering chemistry.

Prerequisites for the course

Basic theoretical concepts of Chemistry in higher secondary level.

Objectives

1. To inculcate sound understanding of different types of sensors and batteries.
2. To develop an understanding of the basic concepts of electronic memory and display systems.
3. To make the students familiar with the principles of corrosion and electrodes.
4. To explore semiconductor manufacturing, PCB assembly, consumer electronics, automotive electronics, telecommunications, and microchip fabrication in the electronics industry.
5. To understand the electronic waste (e-waste) and manage the e-waste in an environmentally sustainable manner.

UNIT I	Energy Systems and Sensors	6

Energy Systems: Introduction, classification of batteries. Components, construction, working and applications of modern batteries; Zn-air and solid state battery (Li ion - polymer battery).

Sensors: Introduction, working principle and applications of Electrochemical sensors and Optical sensors. Classification of electrochemical sensors.

UNIT II	Materials for Memory and Display Systems	6

Memory Devices: Introduction, Basic concepts of electronic memory, History of organic/polymer electronic memory devices, types of organic memory devices; Organic molecules (p-type semiconductor - Pentacene; n-type semiconductor - Perfluoropentacene used as memory materials).

Display Systems: Photoactive and electroactive materials. Organic materials used in Optoelectronic devices-Light absorbing materials - Polythiophenes (P3HT), Light emitting materials - Poly[9-vinylcarbazole] (PVK)]- Materials for LCD - Liquid crystals (LC's) - Introduction, classification, properties and applications in Liquid Crystal Displays (LCD's).

UNIT III	Corrosion and Electrode System	6

Corrosion: Introduction, Industrial, environmental and economic impacts of Corrosion (global concern), types of corrosion - dry/wet Corrosion, electrochemical theory of corrosion, principle and preventive methods of Galvanic corrosion and Differential aeration corrosion – (Water line), Corrosion control methods – galvanization and sacrificial anode method.

Electrode System: Introduction, types of electrodes. Ion selective electrode – construction, working and applications of glass electrode. Determination of pH using glass electrode. Reference electrode - Introduction, calomel electrode – construction, working and applications of calomel electrode.

UNIT IV	Processes in Electronics Manufacture	6
Microchip fabrication – overview, photoresists – chemistry, types. Fabrication facilities – clean rooms - maintenance, ultrapure water– specification, production processes – ion exchange, reverse osmosis. PCB fabrication – electroless and electroplating of copper – principle, bath chemistries and process parameters.		
UNIT V	**E-Waste Management**	**6**
E-Waste: Introduction, sources of e-waste, Composition and Characteristics, Need for e-waste management concerning global perspective. Toxic materials used in manufacturing electronic and electrical products; health hazards due to exposure to e-waste. Recycling and Recovery: Different approaches of recycling (separation-thermal treatments), E-waste management rule.		
	Total Periods	**30**

Suggestive Assessment Methods

Continuous Assessment Test (20 Marks)	Formative Assessment Test (20 Marks)	End Semester Exams (60 Marks)
WRITTEN TEST	ASSIGNMENT & ONLINE QUIZZES	WRITTEN TEST

Outcomes

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

1	Identify appropriate sensors based on the requirements of different energy systems, considering factors such as accuracy, precision, response time, and environmental conditions.(Apply)
2	Apply the skills to design and optimize display systems by selecting suitable materials for applications such as liquid crystal displays (LCDs). (Apply)
3	Apply the knowledge of electrode systems used in various applications such as electroplating, batteries, corrosion monitoring, and electrochemical sensors.(Apply)
4	Apply the knowledge in various sectors of the electronics industry. Identify suitable materials for fabrication of microchip. (Apply)
5	Recognise environmental challenges posed by electronic waste (e-waste). (Knowledge)

Text Books

1. P. C. Jain and Monika Jain, "Engineering Chemistry" Dhanpat Rai Publishing Company (P) LTD, New Delhi, 2018.
2. S. S. Dara and S. S. Umare, "A Textbook of Engineering Chemistry", S. Chand & Company LTD, New Delhi, 2018.

Reference Books

1. ShikhaAgarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, Second Edition, 2019.
2. High Performance Metallic Materials for Cost Sensitive Applications, F. H. Froes, et al. John Wiley& Sons, 2010
3. Vairam Wiley Engineering Chemistry, Wiley India Pvt. Ltd. New Delhi, 2013- 2nd Edition.
4. Expanding the Vision of Sensor Materials. National Research Council 1995, Washington, DC: TheNational Academies Press. doi: 10.17226/4782.

5. R.Gopalan, D.venkappayya, S.Nagarajan Engineering Chemistry, Vikas Publishing house private limited.
6. "Handbook of Electronic waste Management" International best practices and case studies.
7. A Text Book of Engg. Chemistry, Shashi Chawla, Dhanpat Rai & Co. (P) Ltd.

Web Resources

1. https://www.scribd.com/document/673718581/2710-1681213457085(Materials for memory and display systems)
2. https://petronthermoplast.com/conductivity-sensor-and-its-working-principle/#
3.https://www.st.com/resource/en/application_note/cd00003986-introduction-to-semiconductor-technology-stmicroelectronicspdf
4.https://en.wikipedia.org/wiki/Photoresist#:~:text=A%20photoresist%20(also%20known%20simply,crucial%20in%20the%20electronics%20industry.
5.https://www.therma.com/https-www-therma-com-cleanroom-maintenance/
6.https://residuoselectronicos.net/archivos/documentos/21Brasil_Widmer%20et%20al.%20Global%20Perspectives.pdf
7.https://nair.indianrailways.gov.in/uploads/files/1410168855632-PNM%20E-wast%20mgt_Abhivyakti.pdf(Toxic materials in e-waste)
8.https://blog.mywastesolution.com/e-waste-gold-recovery-the-right-way/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	3	3	3									2		
2	3	3	3					2				2		
3	3	3	3									2		
4	3	3	3									2		
5	3	2				3	3	2				2		

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1: Identify appropriate sensors based on the requirements of different energy systems, considering factors such as accuracy, precision, response time, and environmental conditions (Understand)

You are tasked with developing a portable device designed to monitor air quality in urban areas, with a specific focus on detecting pollutants such as carbon monoxide (CO) and nitrogen dioxide (NO2). In this context, provide a comprehensive explanation of the working principles of electrochemical sensors. Additionally, discuss the advantages of these sensors offer for air quality monitoring applications, particularly in portable devices intended for urban environments. Include considerations of their sensitivity, selectivity, power consumption, size, and ability toprovide real-time monitoring.

COURSE OUTCOME 2: Apply the skills to design and optimize display systems by selecting suitable materials for applications such as liquid crystal displays (LCDs). **(**Apply**)**

1. Choosing the right materials for applications like liquid crystal displays (LCDs) presents a challenge for engineers in terms of design and optimization. Discuss the criteria and considerations involved in material selection, including factors such as optical properties, electrical characteristics, mechanical strength, and environmental stability. Explain how these material properties influence the performance, durability, and efficiency of LCD systems. Provide examples of specific materials commonly used in LCDs and their roles within the display technology.

COURSE OUTCOME 3: Apply the knowledge of electrode systems used in various applications such as electroplating, batteries, corrosion monitoring, and electrochemical sensors**.**(Apply)

1. As an environmental scientist, you need to prepare a report addressing the electrochemical corrosion mechanism on metallic surfaces and its potential for releasing toxic products during degradation. Your report should also provide strategies to reduce environmental risks. In your report, please address the following questions:

A).How does the electrochemical corrosion mechanism influencing metallic surfaces contribute to the undesired release of toxic products during degradation? Provide an explanation with relevantexamples.

B).What strategies can be devised to mitigate or minimize the environmental risks associated with electrochemical corrosion on metallic structures in the coastal area? Offer detailed solutions or recommendations.

COURSE OUTCOME 4: Apply the knowledge in various sectors of the electronics industry. Identify suitable materials for fabrication of microchip. (Apply)

1. Imagine you are an engineer tasked with optimizing the electroplating process for copper in a manufacturing facility that produces electronic components. Discuss the comprehensive steps and considerations involved in achieving a high-quality and uniform copper coating. Address the composition and control parameters of the electroplating solution, the configuration of electrodes and management of current density, and the importance of surface preparation and treatment. Additionally, explain the quality control methods and testing techniques necessary to ensure the electroplated copper meets industry standards. Use specific examples from the manufacturing facility to illustrate how each aspect contributes to the overall effectiveness and reliability of thecopper electroplating process.

COURSE OUTCOME 5: Recognise environmental challenges posed by electronic waste (e-waste). (Knowledge)

1. Examine ecologically conscious and sustainable approaches to addressing the problems caused by electronic trash, or "e-waste." Analyze the environmental and health impacts of e-waste, and examine the roles of various stakeholders, including manufacturers, consumers, and policymakers, in mitigating these challenges. Provide specific examples of effective e-waste management practices and policies, and propose innovative solutions for reducing, recycling, and responsibly disposing of e-waste

Prepared By	Verified By
Dr. Sujapon Mini, Prof./Chemistry	Dr. Jona, AP/Chemistry

Theory cum Practical Courses

24HS1102	BUSINESS COMMUNICATION AND VALUE SCIENCE-I (Only for CSBS)	L	T	P	C
		2	0	2	3

Prerequisites for the course

- NIL

Objectives

1. To understand the importance of human values and the ethics behind it.
2. To enhance the writing skills to create clear and accurate content.
3. To master the etiquettes of email communication.
4. To strengthen the understanding ability to decipher technical concepts.
5. To create a better version of self by understanding the key concepts of values and life skills.

UNIT I	HUMAN VALUES	12

Listening – motivational talk on Values – importance of Values: **Reading** - Self exploration - Human Values - foundation value - complete value and taking notes: **Speaking** - Record a conversation on favourite personality and the skills and values they demonstrate - SWOT analysis - identify strength & weakness - Interviewing a celebrity, tech giant to identify the values that drive them - interviewing common folk - cab driver, sweeper, assistants to analyse the values that drive them: **Writing**: Draft a conversation between a celebrity and an interviewer highlighting values - Drafting a professional self-introduction highlighting values that make them unique - Journal Writing - Explore various journaling techniques, styles, and purposes; practice reflective, creative, and academic journal entries to enhance writing skills and personal growth.

UNIT II	GRAMMAR AND LANGUAGE DEVELOPMENT I	12

Listening - Interview questions: **Reading** - conversation questions - formal & informal: **Writing** - Framing Yes or No questions - WH questions - Applications of Tenses - Sentence formation - sentence structure: **Vocabulary Development** - Word formation - Synonyms, antonyms - compound words - single word substitution.

UNIT III	ESSENTIALS OF TECHNICAL COMMUNICATION	12

Listening - importance of Email etiquettes: **Reading -** structure of formal & informal email - positive, negative, neutral responses: **Writing** – business Email: Formal business vocabulary - General Service List (GSL), writing a comprehensive Resume: **Vocabulary Development** - Academic word List (AWL) - Technical specific terms related to the field of technology – **Language Development** - Idioms & Phrases, significant abbreviations

UNIT IV	UNDERSTAND TECHNICAL CONCEPTS	12

Listening - listening to technical talks on emerging trends – cloze test; **Speaking** - presentation on the working principle of electronic/ electrical/ mechanical/ software products/gadgets - ORAI app; **Reading** - Reading Comprehension – technical passages – Articles from journals; **Writing -** Create a podcast on an emerging trend of technology - Writing Instructions - Recommendations: **Vocabulary Development -** prefix and suffix, technical vocabulary.

UNIT V	APPLICATION OF LIFE SKILLS	12

Listening - Life skills Importance of listening - difference between hearing and listening & making notes: **Speaking -** Picture based and newspaper based learning activities - Movie based learning -

identifying skills and values - critical life skills – **Reading** - Community service - work with an NGO - identifying CSR activities that inculcates Human Values – **Writing** – Necessity of life skills, Emotional intelligence, Cognitive skills in personal and work life: **Language Development -** Modal verbs, framing question tags.

Total Periods	**60**

Suggestive Assessment Methods

Lab Exercises / activities (30 Marks)	Continuous Assessment (20 Marks)	End Semester Exams (50 Marks)
1. Cloze 2. Note making 3. Video / Audio submissions 4. Presentation	1. Multiple Choice Questions 2. Descriptive Questions	1.Multiple Choice Questions 2.Descriptive Questions

Outcomes

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

CO 1	Understand and appreciate the necessity of integrating human values into personal and professional life. **(Understand)**
CO 2	Gain a comprehensive understanding of grammar and the processes involved in language development. (**Apply)**
CO 3	Enhance their writing abilities, focusing on clarity, coherence, creativity, and the effective communication of ideas in various written formats. **(Apply)**
CO 4	Develop a solid comprehension of key technical concepts, enabling them to apply this knowledge effectively in practical and theoretical contexts. **(Apply)**
CO 5	Apply essential life skills, such as problem-solving, critical thinking, time management, and interpersonal communication, to enhance their personal and professional effectiveness. **(Apply)**

Text Books:

1.Values-Driven Leadership: The Essential Guide to Developing Your Leadership Values and Skills by Richard Barrett

2.English Grammar in Use by Raymond Murphy

Reference Books:

1.Business Communication Today by Courtland L. Bovee, John V. Thill

2.Introduction to Technical Communication by Alison L. Lutz

3.*Emotional Intelligence 2.0* by Travis Bradberry and Jean Greaves

Web Resources

1. Human Values https://www.youtube.com/watch?v=kOJu1vj_BVk
2. SWOT analysis https://www.youtube.com/watch?v=9-NWhwskTO4
3. Interview with celebrity https://www.youtube.com/watch?v=Sv-C54qahK8
4. Email Etiquettes https://youtu.be/ebQwviR7oDE
5. **Technical concepts https://www.youtube.com/@Lesics**
6. **Podcast https://youtu.be/gVNOAWDrXP4**
7. **How to create a podcast https://youtu.be/mwFYiFZO6sI**
8. **Will Smith's Top Ten rules for success https://www.youtube.com/watch?v=bBsT9omTeh0**

S. No	List of Experiments	CO
1.	Journal writing on Values that drive a person.	CO 1
2.	Video submission of a professional Self Introduction.	CO 1
3.	MCQ on grammar concepts.	CO 2
4.	Aptitude assessment.	CO 2
5.	Email writing - compose an email abiding the etiquette.	CO 3
6.	Presentation on any 10 Idioms and phrases.	CO 3
7.	Listening to technical concepts and completing cloze tests.	CO 4
8.	Submitting a Podcast presentation on any technical or general topic (5min).	CO 4
9.	Listening Cloze test - movie based learning.	CO 5
10.	Presenting a picture / movie review.	CO 5
	Total Periods **30 Th+30 Lab**	

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PSO 3
1								3		3					
2								3		3					
3										3					
4										3		3			
5										3		3			

SUGGESTED COURSE LEVEL ASSESSMENT QUESTIONS:

COURSE OUTCOME 1 (CO1):

1) Introduce yourself in a professional way highlighting Strengths & Weaknesses. (Ap)
2) Make notes on the given passage. (Ap)
3) Frame dialogue between a celebrity and yourself (Ap)

COURSE OUTCOME 2 (CO 2):

1) Fill in the blanks with the appropriate tenses in the sentences or paragraph given. (Ap)
2) Frame WH questions for the statements given. (Ap)
3) Frame Yes or no questions for the statements given. (Ap)
4) Fill the word formation in the given boxes. (Ap)
5) State the synonyms and antonyms for the highlighted words. (Ap)
6) Identify the one word substitution for the following sentences from the answers given.(Ap)

COURSE OUTCOME 3 (CO 3):

1) Draft a formal and informal Email. (Ap)
2) Fill in the blanks with appropriate technical vocabulary. (Ap)
3) Choose the appropriate idiom or phrase that fits the expression given. (Ap)

COURSE OUTCOME 4 (CO 4):

1) Listen to the technical talks and take notes. (Ap)
2) Write a product content for a product review. (Ap)
3) Read the passage given and answer the questions. (Ap)
4) Fill in the blank with appropriate words by adding appropriate prefixes or suffixes. (Ap)

COURSE OUTCOME 5 (CO 5):

1) Watch the video on Types of listening and answer the questions.
2) Make a presentation on the importance of Emotional Intelligence.
3) Watch the video and articulate your emotions using appropriate words.
4) Write a note on optimism and pessimism.
5) Fill in the blank with the suitable modal verb.
6) Frame appropriate question tags.

Prepared By	Verified By
Mrs. Shala. F John, AP/ English	Mrs. Priyadharshini, AP/English

Practical Courses

24PC1311	APPLIED PHYSICS AND CHEMISTRY LABORATORY	L	T	P	C
		0	0	4	2

Preamble

The objective of this course is to enable students to develop their practical applications in the engineering sector by applying the concepts in an appropriate manner to modern technology and to gain practical knowledge that correlates with the theoretical studies.

Prerequisites

Basic practical concepts of Physics and Chemistry in higher secondary level.

Objectives (Physics)

- To demonstrate and to reinforce the theoretical concepts learned in physics lectures through practical experiments.
- To interrogate the competency and understanding of the basic concepts found in experimental physics.
- To gain knowledge of the practical applications of electronic mechanisms.
- To look into measurement and technique problems in experiments.
- To familiarize physics concepts and to design instruments and experimental sets for better and accurate measurements.

Objectives (Chemistry)

- To interpret the students by acquiring practical skills in the determination of water quality parameters quantitatively for industrial and fabrication processes through volumetric analysis.
- To develop an understanding about the range and uses of analytical methods in chemistry.
- To gain knowledge for the measurement pH of sample solutions to detect any potential environmental issues by measuring the hydrogen-ion activity in water-based solutions.
- To demonstrate the students with a practical approach towards the various techniques to monitor and control the quality of the treated water.
- To explain the concept of corrosion, its causes, and its environmental consequences.

PHYSICS

S. No	List of Experiments (Any five)	CO
1	Determination of Energy gap of a material of P-N Junction diode (Forbidden energy band gap kit).	4
2	Determination of Planck's constant and work function using the principle of photoelectric effect.	3
3	Determination of Young's modulus of the material - Non Uniform bending method.	2
4	Determination of thermal conductivity of a bad conductor – Lee's Disc method.	1
5	Determination of the velocity of sound and compressibility of liquids-Ultrasonic interferometer.	5

6	Study of I-V Characteristics of solar cell and determination of its efficiency	4
7	Study the characteristics of LED and LASER sources.	4

CHEMISTRY

S. No	List of Experiments (Any five)	CO
1	Analysis of water sample (hardness) for industrial applications and fabrication processes.	1
2	Estimation of iron in pharmaceutical samples by Potentiometry. (Electrochemical sensor).	2
3	Determination of acid concentration using pH metry (pH sensor).	3
4	Utilization of Conductometric analysis for determining the strength of NaOH solution.	4
5	Corrosion Experiments - Weight loss method and Potentiometry.	5
6	Design a molecular structure using ChemDraw and a computational model.	2
7	Analysis of water (Alkalinity) for industrial and fabrication purposes.	1

List of Projects (PHYSICS)

S. No.	List of Projects	Related Experiment	CO
1	To study Infrared radiation emitted by different sources using phototransistors.	2	4
2	Design a circuit for cool automatic timer controlled Lightwhich controls vehicle traffic passing through the intersection of two or more roadways by giving a visual indication to drivers when to proceed, when to slow, and when to stop using LED and 4017 counter IC along with the 555 timer.	2	3
3	Design temperature controlled circuits trigger automatically when the ambient temperature goes beyond a set limit of, say, 50 degrees centigrade. This temperature setting can be changed as per requirement through the potentiometer in the circuit.	4	1
4	Using ultrasonic sensor, design a ultrasonic distance finder using 8051	5	5
5	Design a water level indicator by connecting a Buzzer, resistor and transistor in series and connect this in parallel to LED.	2	4

List of Projects (CHEMISTRY)

1.	Water Analysis : Analysis of perennial Thamirabarani River water samples collected from various locations (before and after blending of industrial waste water). **i)** Determination of various physical and chemical parameters (Hardness, pH,TDS, Alkalinity) of different water samples. **ii)** From the result, give a detailed report about the watersample whether it is fit/unfit for domestic and industrial purposes.	1,3	1,3

2	Design the molecular structure of Biomolecules by computational methods.	2	2
3	Determination of thermal conductivity of Pure liquids and binary mixtures using IoT model (Temperature sensor and Turbidity sensor)	4	4
4	Air quality monitoring: Study of air pollution in Nellai smart city in the early morning, noon and evening due to CO/CO2 emissions by Arduino method. **i)** From the observations give a detailed report about the impact of air pollution on human health. **ii)** Deduce an explanatory report on environmental impact dueto CO/CO2 emissions.	4	4
5	Food adulteration : Investigation of adulterants in various food stuffs milk, chilli powder, turmeric powder, wheat flour, honey and ghee) by Chemical methods. **i)** Give a report on the presence of adulterants in the given food samples. **ii)** From the observations give a brief report about the impactof food adulteration on human health.	5	5

Lab Assessment

Internal Assessment	External Assessment
(60 Marks)	(40 Marks)

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

CO1	Analyze the experimental data to determine thermal conductivity, enhancing their ability to understand and predict heat transfer in materials. (Analyze)
CO2	Analyze the bending of materials under load and relate the observed deformation to material properties. (Analyze)
CO3	Interpret the experimental results to calculate the Planck's constant and the work function, reinforcing their understanding of the photoelectric principle. (Apply)
CO4	Analyze the experimental data to develop practical skills and a deeper understanding of semiconductor devices, and use this knowledge to design new experiments in engineering.(Analyze)
CO5	Gain a deeper understanding of the acoustic properties of liquids and enhance their practical laboratory skills. (Apply)

Outcomes (Chemistry)

CO1	Analyze the water quality related parameters quantitatively for industrial and fabrication processes. (Analyse)
CO2	Interpret the use of equipment and accessories using analytical methods in chemistry. (Apply)
CO3	Apply the use of equipment for the measurement pH of sample solutions to detect any potential environmental issues. (Apply)
CO4	Apply the use of equipment for the measurement of conductance of sample solutions to monitor and control the quality of the treated water. (Apply)
CO5	Analyze the probable corrosion, corrosion rate, and corrosion mechanism of the metallic material in the given environment. (Analyze)

Reference Books (Physics)

- Physics Laboratory Manual, Department of Physics, Francis Xavier Engineering College, Tirunelveli.

• A Textbook of Engineering Physics Practical ,UNIVERSITY SCIENCE PRESS (An Imprint of Laxmi Publications Pvt. Ltd.)2nd edition.
Reference Books (Chemistry)
• J. Mendham, R.C. Denney, J.D.Barnes, M.Thomas and B.Sivasankar, Vogel's Textbook ofQuantitative Chemical Analysis (5th edition 2009).
Web Resources (Physics)
Virtual Lab - https://bop-iitk.vlabs.ac.in/basics-of-physics/List%20of%20experiments.html Young's Modulus- https://vlab.amrita.edu/?sub=1&brch=280&sim=550&cnt=1 Virtual Lab - https://www.vlab.co.in/ba-nptel-labs-physical-sciences https://iitr.ac.in/Academics/static/Department/Physics/Thermal%20Physics%20Laboratory/To_study_the_characteristics_of_Solar_cell--_Current_voltage_spectral_and_illumination..pdf
Web Resources (Chemistry)
• Water Quality standards - https://www.youtube.com/watch?v=OlGllOZlIyI • Corrosion experiments – weight loss method https://www.youtube.com/watch?v=SMlg WfdB • Chem draw basics- https://youtu.be/a9r4Ofnc-Ro?si=IkzbsfFP_eUKBvU4

CO Vs PO Mapping and CO Vs PSO Mapping – Physics

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

CO Vs PO Mapping and CO Vs PSO Mapping - Chemistry

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

COURSE LEVEL ASSESSMENT QUESTIONS – PHYSICS

COURSE OUTCOME 1 :The students will be able to analyze experimental data to determine thermal conductivity, enhancing their ability to understand and predict heat transfer in materials.(Analyze)

1. Determine the thermal conductivity of a given bad conductor (Glass) using Lee's disc method. (Given: M=800 $X10^{-3}$ Kg, S = 370 $JKg^{-1}K^{-1}$).

COURSE OUTCOME 2 : The students will be able to analyze the bending of materials under load and relate the observed deformation to material properties.(Analyze)

1. Find out the Young's modulus of the material of a beam using Non-Uniform bending method. (Given :Thickness of the beam d = 6.35 mm)

COURSE OUTCOME 3 : The students will be able to interpret the experimental results to calculate Planck's constant and the work function, reinforcing their understanding of photoelectric principle.(Apply)

1. Determination of planck's constant and work function using the principle of photoelectric effect.

COURSE OUTCOME 4 : The students will be able to analyze experimental data to develop practical skills and a deeper understanding of semiconductor devices, and use this knowledge to design new experiments in engineering .(Analyze)

1. Determination of band gap of a Semiconductor (Forbidden energy band gap kit).
2. To study V-I characteristics of LED and laser diode
3. To find out the fill factor of a given solar cell.

COURSE OUTCOME 5 :.The students will be able to gain a deeper understanding of the acoustic properties ofliquids and enhance their practical laboratory skills. (Apply)

1. Determination of velocity of sound and compressibility of liquid – Ultrasonic Interferometer.

COURSE CONTENT AND LECTURE SCHEDULE – PHYSICS

S.No.	TOPIC	NO OF WEEKS REQUIRED
1	Determination of band gap of a Semiconductor diode (Forbidden energy band gap kit).	1
2	Determination of planck's constant and work function using the principle of photoelectric effect.	1
3	Determination of Young's modulus of the material-Non Uniform bending method.	1
4	Determination of thermal conductivity of a bad conductor – Lee's Disc method.	1
5	Determination of velocity of sound and compressibility of liquid – Ultrasonic Interferometer	1
6	To find out the fill factor of a given solar cell.	1

7	To study V-I characteristics of LED and laser diodes.	1

ASSESSMENT QUESTIONS - CHEMISTRY

COURSE OUTCOME 1: Analyze the water quality related parameters quantitatively for industrial and fabrication processes. (Analyse)

1. You are the Quality Control Engineer at a manufacturing plant that produces precision metal components for the automotive industry. Your plant uses water extensively in various fabrication processes, including cooling systems, rinsing, and cleaning parts.Perform a hardness test on the givenwater sample using a titration method with EDTA (Ethylenediaminetetraacetic acid) as the titrant. Record the total hardness in ppm (parts per million) of calcium carbonate ($CaCO_3$).

COURSE OUTCOME 2: Interpret the use of equipment for the measurement of electrode potential of solutions. (Apply)

1. You are a quality control engineer working in a pharmaceutical company that produces iron supplements. To ensure that each batch meets regulatory standards and contains the correct amount of iron, you need to determine the iron content in a pharmaceutical sample using potentiometric titration. The sample contains ferrous sulfate ($FeSO_4$) as the iron source.

COURSE OUTCOME 3: Apply the use of equipment for the measurement pH of sample solutions to detect any potential environmental issues. (Apply)

1. You are an environmental scientist working on a project to monitor the pH of water sources in a nature reserve to ensure the ecosystem's health. Accurate pH measurements are crucial to detect any potential environmental issues, such as acid rain or pollution. Analyse the given water sample with the use of a pH meter equipped by a glass electrode.

COURSE OUTCOME 4: Apply the use of equipment for the measurement of conductance of sample solutions tomonitor and control the quality of the treated water. (Apply)

1. You are an engineering intern at a water treatment facility. The facility is implementing a new process to monitor and control the quality of the treated water. One of your tasks is to measure the conductance of various water samples using a conductivity meter to ensure that the treated water meets the required standards for ion content. Analysethe given water sample with the use of a conductivity meter equipped by a conductivity cell.

COURSE OUTCOME 5: Analyze the probable corrosion, corrosion rate, and corrosion mechanism of the metallic material in the given environment (Analyze)

1. You are an engineering consultant for a company that operates offshore oil rigs. One of the key components of the rig is a pipeline made of carbon steel, which transports crude oil from the seabed to the surface. The pipeline is exposed to a harsh marine

environment, including saltwater, varying temperatures, and mechanical stresses. Your task is to analyze the probable corrosion and corrosion rate of the carbon steel pipeline in this environment.

COURSE CONTENT AND LECTURE SCHEDULE - CHEMISTRY

S.No.	TOPIC	NO OF WEEKS REQUIRED
1	Analysis of water sample(hardness) for industrial applications and fabrication processes.	1
2	Estimation of iron in pharmaceutical samples by Potentiometry (Electrochemical sensor).	1
3	Determination of acid concentration using pH metry.(pH sensor).	1
4	Utilization of conductometric analysis for determining the strength of solution.	1
5	Corrosion Experiments - weight loss method and potentiometry	1
6	Design a molecular structure using ChemDraw and a computational model.	1
7	Analysis of water (Alkalinity) for industrial and fabrication purposes.	1

Prepared By

Dr. R Suman, AP/Chemistry

Verified By

Mr. M. Robinson, AP/Chemistry

24GE1511	ENGINEERING PRACTICES LABORATORY	L	T	P	C
		0	0	4	2

Prerequisites for the course

Basic Science

Objectives

To provide exposure to the students with hands-on experience in various basic engineering
practices in Civil, Mechanical, Computer Science, Electrical, and Electronics Engineering.

S.No	List of Experiments	CO
	BASIC EMBEDDED SYSTEM (ECE)	
1	Control LED with Arduino Board and Tinker cad software.	CO1
2	Control LED with push button	CO1
3	Demonstrate RGB LED Color Mixing with Arduino in Tinker cad	CO1
4	Demonstrate LCD Display with Arduino.	CO1
5	Design a system to demonstrate a street traffic light system.	CO1
6	Read data from a sensor and experiment with both Analog and Digital sensors.	CO1
7	Interface Soil Moisture Sensor with Arduino	CO1
8	Interface Gas Sensor with Arduino	CO1
9	Interface Ultrasonic Distance Sensor with Arduino	CO1
10	Interface PIR Sensor with Arduino	CO1
	ELECTRICAL BOOTH (EEE)	
11	Residential house wiring using switches, fuse, indicator, lamp, and energy meter.	CO2
12	Fluorescent lamp wiring.	CO2
13	Staircase wiring	CO2
14	Measurement of electrical quantities – voltage, current, power in Electrical circuit.	CO2
15	Measurement of energy using a single phase energy meter	CO2
	ASSEMBLING AND DISMANTLING OF ELECTRICAL APPLIANCES (EEE)	
16	Dismantling and Assembling of Iron box	CO3

17	Dismantling and Assembling of fan	CO3
18	Dismantling and Assembling of Mixie	CO3
19	Dismantling and Assembling of Induction stove	CO3
20	Introduction to PLC programming	CO3
	BASIC CIVIL TOOLS AND SURVEYING (CIVIL)	
21	Introduction to Construction Tools	CO4
22	Visual inspection and Quality check on Bricks	CO4
23	Visual inspection and Quality check on Cement	CO4
24	Visual inspection and Quality check on Aggregates	CO4
25	Introduction to Surveying and Basic Tools	CO4
26	Field Measurements- Ranging and Marking	CO4
27	Detection and Correction of errors in field measurements	CO4
	OS INSTALLATION (CSE)	
28	Disk formatting, partitioning, and Disk operating system commands	CO5
29	Install, upgrade, and configure Windows/Linux operating systems	CO5
30	Installation of Dual OS	CO5
31	Installation Antivirus and configure the antivirus	CO5
32	Installation of printer and scanner software	CO5
	ASSEMBLING & DISMANTLING OF COMPUTER HARDWARE (CSE)	
33	Assembly and Disassembly of hardware	C06
34	Troubleshooting and Managing Systems	C06
35	Study of basic network commands	C06
36	Establish network connections	C06
37	Remote desktop connections and file sharing	C06

	DESIGN & 3D PRINTING (MECHANICAL)	
38	Introduction to Additive Manufacturing and basic machine handling methodologies.	CO7
39	Modeling Creative Designs in CAD Software.	CO7
40	Generating STL files from the CAD Models & Working on STL files.	CO7
41	Printing the part in STL format.	CO7
42	Evaluating the fabricated part for its suitability to a given application in terms of its fit, surface finish & dimensional accuracy.	CO7
	WELDING (MECHANICAL)	
43	Welding tools and techniques, preparation of butt joints.	CO8
44	Preparation of lap and T Joints by shielded metal arc welding.	CO8

Outcomes

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

CO1	Interface Embedded Processors with I/O devices
CO2	Carry out wiring and electrical measurements for residential installations.
CO3	Carry out assembling and dismantling of electrical home appliances
CO4	Conduct quality checks on construction materials and error correction in field measurements
CO5	Install and configure Windows and Linux operating systems.
CO6	Identify the basic hardware components
CO7	Distinguish the basic concepts of additive manufacturing and its applications
CO8	Use welding equipment to join the structures and sheet metal works

Laboratory Requirements

ELECTRONICS		
1	Arduino UNO	30 Nos.
2	LCD Display	5 each
3	Soil Moisture Sensor	5 each
4	Gas Sensor	5 each
5	Ultrasonic Distance Sensor	5 each
6	PIR Sensor	5 each

	ELECTRICAL	
1	Single and Two way Switches, Fuses,	10 each
2	Voltmeter, Ammeter, Wattmeter, Energy meter	5 each
3	Iron Box, Fan	5 each
4	Mixie, Induction Stove	5 each
5	PLC kit	2 each
6	Fluorescent lamp	5 each
	CIVIL	
1	Trowel, Shovel and Pan	5 Nos.
2	Weighing balance	2 Nos.
3	Measuring tape and cross staff	5 Nos.
4	Arrows and Ranging rods	10 Nos.
5	Marking twine	5 Nos.
6	Chalk powder	10 kg
	COMPUTER SCIENCE	
1	Computer System (Processor, RAM, HarddisK, Motherboard)	3 Nos
2	OS setup in Pendrive	3 Nos
3	Network Switch	1 Nos
4	Jack crimped UTP Cable (3 metre)	10 Nos
5	RJ 45 connector	6 Nos
	MECHANICAL	
1	3D - Design software with systems	30
2	3D printing machine	02
3	Arc welding transformer with cables and holders	05
4	Welding booth, accessories with exhaust facility	05

Reference Books

1. K.Jeyachandran, S.Natarajan & S, Balasubramanian, "A Primer on Engineering Practices

Laboratory", Anuradha Publications, (2007)

2. T.Jeyapoovan, M.Saravanapandian&S.Pranitha, "Engineering Practices Lab Manual", Vikas Publishing House Pvt. Ltd, (2006)

3. H.S. Bawa, "Workshop Practice", Tata McGraw – Hill Publishing Company Limited, (2007)

4. A.Rajendra Prasad & P.M.M.S. Sarma, "Workshop Practice", Sree Sai Publication, (2002).

5. Simon Monk ,"Programming Arduino: Getting Started with Sketches" Mc Graw hill,2012

6. Gibson, I, Rosen, D W., and Stucker, B., Additive Manufacturing Methodologies: Rapid Prototyping to Direct Digital Manufacturing, Springer, 2015

7. Dr. B.C. Punmia, Ashok Kumar Jain, Ashok Kr. Jain, Arun Kr. Jain, Surveying (Volume –I and II), Lakshmi Publications, 17th Edition, 2016

8. RON GILSTER , "PC Hardware: A Beginner's Guide". (CSE)

9. Chris Rhodes, MVP, Andrew Bettany, MVP, "Windows Installation and Update Troubleshooting". (CSE)

Web Resources

https://youtube/EJEz6t5SpMw?si=dUvXVwj7_rcmd3jF

https://www.youtube.com/watch?v=wAjkSj3ZjLs

https://www.youtube.com/watch?v=Zdj-nUY0fKk

https://www.youtube.com/watch?v=yrAdEaLzIK4

https://youtu.be/AmXBRzizPMI?si=tK4roYcYaBPDwXuf

https://youtu.be/kOUu7LJuV7M?si=fjkeHd86NHLPZdZp

CO Vs PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	3	3	3	3							
2	3	2	2	2	1	2		2	3		2	2
3	3	2	2	2	1	2		2	3		2	2
4	3	3	2	2	3				2		2	2
5	3	2	2	2								
6	3	3	3	2	1							
7												
8												

Verified By

Ms. M. Renisha, AP/Civil

24CS1511	PROGRAMMING PRACTICE LABORATORY USING C	L	T	P	C
		0	0	4	2

Preamble

The goal of the practice lab is to provide the students with foundation in computer programming to enhance the problem solving skills related to the field of engineering. It enables the algorithmic approach among the students to solve real world problems thus providing the base to learn other new programming languages

Prerequisites for the course

- **NIL**

Objectives

1. To develop C programs using conditional and looping statements
2. To be able to use arrays and strings in C
3. To build modular programs using functions in C
4. To explicitly manage memory using pointers in C
5. To develop applications in C using structures and files

S. No	List of Experiments	CO
1	Programs using simple statements	CO1
2	Programs using decision making statements	CO1
3	Programs using looping statements	CO1
4	Programs using one dimensional and two dimensional Arrays	CO2
5	Programs using strings.	CO2
6	Programs using user defined functions and recursive Functions	CO3
7	Programs using functions and pointers	CO3
8	Programs using structures and pointers	CO4
9	Programs using structures and unions	CO4
10	Programs using file concept	CO4

S.No.	List of Projects	Related Experiment	CO
1.	Vaccine Status Registration System	Ex. 1 to 10	CO5
2.	Toll Bill Management system	Ex. 1 to 10	CO5
3.	Voting Eligibility system	Ex. 1 to 10	CO5
4.	Cricket Scorecard Display system	Ex. 1 to 10	CO5
5.	Medical History Viewing System	Ex. 1 to 10	CO5
6.	Bus/ Flight Ticket Reservation System	Ex. 1 to 10	CO5
7.	Vehicle Parking Control System	Ex. 1 to 10	CO5
8.	Canteen Menu Management System	Ex. 1 to 10	CO5
9.	Grocery Checklist Management System	Ex. 1 to 10	CO5
10.	Diary Management System	Ex. 1 to 10	CO5
11.	Retail Shop Inventory Management System	Ex. 1 to 10	CO5

12.	Pharmacy Inventory System	Ex. 1 to 10	CO5
13.	Library Book Management System	Ex. 1 to 10	CO5
14.	Student Subject Selection System	Ex. 1 to 10	CO5
15.	Student Leave Application System	Ex. 1 to 10	CO5

Suggestive Assessment Methods

Lab Components Assessments (60 Marks)	**End Semester Exams (40 Marks)**
1. Exercises (Hacker rank score) 2. Project File (Progress Score) 3. Viva voce	1. Record note 2. Exercises 3. Viva voce

Course Outcomes

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

CO1	Implement program using control statements
CO2	Implement arrays and perform string operations
CO3	Develop reusable modules, store data in main memory effectively using pointers
CO4	Form heterogeneous data using structures, union and files
CO5	Build a project based on the required concepts learnt in C

Laboratory Requirements

- C compiler
- System with windows
- Internet

Reference Books

1. Reema Thareja, "Programming in C",Oxford University Press, Second edition, 2016

Web Resources

1. https://www.hackerrank.com/
2. https://www.codechef.com/selflearning?itm_medium=navmenu&itm_campaign=learncp
3. https://www.hackerearth.com/practice/basic-programming/input-output/basics-of-input-output/tutorial/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3										1		
2	3	3	3										1		
3	3	3	3										2		
4	3	3	3										2		
5	2	2	2			1			2	2	2	1	3		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	Model Exam	END SEM EXAM

REMEMBER		
UNDERSTAND		
APPLY	50	100
ANALYZE		
EVALUATE		
CREATE	50	

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1: (Blooms Category: Apply) (Problem Source: Code chef)

Problem Statement:

Pooja would like to withdraw X $US from an ATM. The cash machine will only accept the transaction if X is a multiple of 5, and Pooja's account balance has enough cash to perform the withdrawal transaction (including bank charges). For each successful withdrawal the bank charges 0.50 $US dollars. Calculate Pooja's account balance after an attempted transaction.

Input Constraints:

Positive integer 0 < X <= 2000 - the amount of cash which Pooja wishes to withdraw.

Nonnegative number 0<= Y <= 2000 with two digits of precision -To represent Pooja's initial account balance.

Output Constraints:

Output the account balance after the attempted transaction, given as a number with two digits of precision. If there is not enough money in the account to complete the transaction, output the current bank balance.

Example:

TYPE	INPUT		OUTPUT
Successful Transaction	30	120.00	89.50
Incorrect Withdrawal Amount (not multiple of 5)	42	120.00	120.00
Insufficient funds	300	120.00	120.00

COURSE OUTCOME 2: (Blooms Category: Apply) (Problem Source: Code chef)

Problem Statement:

Write a program that takes in a letter class ID of a ship and display the equivalent string class description of the given ID. Use the table below.

Class ID	Ship Class
B or b	Battle Ship
C or c	Cruiser
D or d	Destroyer
F or f	Frigate

Input Constraints:

The first line contains an integer T, the total number of test cases. Then T lines follow, each line contains a character. 1 ≤ T ≤ 1000

Output Constraints:

For each test case, display the Ship Class depending on ID, in a new line.

Example:

INPUT	OUTPUT
3 B C	Battleship Cruiser Destroyer

D	

COURSE OUTCOME 3: (Blooms Category: Apply) (Problem Source: Hacker rank)

Problem Statement:

Functions are a bunch of statements grouped together. A function is provided with zero or more arguments, and it executes the statements on it. Based on the return type, it either returns nothing (void) or something. For example, a function to read four variables and return the sum of them can be written as

```
int sum_of_four(int a, int b, int c, int d) {
int sum = 0;
        sum += a;
        sum += b;
        sum += c;
        sum += d;
        return sum;                }
```

+= : Add and assignment operator. It adds the right operand to the left operand and assigns the result to the left operand. So a += b is equivalent to a = a + b;

Task

Write a function int max_of_four(int a, int b, int c, int d) which reads four arguments and returns the greatest of them. Note that it is not built in max function in C. Code that will be reused is often put in a separate function that returns the greater of the two values.

Input Constraints:

Input will contain four integers(one on each line)

Output Constraints:

Print the greatest of the four integers.

Sample Input: 3 4 6 5

Sample Output: 6

COURSE OUTCOME 4: (Blooms Category: Apply) (Problem Source: Hacker rank)

Problem Statement:

You are transporting some boxes through a tunnel, where each box is a parallelepiped, and is characterized by its length, width and height. The height of the tunnel feet and the width can be assumed to be infinite. A box can be carried through the tunnel only if its height is strictly less than the tunnel's height. Find the volume of each box that can be successfully transported to the other end of the tunnel. Note: Boxes cannot be rotated.

Input Constraints:

The first line contains a single integer, denoting the number of boxes. Lines follow with three integers on each separated by single spaces, and which are length, width and height in feet of the box.

Output Constraints:

For every box which has a height lesser than 41 feet, print its volume in a separate line.

SAMPLE INPUT			SAMPLE OUTPUT
4			
5	5	5	
1	2	40	125
10	5	41	80
7	2	42	

Prepared By

Dr. T. C. Subbulakshmi, Prof/IT

Verified By

Dr. G. Aravind Swaminathan, HoD/CSE

Mandatory Course

24HS1103	TAMIL HERITAGE	L	T	P	C
		1	0	0	1

Preamble: This course is offered to equip students to create awareness of the contribution of Tamil people to Indian culture by highlighting the characteristics of Tamil language and literature and exhibiting Tamil culture through traditional arts such as performing arts and fine arts.

Prerequisites for the course:

The prerequisite knowledge required to study this course is basic knowledge in English and Tamil Heritage.

UNIT I	LANGUAGE AND LITERATURE	6

Language Families in India-Dravidian Languages –Tamil as Classical Language –Classical Literature in Tamil – Secular Nature of Sangam Literature –Distributive Justice in Sangam Literature Management Principles in Thirukural -Forms of minor Poetry development of Modern literature in Tamil-Contribution of Bharathiyar and Bharathidhasan.

UNIT II	HERITAGE-ROCK ART PAINTINGS TO MODERN ART– SCULPTURE	6

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 - Mridangam, Parai, Veenai, Yazh and Nadhaswaram

UNIT III	FOLK AND MARTIAL ARTS	6

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

UNIT IV	THINAI CONCEPT OF TAMILS	6

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

UNIT V	CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE	6

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

Total Periods	30

Assessment Method

Continuous Assessment 1	Continuous Assessment 2

50 marks	50 marks

Course Outcomes:

CO1	To widen the knowledge on the characteristics of Tamil language and literature.
CO2	To explore the traditional Tamil fine arts and its techniques of Tamil Heritage.
CO3	To evaluate the various types of performing arts and their cultural context.
CO4	To get an insight on the lifestyle and living techniques of Tamil ancestors.
CO5	To recognise and perceive the role played by Tamils in the unity and development of India.

CO PO Mapping:

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12
1								**1**	**2**	**3**	**1**	**3**
2								**1**	**3**	**2**	**3**	**2**
3								**1**	**3**	**2**	**1**	**2**
4								**3**	**2**	**2**	**3**	**2**
5								**2**	**3**	**3**	**2**	**3**

TEXT-CUM-REFERENCE BOOKS

1. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL– (in print)
2. Social Life of the Tamils- The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
3. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D.Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
4. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
5. Keeladi-'Sangam City Civilization on the banks of river Vaigai'(Jointly Published by:Department of Archaeology &TamilNadu Text Book and Educational Services Corporation, Tamil Nadu)
6. Studies in the History of India with Special Reference to TamilNadu (Dr.K.K.Pillay) (Published by: The Author)
7. Porunai Civilization(Jointly Published by:Department of Archaeology &TamilNadu Text Book and Educational Services Corporation,Tamil Nadu)
8. Journey of Civilization Industo Vaigai(R.Balakrishnan)(Published by:RMRL)– Reference Book.

24HS1103	தமிழர் மரபு	L	T	P	C
		1	0	0	1

முன்னுரை(Preamble)

இப்பாடத்திட்டம் பொறியியல் பயிலும் முதலாம் ஆண்டு மாணவர்களின் முதலாம் பருவத்திற்கு உரியது. தமிழ் மொழி மற்றும் இலக்கியத்தின் தன்மைகளை எடுத்துரைத்து மரபுக் கலைகளான நிகழ்த்து கலைகள் மற்றும் நுண்கலைகள் வழியாகத் தமிழ்ப் பண்பாட்டை புலப்படுத்தி இந்திய பண்பாட்டிற்கு தமிழர்கள் ஆற்றிய பங்கினை மாணவர்கள் அறியச் செய்தல்.

பாடநெறிக்கான முன்நிபந்தனைகள்(Prerequisites for the course)

தமிழ் மொழியில் எழுத படிக்க தெரிந்திருத்தல் அவசியம்.

அலகு I	மொழி மற்றும் இலக்கியம்	6

இந்திய மொழிக் குடும்பங்கள்- திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி - தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமய சார்பற்ற தன்மை - சங்க இலக்கியத்தில் பகிர்தல் அறம் - திருக்குறளில் மேலாண்மைக் கருத்துக்கள் - சிற்றிலக்கியங்கள்- தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி- தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

அலகு II	மரபு- பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை- சிற்பக்கலை	6

நடுகல் முதல் நவீன சிற்பங்கள் வரை - ஐம்பொன் சிலைகள்- பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள்- தேர் செய்யும் கலை- சுடுமண் சிற்பங்கள் - நாட்டுப்புறத் தெய்வங்கள்- குமரி முனையில் திருவள்ளுவர் சிலை - இசைக் கருவிகள்- மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் -

அலகு III	நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்	6

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

அலகு IV	தமிழர்களின் திணைக் கோட்பாடுகள்	6

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

அலகு V	இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு	6

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

Total Periods	**30**
Assessment Method	
Continuous Assessment 1	**Continuous Assessment 2**
50 marks	**50 marks**

எதிர்பார்க்கும் படிப்பின் முடிவுகள்

CO1	மாணவர்கள் தமிழ் மொழி மற்றும் இலக்கியத்தின் தன்மைகள் குறித்து அறிந்து கொள்வார்.
CO2	தமிழ் மரபு சார்ந்த நுண்கலைகளையும் அதன் நுட்பங்களையும் புரிந்து கொள்வர்.
CO3	நிகழ்த்து கலைகளின் வகைகளையும் அதன் பண்பாட்டுச் சூழலையும் அறிந்து கொள்வர்.
CO4	பழந்தமிழரின் வாழ்க்கைச் சூழல்களை அறிந்து கொள்வர்.
CO5	இந்திய ஒருமைப்பாட்டிற்கும் வளர்ச்சிக்கும் தமிழர்கள் ஆற்றிய பங்கு குறித்து அறிவர்.

CO PO Mapping:

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12
1								**1**	**2**	**3**	**1**	**3**
2								**1**	**3**	**2**	**3**	**2**
3								**1**	**3**	**2**	**1**	**2**
4								**3**	**2**	**2**	**3**	**2**
5								**2**	**3**	**3**	**2**	**3**

TEXT-CUM REFERENCE BOOKS

1. தமிழக வரலாறு - மக்களும் பண்பாடும் - கே. கே பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித்தமிழ் - முனைவர் இல. சுந்தரம் (விகடன் பிரசுரம்).

3. கீழடி - வைகை நதிக்கரையில் சங்க கால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு).
4. பொருநை - ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)

Prepared By	Verified By
Dr.V Ponraj, AP/Tamil	Dr. Nagarajan, AP/Tamil

SEMESTER II								
S.No	**Course Code**	**Course Name**	**Category**	**Contact Periods**	**L**	**T**	**P**	**C**
Theory Courses								
1	**24HS2101**	**Business Communication and Value Science – II**	**HSSM**	**2**	**2**	**0**	**0**	**2**
2	**24CB2601**	**Fundamentals of Economics**	**PC**	**2**	**2**	**0**	**0**	**2**
3	**24EE2501**	**Fundamentals of Electrical and Electronics Engineering**	**ES**	**3**	**3**	**0**	**0**	**3**
4	**24ME1501**	**Engineering Graphics**	**ES**	**6**	**2**	**0**	**4**	**4**
5	**24CS2501**	**Introduction to Computing Using Python**	**ES**	**3**	**3**	**0**	**0**	**3**
6	**24GE2901**	**Design Thinking**	**EEC**	**1**	**1**	**0**	**0**	**1**
Theory cum Practical Courses								
1	**24CB2602**	**Digital principles and Computer Organization**	**PC**	**5**	**3**	**0**	**2**	**4**
Practical Courses								
1	**24AI2611**	**Artificial Intelligence Tools Laboratory**	**PC**	**4**	**0**	**0**	**4**	**2**
2	**24CS2511**	**Python Programming Laboratory**	**ES**	**4**	**0**	**0**	**4**	**2**
Mandatory Courses								
1	**24HS2103**	**Technology In Tamil Culture/ தமிழரும் தொழில்நுட்பமும்**	**HSSM**	**1**	**1**	**0**	**0**	**1**
Total				**31**	**17**	**0**	**14**	**24**

Theory Courses

24HS2101	TECHNICAL COMMUNICATION SKILLS	L	T	P	C
		2	0	0	2

Preamble

This course is offered to develop strategies and skills to enhance professional students' ability to read and comprehend engineering and technology texts. Foster their ability to write convincing job applications and effective reports. Develop their speaking skills to make technical presentations, participate in group discussions. The outcome of the course is to help students acquire the language skills of listening, speaking, reading and writing competency in English language thereby making them meet the global expectations.

Prerequisites for the course

- The prerequisite knowledge required to study this Course is the basic knowledge in English Language.

Objectives

1. To widen strategies and skills to augment ability to read and comprehend engineering and technology texts.
2. To draft convincing job applications and effective reports.
3. To develop speaking skills to make technical presentations, participate in group discussions.
4. To strengthen listening skills to comprehend technical lectures and talks in their areas of specialization.
5. To cultivate writing skills both technical and general.

UNIT 1	READING AND STUDY SKILLS	6

Reading - Reading longer technical texts / technical blogs and taking down notes; **Writing** - interpreting charts (all the types), graphs – comparing and contrasting statements/paragraphs – analyzing technical details - writing technical blogs - Drafting lab reports, writing clear and concise emails to professors and colleagues, composing technical summaries of research articles; **Vocabulary Development** - Select Technical Vocabulary; **Language Development** - Active Voice and Passive Voice

UNIT 2	INTRODUCTION TO PROFESSIONAL WRITING	6

Reading - Technical related topics; **Writing** - statement of purpose - press release – extended definitions - writing instructions – recommendations –Minutes of the Meeting - Writing - user manual development for a chosen engineering tool, safety protocol development for a specific engineering lab; **Language Development** - Subject Verb Agreement, Compound Words.

UNIT 3	INTERVIEW SKILLS	6

Reading- newspaper article - read company profile - practice in speed reading ; **Writing** - Job Application - Resume- Internship application - letter to the editor - email etiquette - positive, negative and neutral responses - sending professional emails; Writing opinion paragraph - Writing paragraphs with reasons; **Vocabulary Development** - select Technical Vocabulary; **Language Development** - If – Conditionals

UNIT 4	REPORT WRITING I	6

Reading - Analyzing research articles on emerging technologies in engineering, white papers on future engineering trends, identifying potential research opportunities; **Writing** - Fire Accident Report - Industrial Visit Report - Project Report; **Vocabulary Development**- finding suitable synonyms - paraphrasing; **Language Development** - Clauses.		
UNIT 5	**REPORT WRITING II**	**6**
Reading - Analyzing project management documents, work breakdown structures (WBS), and Gantt charts, evaluating project feasibility and timelines; **Writing** - Writing Feasibility Reports, Survey Reports; **Vocabulary Development** - verbal analogies ; **Language Development** - Prepositional Phrases.		
	Total Periods	**30**

Suggestive Assessment Methods

Formative Assessment (20 Marks)	Continuous Assessment (20 Marks)	End Semester Exams (60 Marks)
(i) Google Form based - on-line Test incorporating Listening, Speaking and Reading	Written Test	Written Test

Outcomes

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

CO1	Understand advanced technical texts from varied technical genres to understand engineering concepts and explore more. (Apply)
CO2	Review technical contents written on par with international standards and rewrite contents using the right vocabulary without grammatical errors to make their articles published in reputed journals. (Apply)
CO3	Develop polished resumes and job applications tailored to specific roles, effectivelyhighlighting their qualifications and enhancing their chances of securing desired employment opportunities. (Apply)
CO4	Write reports utilizing the required format prescribed on par with international standards using the exact vocabulary to make their reports worthy to be read.(Apply)
CO5	Appraise the need for new products and write feasibility and survey reports following the format prescribed in a way to create awareness. (Apply)

Text Books

1. Mike Markrl. Technical Communication,Palgrave Macmillan: London, 2012.
2. Sumant,S and Joyce Pereira. Technical English II. Chennai: Vijay Nicole Imprints Private Limited, 2014.
3. Kumar, Sanjay and Pushp Lata. Communication Skills: A Workbook. New Delhi: OUP, 2018.

Reference Books

1. Raman, Meenakshi & Sangeetha Sharma. Communication Skills. New Delhi: OUP, 2018
2. Rizvi M, Ashraf. Effective Technical Communication. New Delhi: Tata McGraw-Hill Publishing Company Limited, 2007

Web Resources

1. Interpretation of Charts : https://youtu.be/4lxA7lo9GLU : https://www.englishhints.com/charts-and-graphs.html
2. Instructions https://www.wikihow.com/Write-Clear-Instructions
3. Resume building https://novoresume.com/career-blog/how-to-write-a-resume-guide
4. Report writing - https://www.youtube.com/watch?v=FXIuHOFAxos ; https://www.deakin.edu.au/students/studying/study-support/academic-skills/report-writing
5. UPSC Interview: https://www.youtube.com/watch?v=OhJWg-0qdI0

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PS O 3
1										3		1			
2										3		1			
3										3					
4										3					
5										3		2			

SUGGESTED COURSE LEVEL ASSESSMENT QUESTIONS:

COURSE OUTCOME 1 (CO 1) :

1) Read the given passage and take notes.
2) Analyse the given type of chart or graph and answer the questions given.
3) Analyse the given chart or graph and write paragraphs comparing and contrasting the data.
4) Analyse the given chart or graph and write paragraphs giving importance to technical details.
5) Fill in the blank with appropriate technical vocabulary.
6) Convert the given active voice sentence into passive voice or impersonal passive voice.

COURSE OUTCOME 2 (CO 2) :

1) Write a purpose statement for the tool or gadget given.
2) Write an extended definition for the given word.
3) Write 8 instructions / recommendations on the given topic.
4) Write the Minutes of the meeting for the given meeting.
5) Fill in the blank with appropriate Subject Verb agreement.
6) Fill in the blank with suitable compound words.

COURSE OUTCOME 3 (CO 3) :

1) Listening to mock interviews and answering the questions.
2) Listen to the strategies of GD and answer the given questions.
3) Read and submit a recording of technical content following the strategies of speed reading.
4) Write Job application with a cover letter for the given job description.
5) Write paragraphs expressing opinion on the given topic.

6) Fill in the blank / complete the sentence with appropriate If-Conditionals.COURSE OUTCOME 4 (CO 4) :

1) Write a fire accident report for the provided incident.
2) Write an Industrial visit report.
3) Write a report on the Project work undertaken by the candidate giving importance to thecurrent status report and the time needed for the completion of the project.
4) Find the appropriate synonym for the given word.
5) Paraphrase the given passage.
6) Fill in the blank with appropriate clauses.COURSE OUTCOME 5 (CO 5) :

1) Write a Feasibility report for a business / project proposal given.
2) Write a survey report for the given scenario.
3) Pick out the appropriate Verbal Analogy.
4) Fill in the blank with appropriate articles.
5) Complete the sentence with appropriate Prepositional Phrases.
6) Choose the appropriate word to complete the sentence.

Prepared By

Mr. David Ayling J, AP/ English

Verified By

Ms. Thamizh Paavai, AP/English

24CB2601	FUNDAMENTALS OF ECONOMICS	L	T	P	C
		2	0	0	2

Prerequisites for the course

- Nil

Objectives

1. To impart the knowledge of micro economics that deals with the study of economic decision making by individuals and individual firms.
2. To analyze the short-term effects of fiscal policy on economic output and the price level, considering its role in stabilizing the economy during periods of recession or inflation.
3. To exemplify the demand curves of households and supply curves of firms with the principles.
4. To make the students understand the various concepts in macroeconomics that deals with the performance and behaviour of an economy.
5. To analyze the effectiveness of monetary policy in stabilizing the economy during different phases of the business cycle

UNIT I	INTRODUCTION TO MICRO ECONOMICS	6

Introduction to Economics – Themes of Economics – Micro Vs Macro Economics- Demand curves and supply curves- Elasticity of Demand - Elasticity of Supply- Demand Curves of Households and firms

UNIT II	WELFARE ANALYSIS	6

Consumers and Producers Surplus- Price Ceilings and Price Floors; Consumer Behavior - Axioms of Choice-Budget Constraints and Indifference Curves; Consumers Equilibrium Effects of a Price Change, Income and Substitution Effects Derivation of a Demand Curve

UNIT III	PRODUCTION AND COST FUNCTION	6

Theory of Production - Production Function and Isoquants - Cost Minimization; Cost Curves - Total, Average and Marginal Costs - Long Run and Short Run Costs; Equilibrium of a Firm under Perfect Competition; Monopoly and Monopolistic Competition

UNIT IV	MACRO ECONOMICS	6

National Income and its Components - GNP, NNP, GDP, NDP Consumption Function; Investment; Simple Keynesian Model of Income Determination and the Keynesian Multiplier; Government Sector -Taxes and Subsidies; External Sector - Exports and Imports; Money -Definitions; Demand for Money Transaction and Speculative Demand; Supply of Money - Banks Credit Creation Multiplier; Integrating Money and Commodity Markets - IS, LM Model

UNIT V	BUSINESS CYCLES AND STABILIZATION	6

Monetary and Fiscal Policy - Central Bank and the Government; the Classical Paradigm - Price and Wage Rigidities - Voluntary and Involuntary Unemployment.

Total Periods	30

Suggestive Assessment Methods

Continuous Assessment Test: (100 Marks)

1. DESCRIPTIVE QUESTIONS

2.FORMATIVE MULTIPLE CHOICE QUESTIONS

Outcomes

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

CO 1: Understand the functioning of elasticity of demand in micro economics

CO 2: Analyze the supporting of price, income and substitution effects in the consumers and producer's surplus.

CO 3: Analyze the equilibrium of a firm under perfect competition, monopoly and monopolistic competition.

CO 4: Apply the concepts of demand for money and supply of money with appropriate model in macro-economic analysis.

CO 5: Examine and evaluate the problems of voluntary and involuntary unemployment

Text Books

1. Paul Anthony Samuelson, William D. Nordhaus, Economics, Nineteenth Edition, McGraw-Hill Education, 2010.
2. N. Gregory Mankiw, Principles of Macroeconomics, Seventh Edition, Cengage Learning, 2018.
3. Pindyck, Robert S and Daniel L. Rubinfeld , Micro Economics, Eighth Edition, 2013.

Reference Books

1. Dornbusch, Fischer and Startz, Macroeconomics, Tenth Edition, Tata Mcgraw Hill, 2012.
2. Hal R, Varia, Intermediate Microeconomics: A Modern Approach, Eighth Edition Affiliated East-West Press, 2006

Web Resources

1. https://onlinecourses.swayam2.ac.in/imb24_mg85/preview
2. https://onlinecourses.nptel.ac.in/noc23_ec06

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2					2	2	2			2	2	2		
2						2	3	2		2	2		2		
3							2		2	2	3				2
4						2	2		2	2	3				2
5							2	2	2	2	2	2			2

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	20	20			
UNDERSTAND	30	30			
APPLY	50	50			
ANALYZE					
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

Course Outcome 1 (CO1):

1. A new technology in the production of smartphones has reduced the manufacturing costs significantly. How will this technological advancement affect the market equilibrium price and quantity of smartphones? Additionally, illustrate and explain the changes using a supply and demand graph.
2. A coffee shop notices that when it raises the price of its coffee by 10%, its total revenue decreases by 5%. Calculate the price elasticity of demand for the coffee and explain what this implies about consumer behavior. How should the coffee shop adjust its pricing strategy to maximize revenue?

Course Outcome 2 (CO2):

1. The government introduces a subsidy on renewable energy products to encourage environmentally friendly consumption. Analyze the impact of this subsidy on consumer and producer surplus. Illustrate your answer with a supply and demand diagram and discuss the potential welfare implications, including any deadweight loss or gain in total surplus. Additionally, evaluate whether the subsidy could lead to any unintended economic consequences.
2. A city government implements a price ceiling on rental housing to make it more affordable for low-income residents. Evaluate the welfare effects of this policy on tenants and landlords. Use a supply and demand diagram to illustrate the changes in consumer and producer surplus. Discuss the potential for deadweight loss and any secondary effects such as housing shortages, black markets, or reduced maintenance of rental properties.

Course Outcome 3 (CO3):

1. A company experiences different cost behaviors in the short run and long run. Explain how the firm's long-run average cost (LRAC) curve is derived from its short-run average cost (SRAC) curves. Analyze the presence of economies and diseconomies of scale using the LRAC curve. Provide a scenario where the firm might experience both economies and diseconomies of scale as it expands its production, and discuss the strategic decisions the firm should consider in managing its scale of operations.
2. Evaluate the impact of a significant technological innovation on a firm's short-run and long-run cost functions. How would this innovation affect the firm's marginal cost (MC), average total cost (ATC), and average variable cost (AVC) curves? Discuss the potential changes in the firm's production decisions and market competitiveness. Provide a graphical representation to support your analysis, showing the shifts in the cost curves before and after the technological innovation

Course Outcome 4 (CO4):

1. A government decides to increase its spending on infrastructure projects to combat a recession. Using the aggregate demand and aggregate supply (AD-AS) model, illustrate and explain how this fiscal policy action is likely to impact the overall economic output and price level in the short run. Discuss any potential crowding-out effects on private investment.
2. The central bank implements an expansionary monetary policy by lowering the interest rates. Using the IS-LM model, analyze how this policy action will affect national income, interest rates, and inflation in the short run. Explain the transmission mechanism through which lower interest rates influence aggregate demand and economic activity.

Course Outcome 5 (CO5):

1. During an economic downturn, the government implements a combination of tax cuts and increased public spending to stimulate the economy. Using the AD-AS (Aggregate Demand-Aggregate Supply) model, illustrate and explain the short-term effects of this fiscal policy on economic output and the price level. Discuss how these measures can help stabilize the economy during a recession, and identify any potential long-term consequences of such policies, including their impact on the national debt.
2. In response to rising inflation during an economic boom, the central bank decides to increase interest rates. Using the IS-LM (Investment-Saving, Liquidity Preference-Money Supply) model, analyze how this monetary policy action affects aggregate demand, investment, and overall economic output. Explain how higher interest rates can help stabilize the economy by controlling inflation, and discuss any potential trade-offs or negative effects this policy might have on employment and growth in the short term.

Prepared By
Mrs. A. Anitha, AP/CSBS

Verified By
Dr. S. Gomathi,HoD/CSBS

21EE2501	FUNDAMENTALS OF ELECTRICAL AND ELECTRONICS ENGINEERING	L	T	P	C
		3	0	0	3

Prerequisites for the course

- Engineering Physics
- Engineering Mathematics

Course Objectives

The course will enable students to:

- Know the basic concepts of electric circuits and analysis and introduction to measurement and metering equipment's for electric circuits
- Gain knowledge on the basic operation of electric machines and transformers.
- Have an Introduction of semiconductor devices and its applications.
- To understand the fundamentals of digital electronics.
- Learn about the basics of communication systems.

UNITI	ELECTRICAL CIRCUITS	9

Ohms Law– Kirchoff's Laws– Steady State Solution of DC Circuits –Mesh and Node Analysis- Introduction to AC Circuits –Operating Principles of Moving Coil and Moving Iron Instruments, Wattmeter and Energy meter.

UNITII	ELECTRICAL MACHINES	9

DC Generator- DC Motor- Single Phase Transformer - single phase induction Motor: Construction, Principle of Operation, EMF Equation and Applications.

UNITIII	SEMICONDUCTORDEVICESANDAPPLICATIONS	9

Characteristics of PN Junction Diode and Zener Diode– Half wave and Full wave Rectifier –Bipolar Junction Transistor: CB, CE, CC Configurations and Characteristics.

UNITIV	DIGITALELECTRONICS	9

Number System –Number System Conversions – Logic Gates- Half and Full Adders–Half Subtractor and Full Subtractor - Introduction to Flip-Flops: SR, JK, T, D.

UNITV	BASICS OF COMMUNICATION SYSTEMS	9

Types of Signals: Analog and Digital Signals – Modulation: Amplitude and Frequency Modulation - Demodulation-Communication Systems: Radio, TV, Satellite (Block Diagram Approach only)

		Total Periods 45
		Suggestive Assessment Methods
Continuous Assessment Test (30 Marks)	**Formative Assessment Test (10 Marks)**	**End Semester Exams (60 Marks)**
1.DESCRIPTION QUESTIONS 2.FORMATIVE MULTIPLE CHOICE QUESTIONS	1.ASSIGNMENT 2.ONLINE QUIZZES 3.PROBLEM–SOLVING ACTIVITIES	1.DESCRIPTION QUESTIONS 2.FORMATIVE MULTIPLE CHOICE QUESTIONS

CourseOutcomes

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

CO1: Apply the basics of electric circuits, analysis, measurement and metering for electric circuits.

CO2: Understand the construction, operating principle of DC machine, single phase transformer and single-phase induction motor.

CO3: Understand the basic structure of electronic devices such as diodes, Rectifiers and transistor.

CO4: Analyze the various number systems and simplifications using mathematical expression and understand the concepts of flipflops.

CO5: Understand the basics of communication systems.

TextBooks

1. R. Muthu subramanian, S. Salivahanan and K A Muraleedharan, "Basic Electrical, Electronics and Computer Engineering",2nd ed., Tata McGraw Hill,2022.
2. R. Sedha, "Applied Electronics", S. Chand & Co., 2019.

ReferenceBooks

1. Mittleand V. N. Mittle, "Basic Electrical Engineering" , Tata McGraw Hill Edition, New Delhi, 2005.
2. T K Nagsarkarand, M S Sukhija, "Basics of Electrical Engineering", Oxfordpress2005.

WebResources

1. https://nptel.ac.in/courses/108/104/108104139/
2. https://nptel.ac.in/courses/108/105/108105155/
3. https://nptel.ac.in/courses/108/105/108105132/
4. https://nptel.ac.in/courses/117/102/117102061/

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3												
2	3	2				2						2	3		
3	3														
4	3	3	2										2		
5	3					2						2			

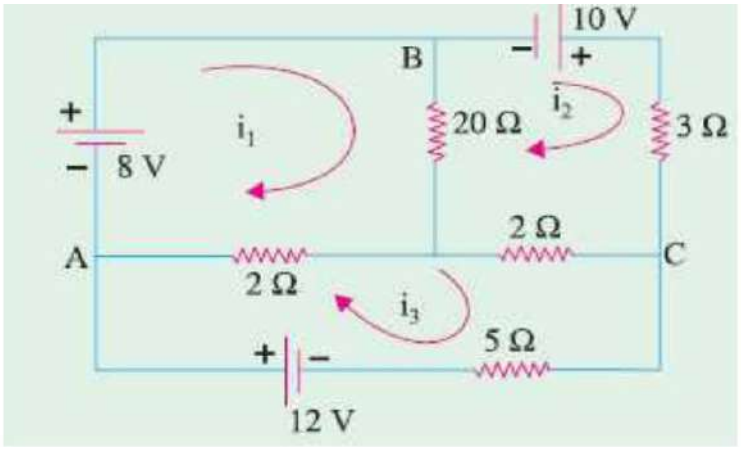
BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	30	30	05	05	20
UNDERSTAND	20	20	10	10	20
APPLY	20	20	05	05	30
ANALYZE	30	30	05	05	30
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1: Apply the basic properties of electrical elements, and Analyze AC and DC circuit, and measurement and metering for electric circuits.

1. Classify different electrical measuring equipment's and understanding their principles.
2. Determine current in 5ohm resistor by any one method



COURSE OUTCOME 2:

1. Explain operative principle of transformer with background of magnetic circuits
2. Explain the construction, working principle of single phase Induction motor

COURSE OUTCOME 3: Understand the utilization of semiconductor devices.

1. Explain CB configuration with the help of input and output characteristics.
2. With a neat diagram explain the working of a PN junction diode in forward bias and reverse bias and show the effect of temperature on its V-I characteristics.

COURSE OUTCOME 4: Understand the fundamentals of digital circuits.

3. Write short notes on i) RS flip flop ii)D- flip flop, iii) JK flip flop, iv)T-flip flop
4. Explain the working of half adder and full adder using truth table.

COURSE OUTCOME 5: Understand the basics of communication systems.

5. Discuss the usage of satellite for long distance communication with a neat block diagram of basic satellite transponder.
6. Explain the types of analog modulation with neat diagrams.

Prepared By — Verified By

Mrs. S. Lakshmi, AP/EEE — Mr. N. V. Selvam, AP/EEE

24ME1501	ENGINEERING GRAPHICS	L	T	P	C
		2	0	4	4

Prerequisites for the course

NIL

Preamble

Engineering drawing is an important tool for all Engineers and for many others professionals. It is the language of Engineers. Engineering Drawing communicates all needed information from the engineer who designed a part to the workers who will manufacture it.

Objectives

1. To understand the importance of the drawing in Engineering applications.
2. To improve their visualization skills so that they can apply this skill in developing new products.
3. To expose them to existing standards related to technical drawings.
4. To develop graphic skills for communication of concepts, ideas, and design of Engineering Products.

CONCEPTS AND CONVENTION	**2**

Importance of graphics in Engineering applications – Use of drafting instruments – BIS conventionsand specifications – Size, layout of drawing sheets – Lettering and Dimensioning

UNIT I	**PROJECTION OF POINTS, LINES AND PLANES**	**12**

General Principles of orthographic projection – First Angle Projection, projection of points in four quadrants – Projection of straight lines located in the first quadrant – inclined to both planes – Projection of planes (Change of position method only).

UNIT II	**PROJECTION OF SOLIDS**	**10**

Projection of simple solids like prisms, pyramids, cylinder, and cone when the axis is inclined to one reference plane by change of position method.

UNIT III	**SECTIONS OF SOLIDS AND DEVELOPMENT OF SURFACES**	**12**

Sections of regular solids as per BIS conventions - Constructing sectional views of simple objects andcomponents - Development of lateral surfaces of regular solids-Projection of truncated solids.

UNIT IV	**INTERSECTION OF SOLIDS**	**12**

Line of intersection, Determining the line of intersection between surfaces of two interpenetrating two square prisms and Intersection of two cylinders with axes of the solids intersecting each other Perpendicularly, using line method.

UNIT V	**ISOMETRIC AND PERSPECTIVE PROJECTIONS**	**12**

Principles of isometric projection, isometric scale, isometric projections of simple solids, truncated prisms, pyramids, cylinders, and cones. Perspective projection of prisms, pyramids, and cylinders by visual ray method.

Text Books

1. Venugopal K. and Prabhu Raja V., "Engineering drawing + AutoCAD", New Age International (P) Limited (2022)
2. Natrajan K.V., "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai (2015)

Reference Books

1. N.D.Bhatt, "Engineering Graphics", Charotor Publishing House, 53RD Edition 2019
2. Kumar M.S., "Engineering Graphics", D.D. Publications, (2015)
3. Parthasarathy N.S. and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, (2015)
4. Shah M.B. and Rana B.C., "Engineering Drawing", Pearson Education (2009)

Publication of Bureau of Indian Standards:

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

Web Recourses

1. http://nptel.ac.in/courses/112103019
2. https://archive.nptel.ac.in/courses/112/105/112105294/

Suggestive Assessment Methods

CAT 1 (20Marks)	Formative Assessment Test (20 Marks)
CAT 1 10 MARKS CAT 2 10 MARKS	Assignment, Multiple Choice Questions

Outcomes

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

C112.1: Apply the principles of orthographic projection in construction of points, lines and planes
C112.2: Apply the principles of change of position method in projection of simple solids
C112.3: Develop projections of sectioned solids and their developmental surface.
C112.4: Construct the intersection of curves of simple solids
C112.5: Develop the isometric and perspective view of simple solids.

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
112.1	3	1	1	2									3	2
112..2	3	1	1	1	1								3	2
112.3	3	1	1	1	1								3	2
112.4	2	2	1	1	1								3	1
112.5	2	2	1	1	1								3	2

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER					
UNDERSTAND			5	5	
APPLY	100	100	10	10	100
ANALYZE			10		
EVALUATE					
CREATE				10	

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1: Apply the principles of orthographic projection in construction of points, lines and planes

1. Draw the projections of the following points on a common reference line. (Apply)

   A,35 mm above HP and 25 mm in front of VP
   B,40 mm below HP and 15mm behind VP C,50 mm above HP and 25 mm behind VPD,45 mm below HP and 25 mm behind VPE, 30 mm behind VP and on HP

2. A line CD measuring 80 mm is inclined at an angle of 30° to HP and 45° to VP. The point C is 20 mmabove HP and 30 mm in front of VP. Draw the projections of the straight line.(Apply)
3. A pentagon of side 30 mm rests on the ground on one of its corners with the sides containing the corner being equally inclined to the ground. The side opposite to the corner on which it rest is inclined at 30° to the VP and is parallel to the HP. The surface of the pentagon makes 50° with the ground. Draw the top and front views of the pentagon.

COURSE OUTCOME 2: Apply the principles of change of position method in projections of solidproblems and draw graphically

1. A pentagonal pyramid of base side 25mm and height 40 mm, is resting on the ground on one of its triangular faces. The base edge of that face is inclined 30o to VP. Draw the projections of the solid. (A)

2. A hexagonal prism has side 25mm and height 50mm has a corner of its base on the ground and the long edge containing that corner inclined at 30o to HP and 45o to VP. Draw the projections of the solid. (A)

COURSE OUTCOME 3: Develop projections of sectioned solids and their developmental surface.

3. A cylinder of base diameter 50mm and height 60mm rest on its base on HP. It is cut by a plane perpendicular to VP and inclined at 450 to HP. The cutting plane meets the axis at a distance 15mm from its top base. Draw the sectional plan and true shape of the section. (A)

4. A regular hexagonal pyramid side of base 30 mm and height 60 mm is vertically on its base on HP, such that two of its sides of the base are perpendicular to VP. It is cut by a plane inclined at 30° to HP and perpendicular to VP. The cutting plane bisects the axis of the pyramid. Obtain the development of the lateral surface of the truncated pyramid. (A)

COURSE OUTCOME 4: Construct the intersection of curves of simple solids

1. A square prism 30 mm base sides and 70mm axis is completely penetrated by another square prism of 25 mm sides and 70 mm axis, horizontally. Both axes Intersects and bisect each other. All faces of prisms are equally inclined to VP. Draw projections showing curves of intersections.

2. A vertical cylinder of 80 mm diameter is completely penetrated by another cylinder of 60 mm diameter, their axes bisecting each other at right angles. Draw their projections showing curves of penetration, assuming the axis of the penetrating cylinder to be parallel to the VP.

COURSE OUTCOME 5: Develop the isometric and perspective view of simple solids.

1. A cone of diameter 50 mm and axis 70 mm rests on its base on HP. A section plane perpendicular to VP and inclined at 30° to HP cuts the solid and passes through a point on axis which is 40 mm above HP. Draw the isometric view of a truncated cone. (A)

2. A pentagonal pyramid of base edge 25 mm and height 65 mm rests vertically on its base on the HP such that one of its base edge parallel to VP. It is cut by a plane, parallel to HP and perpendicular to VP and passes through a point 25 mm from the apex. Draw the isometric view of the frustum of pyramid. (A)

Prepared By

Dr. S. M. Rajkumar, Asp/Mech

Verified By

Dr. M. Samual Hansen, HoD/Mech

24CS2501	INTRODUCTION TO COMPUTING USING PYTHON	L	T	P	C
		3	0	0	3

Preamble

This course provides learners an insight into Python programming, and develop programming skills to manage the development of software systems. The Python Programming course is designed to equip students with a comprehensive understanding of Python, a versatile and widely-used programming language. Covering fundamentals to advanced topics, this course includes Python syntax, data structures, functions, object-oriented programming, file handling, and database operations. Students will also explore data science libraries, GUI development with Tkinter, Image processing and web development thereby enabling them to apply Python in various real-world scenarios.

Prerequisites for the Course

- **Introduction to programming**

Objectives

1. Understand Python syntax, control flow, and input/output operations proficiently.
2. Apply data structures like lists, tuples, dictionaries, and sets, along with functions including recursion and lambda functions effectively.
3. Master object-oriented programming principles, implementing classes, inheritance, polymorphism, and encapsulation in Python.
4. Manipulate files, handle exceptions, and organize code into modules and packages adeptly.
5. Utilize Python libraries such as NumPy, Pandas, Matplotlib, Tkinter, data analysis, visualization, GUI development, and database interaction with proficiency.

UNIT I	INTRODUCTION TO PYTHON PROGRAMMING	9

Overview of Python Programming language – Python Interpreter and Environment –Basic syntax keywords – Data types- Variables and Identifiers – Statements - Operators– Expression – Input/Output – import statement - Control flow - Decision making – Loop control structure.

UNIT II	DATA STRUCTURES AND FUNCTIONS	9

Data structures : Lists – Tuples – Dictionaries - sets – Stack – Queue - Working with Strings

Functions: Definition, Function call, Parameters , return values – Recursion – Anonymous and Lambda Function– Scope of variables

UNIT III	OBJECT ORIENTED PROGRAMMING CONCEPTS	9

Introduction to OOP concepts – Classes – Instance variables - Objects – scopes – namespaces - Inheritance – Polymorphism –Overloading – operator overloading - Overriding - Encapsulation – Class methods, Instance methods and static methods.

UNIT IV	FILES AND MODULES	9

Introduction to Files – File Modes – Reading, Writing Files and appending files– Errors - Handling Exceptions – User-defined and system Exceptions.

Introduction to Modules and Packages – creating and importing modules – Built-in and External modules

UNIT V	PYTHON LIBRARIES AND FRAMEWORKS	9

Data set –Data science libraries – Numpy, Pandas and Matplotlib – Working with Datasets – preprocessing Data sets – Data Analysis and Visualization - GUI programming with Tkinter Library - Data base - Basic operations on Databases – Interfacing Database with GUI – Introduction to web development & Image processing Libraries with python.	
Total Periods	**45**

Laboratory Requirements

- 60 Systems with Windows / LINUX operating system with python IDLE or equivalent.

Suggestive Assessment

Continuous Assessment Test (20 Marks)	Formative Assessment Exam (20 Marks)	End Semester Exams (60 Marks)
1. DESCRIPTIVE QUESTIONS 2. Programming Exercises	1. LAB EXPERIMENTS 2. MODEL EXAMINATION	1. DESCRIPTIVE QUESTIONS

Outcomes

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

CO1: Apply basic control flow mechanisms, and demonstrate proficiency in performing input/output operations.

CO2: Demonstrate the data structures effectively and implement functions

CO3: Apply OOP concepts to design and implement Python classes with appropriate methods and attributes.

CO4: Manipulate files, handle exceptions effectively, and organize Python code into modules and packages.

CO5: Demonstrate applications using popular Python libraries and frameworks.

Text Books

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", Second Edition,Shroff/O'Reilly Publishers, 2016(Unit I -IV)
2. Jake VanderPlas, Python Data Science Handbook, Oreilly Media, First Edition,2016.(Unit V)

Reference Books

1. Charles Dierbach, "Introduction to Computer Science using Python", Wiley India Edition, 2016.
2. David Beazley and Brian K. Jones , "Python Cookbook", Oreilly Media, Third Edition,2013.(Unit V)

Web Resources

1. Python for Data science - https://onlinecourses.nptel.ac.in/noc20_cs36/course (Unit III – Numpy, Pandas)
2. https://www.geeksforgeeks.org(Unit V)

Prepared By	Verified By
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24GE2901	DESIGN THINKING	L	T	P	C
		1	0	0	1

Preamble

The course Design thinking help the learners to transform the way developing products, services, processes, and organizations. It brings innovative solutions to life based on how real users think, feel and behave.

Prerequisites for the course

Nil

Objectives

- Understand the importance of design thinking concepts and principles
- Use design thinking methods in every stage of the problem
- Create prototypes for clear understanding of the problem statement.
- Learn the different testing phases of design thinking
- Apply various methods in design thinking to different industrial problems

UNIT I	INTRODUCTION	3

Need for design - Tools - Principles of Design Thinking - The process of Design Thinking - Planning a Design Thinking project.

UNIT II	PROBLEM ANALYSIS AND DEFINITION	3

Search field determination - Problem clarification - Understanding of the problem – Problem analysis - Reformulation of the problem - Observation Phase - Empathetic design - Methods for Empathetic Design.

UNIT III	IDEATION AND PROTOTYPING	3

Ideate Phase - The creative process and creative principles - Creativity techniques - Evaluation of ideas - Prototype Phase - Lean Start-up Method for Prototype Development - Visualization and presentation techniques.

UNIT IV	TESTING AND IMPLEMENTATION	3

Test Phase - Tips for interviews - Tips for surveys - Kano Model - Desirability Testing - How to conduct workshops - Requirements for the space - Material requirements - Agility for Design Thinking.

UNIT V	**DESIGN THINKING IN INDUSTRY**	**3**

Design Thinking meets the corporation – The New Social Contract – Design Activism – Designing tomorrow – Case Study.

Total Periods	**15**

Suggestive Assessment Methods

Continuous Assessment Test (20 Marks)	**Formative Assessment Test (20 Marks)**	**End Semester Exams (60 Marks)**
1. DESCRIPTIVE QUESTIONS	1. ASSIGNMENT 2. MCQ	1. DESCRIPTIVE QUESTIONS

Outcomes

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

CO1– Understand the key concepts of design thinking.

CO2– Apply design thinking in the problem analysis phase.

CO3– Apply design thinking in the ideate and innovate phase of problem solving.

CO4– Apply design thinking in the testing and implementation phase.

CO5– Apply innovative solutions to real world problems using industry standards.

Text Books

1. Nir Eyal. Edited by Ryan Hoover, Hooked- How To Build Habit-Forming Products, Published by Portfolio, 2014.
2. Judkins Rod, The Art of Creative Thinking, Hodder & Stoughton, 2015.

Reference Books

1. Dan Senor, Saul Singer, Start-up Nation, Hachette Book Group, 2009.
2. Simon Sinek, Start with Why, Self-help book, 2009.

Web Resources

1. https://www.interaction-design.org/literature/article/personas-why-and-how-you-should-use-them
2. https://www.youtube.com/watch?v=GNvLpfXCge8
3. https://www.coursera.org/lecture/patient-safety-project-planning/prototyping-phase-jVuQ

CO Vs. PO Mapping and CO vs. PSO Mapping

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

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER					
UNDERSTAND	70	70	70	70	
APPLY	30	30	30	30	
ANALYZE					
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

Course Outcome 1 (CO1):

1. Identify a real-world problem and describe how applying design thinking could lead to a better solution than traditional problem-solving methods.
2. Demonstrate how a specific design thinking tool (e.g., empathy mapping) can be applied to understand user needs in the context of a mobile banking app.

Course Outcome 2 (CO2):

1. Using the empathetic design method, conduct an observation phase to identify key pain points in the user experience of a public transportation system. How would you reformulate these pain points into actionable problem statements?
2. Clarify a problem faced by remote workers during virtual meetings by determining the search field and analyzing the problem. Propose an empathetic design method to develop a solution.

Course Outcome 3 (CO3):

1. In the ideate phase, utilize at least two creativity techniques to generate solutions for reducing food waste in restaurants. How would you evaluate these ideas to select the most viable one?
2. Apply the lean start-up method to develop a prototype for a new fitness app. How would you use visualization and presentation techniques to effectively communicate your prototype to potential investors?

Course Outcome 4 (CO4):

1. Design a desirability test for a new smart home device using the Kano Model. What steps would you take to gather user feedback, and how would you analyze the results to inform design improvements?
2. Plan a user testing workshop to evaluate a new educational app. What are the space and material requirements, and how would you ensure agility in adapting the workshop based on real-time feedback?

Course Outcome 5 (CO5):

1. How can a corporation integrate design thinking into its strategy to address a new social contract with its employees focused on remote work and well-being? Provide an example of a specific initiative and outline the steps taken.
2. Analyze a case study where design activism played a crucial role in driving social change. How were design thinking principles applied to achieve the desired outcomes?

Prepared By — Verified By

Mrs. A. Anitha, AP/CSBS — Dr. S. Gomathi,HoD/CSBS

Theory cum Practical Courses

24CB2602	DIGITAL PRINCIPLES AND COMPUTER ORGANIZATION	L	T	P	C
		3	0	2	4

Preamble

The main objective of this course is to make the students understand the basic building blocks of computers, logic gates, combinational and sequential circuits and to conceptualize the basics of computer organizational and architectural issues.

Prerequisites for the course

- NIL

Objectives

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

UNIT I	COMBINATIONAL LOGIC	9

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

SUGGESTED ACTIVITIES:

- EL - Exclusive OR function 52
- Practical - Simplification and implementation of Boolean functions

SUGGESTED EVALUATION METHODS:

- Tutorial problems
- Assignment problems
- Quizzes

UNIT II	SYNCHRONOUS SEQUENTIAL LOGIC	9

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

SUGGESTED ACTIVITIES:

- Flipped Class room
- Introduction to HDL – in class and EL based on that
- Practical - Implementation of the arithmetic circuits and getting started with HDL

SUGGESTED EVALUATION METHODS:

- Tutorial problems
- Assignment problems
- Quizzes

UNIT III	**COMPUTER FUNDAMENTALS**	**9**

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

SUGGESTED ACTIVITIES:

- Mostly in Class
- Practical - Project demonstration and presentation

SUGGESTED EVALUATION METHODS:

- Tutorial problems
- Assignment problems
- Quizzes

UNIT IV	**PROCESSOR**	**9**

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

SUGGESTED ACTIVITIES:

- In Class activity for place - value systems
- Practical – Abacus – Counting – Activity

SUGGESTED EVALUATION METHODS:

- Tutorial problems
- Assignment problems
- Quizzes

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

Memory Concepts and Hierarchy – Memory Management – Cache Memories: Mapping and Replacement Techniques – Virtual Memory – DMA – I/O – Accessing I/O: Parallel and Serial Interface – Interrupt I/O.

SUGGESTED ACTIVITIES:

- Combination of in class & Flipped
- Practical - Project demonstration and presentation

SUGGESTED EVALUATION METHODS:

- Tutorial problems
- Assignment problems
- Quizzes

Total Periods	**45+15**
LIST OF EXPERIMENTS	**CO**
Verification of Boolean theorems using logic gates.	**CO 1**
Design and implementation of combinational circuits using gates for arbitrary functions.	**CO 1**
Implementation of 4-bit binary adder/subtractor circuits.	**CO 1**
Implementation of code converters.	**CO 1**
Implementation of BCD adder, encoder and decoder circuits	**CO 1**
Implementation of functions using Multiplexers.	**CO 1**
Implementation of the synchronous counters	**CO 2**
Implementation of a Universal Shift register.	**CO 2**
Simulator based study of Computer Architecture	**CO 3**

Suggestive Assessment Methods

Continuous Assessment Test (20 Marks)	**Formative Assessment Test (20 Marks)**	**End Semester Exams (60 Marks)**
1. DESCRIPTIVE QUESTIONS 2. FORMATIVE MULTIPLE CHOICE QUESTIONS	1. Open Book Test 2. Online Quizzes 3. Assignments	1. DESCRIPTIVE QUESTIONS 2. FORMATIVE MULTIPLE CHOICE QUESTIONS

Outcomes

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

CO 1 Design various combinational digital circuits using logic gates

CO 2 Design sequential circuits and analyze the design procedures

CO 3 State the fundamentals of computer systems and analyze the execution of an instruction

CO 4 Analyze different types of control design and identify hazards

CO 5 Identify the characteristics of various memory systems and I/O communication

Text Books

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

Reference Books

1. Carl Hamacher, ZvonkoVranesic, SafwatZaky, NaraigManjikian, "Computer Organization and Embedded Systems", Sixth Edition, Tata McGraw-Hill, 2012.
2. William Stallings, "Computer Organization and Architecture – Designing for Performance",
Tenth Edition, Pearson Education, 2016.

Web Resources

5. https://www.coursera.org/learn/digital-systems

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	3	3				1				3		
2	3	3	2	2	2				1				3		
3	3	2	2	2	1				1				3		
4	2	2	3	2					2				3		
5	3	3		3			3						3		

BLOOMS LEVEL ASSESSMENT PATTERN

BLOOMS CATEGORY	CAT 1	CAT 2	FAT 1	FAT 2	END SEM EXAM
REMEMBER	20	10	5	5	10

UNDERSTAND	40	20	10	10	20
APPLY	40	50	5	5	50
ANALYZE		20	5	5	20
EVALUATE					
CREATE					

COURSE LEVEL ASSESSMENT QUESTIONS

Course Outcome 1 (CO1):

1. Show that NAND gate is a universal gate. (Analyze)
2. What is the basic function of a decoder? Explain basic 3- input decoder with diagram.(Apply)
3. Using the Karnaugh Map Method. Minimize the expression: X = A B C + A B C + A B C + A B C(Apply)

Course Outcome 2 (CO2):

1. Describe the mode of working of an edge triggered S-R flip flop.(Apply)

2. Describe the working of Ripple counter with the suitable diagram and counting sequence. How is the Ripple counter used in digital circuit?(Analyse)

3. Describe the working of a Master-Slave J-K flip flop with the help of clear Block diagram and state table. Explain the "Race-around condition" and discuss how the master-slave setup circumvents it?(Analyze)

Course Outcome 3 (CO3):

3. Distinguish between Fixed point and Floating-point representation of a given number. (Understand)
4. Perform the arithmetic operation in binary using 2's complement representation (i). (+42) + (-13) (ii) (-42) – (-13). (Apply)
5. Draw the connection between processor and memory and mention the functions of each component in the connection. (Understand)

Course Outcome 4 (CO4):

1. Explain the following a) Time shared common bus system b) Cross bar switch c) Multiport memory(Understand)
2. What is instruction hazard? Explain in detail how to handle the instruction hazards in pipelining with relevant examples (Remember)
3. Discuss in detail about the hardwired control unit with block diagram.(Apply)

Course Outcome 5 (CO5):

1. Write the formula for the average access time experienced by the processor in a system with two levels of caches(Analyse)
2. How data transfers can be controlled using handshaking technique?(Apply)
3. Draw the neat sketch of memory hierarchy and explain the need of cache memory?(Understand)

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Practical Courses

21AI2611	ARTIFICIAL INTELLIGENCE TOOLS LABORATORY	L	T	P	C
		0	0	4	2

The goal of the AI tools lab is to provide familiarity with AI tools for professional applications, its purpose, and perhaps some key features or benefits it offers.

Prerequisites for the course

- **NIL**

Objectives

1. Understanding the complex AI concepts to non-technical stakeholders through presentations,reports, and visualizations.
2. Engage in practical exercises and projects that involve data visualization and dashboardingtools involves designing, implementing, and deploying AI models.
3. To analyze and interpret images and videos, such as facial recognition or object detection.
4. To deploy AI models training ,evaluation and optimization.
5. To Apply AI techniques to solve real world problems

S.No	List of Experiments	CO
1	Converting idea to customized presentation, technical paperwith plagiarism checking using slideAI,neo-gpt	CO1
2	Bug fixing and trouble shooting with Codeium	CO1
3	Creating Dashboards using Google data studio	CO2
4	Creating interactive dashboard for business application using PowerBI	CO2
5	Creating interactive multilingual chat bot for customer service using Google dialog flow	CO2
6	Object Detection using Google's Teachable machine	CO3
7	Motion Detection using Google's teachable machine	CO3
8	ML application development and code generation using vertex AI – classification/ prediction/associations	CO4
9	Building AI Personal Trainer with IBM Watson and deployment in webapp	CO4
10	Web application development for disease prediction using streamlit	CO5

11	Personalized recommendation system using streamlit	CO5

S.No.	List of Projects	PO	CO
1.	Plagiarism Grammar checking for content writing.	PO1,PO5	CO1
2.	Code Review Assistance	PO1,PO5	CO2
3.	Customer Dashboard Creation	PO1,PO5	CO2
4.	User queries Chatbot Creation	PO1,PO5	CO2
5.	Stock prediction	PO1,PO5	CO3
6.	Consumer sentiment analysis	PO1,PO5	CO3
7.	Handwritten digit recognition	PO1,PO5	CO4
8.	Spam email classifier	PO1,PO5	CO4
9.	Fake news detector	PO1,PO5	CO5
10.	Coupon purchase prediction	PO1,PO5	CO5

Suggestive Assessment Methods

Lab Components Assessments(50 Marks)	End Semester Exams(50 Marks)
• Project File(Progress Score) • Viva voce	1. Record note 2. Exercises 3. Viva voce

Course Outcomes

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

CO1	Improve the ability to communicate complex AI concepts to non-technical stakeholders through presentations, reports, visualizations and automated codegenerations.
CO2	Develop critical thinking skills to evaluate visualization in data and dashboardingtools for content and debugging solutions effectively.
CO3	Use AI to analyze and interpret images and videos, such as facial recognition orobject detection.
CO4	Engage in practical exercises and projects that involve designing, implementing, and deploying AI models. This includes data preprocessing, model training, evaluation, and optimization
CO5	Apply AI techniques to solve real-world problems across various domains such as healthcare, finance, marketing, and more. Emphasis on problem-solving, critical

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	3	3				1				3		
2	3	3	2	2	2				1				3		
3	3	2	2	2	1				1				3		
4	2	2	3	2					2				3		
5	3	3		3			3						3		

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24CS2511	PYTHON PROGRAMMING LABORATORY	L	T	P	C
		0	0	4	2

Prerequisites for the course

- 24CS1511 – Programming Practice Laboratory using C

Objectives

1. To build python programming skills for real-world applications.
2. To develop Python programs with conditionals and loops.
3. To use Python data structures - lists, tuples, dictionaries.
4. To do input/output with files in Python.
5. To develop collaboration skills by working in teams on projects

S.No	List of Experiments	CO
1	Basic Python Programming a) Write a program that takes 2 numbers as command line arguments and prints its sum. b) Implement python script to show the usage of various operators available in python language.	**CO1**
2	Python Programs using conditionals – if, if – else, if – elif – else statements a) Write a program for checking the given number is even or odd. b) Write a program for finding biggest number among 3 numbers c) Implement python script to read person's age from keyboard and display whether he is eligible for voting or not. d) Implement python script to check the given year is leap year or not	**CO2**
3	Python Programs using looping statements a) Implement Python Script to generate first N natural numbers. b) Implement Python Script to check given number is palindrome or not. c) Implement Python script to print factorial of a number. d)Implement Python Script to check given number is Armstrong or not.	**CO2**
4	Python Programs using Functions a) Define a function max_of_three() that takes three numbers as arguments and returns the largest of them. b) Write a program which makes use of function to display all such numbers which are divisible by 7 but are not a multiple of 5, between 1000 and 2000.	**CO2**
5	Python Programs using List a) Write a program which accepts a sequence of comma - separated numbers from console and generate a list and a tuple	**CO3**

	which contains every number. Suppose the following input is supplied to the program: 34, 67, 55, 33, 12, 98. Then, the output should be: ['34', '67', '55', '33', '12', '98'] ('34',67', '55', '33', '12', '98').	
6	Python Programs using String, Tuples, Numpy array. a) Accepts a string and calculate the number of upper case letters and lower case letters. b) Write a python program to check whether the given string is palindrome or not. c) Create all possible strings by using 'a', 'e', 'i', 'o', 'u'. Use the characters exactly once. d) Multiply all the numbers in a list.	**CO3**
7	Python Programs using Dictionary a) Create a dictionary and apply the following methods 1) Print the dictionary items 2) access items 3) use get() 4)change values 5) use len()	**CO3**
8	Python Programs using Files a) Write Python script to display file contents. b) Write Python script to copy file contents from one file to another.	**CO4**
9	Programs to implement Inheritance.	**CO4**
10	Python Programs using Exceptions	**CO3**
11	Calculation of the Area : Don't measure	**CO3**
12	Monte Hall : 3 doors and a twist	**CO3**
13	Sorting : Arrange the books	**CO3**
14	Searching : Find in seconds	**CO3**
15	Anagram	**CO2**
16	Lottery Simulation - Profit or Loss	**CO3**
17	Simulate a password generator	**CO3**
18	Simulate a grade book for a teacher	**CO2**
19	Rock Paper and Scissor.	**CO2**
20	Converting an Image to Black and White/Grayscale	**CO5**
21	Blurring an Image, Edge Detection and Reducing the Image Size	**CO5**

S.No.	**List of Projects**	**Related Experiment**	**CO**
1.	Currency Conversion system	EXP 1,2,7,11	CO1-CO5
2.	ATM System	EXP1,2,8,9,11	CO1-

			CO5
3.	Airline Reservation System	EXP 1,2,3,6,7,8,9,11	CO1-CO5
4.	Library Management System	EXP 1,2,3,4,5,6,7,8,9,11	CO1-CO5
5.	Restaurant Billing System	EXP 1,2,3,4,6,7,8,9,11	CO1-CO5
6.	Inventory System	EXP 1,2,3,4,5,6,7,8,9,11	CO1-CO5
7.	College management system	EXP 1,2,3,4,6,7,8,9,11	CO1-CO5
8.	Number Guessing Game	EXP 1,2,3,6,7,8,9,10,11	CO1-CO5
9.	Electricity billing system	EXP 1,2,3,6,7,8,9,11	CO1-CO5
10.	Healthcare management System	EXP 1,2,3,4,5,6,7,8,9,11	CO1-CO5
11.	Blood Donation System	EXP 1,2,3,6,7,8,9,11	CO1-CO5
12.	Quiz Application	EXP 1,2,3,4,6,7,8,9,11	CO1-CO5
13.	Stock management system	EXP 1,2,3,4,5,6,7,8,9,11	CO1-CO5
14.	Payroll Management System	EXP 1,2,3,6,7,8,9,11	CO1-CO5
15.	Exam Seating Arrangement System	EXP 1,2,3,6,7,8,9,11	CO1-CO5

Suggestive Assessment Methods

Lab Components Assessments (60 Marks)	**End Semester Exams (40 Marks)**
1. Exercises (Hacker rank score) 2. Project File (Progress Score) 3. Viva voce	1. Record note 2. Exercises 3. Viva voce

Outcomes

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

CO1	Write simple Python programs for solving problems using conditional statements.
CO2	Write Python programs for solving problems using looping statement and list and decompose a Python program into functions.
CO3	Represent data using Python strings, arrays, tuples, dictionaries and solve computational problems using them and use Numpy and Pandas libraries in real time applications.
CO4	Read and write data from/to files in Python programs and handle exceptions while dealing with data.

CO5	Apply the power of graphics for processing images.

Laboratory Requirements

SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH:
HARDWARE:
Intel Desktop Systems: 36 nos
Printers: 02
SOFTWARE:
Microsoft Windows 10
Net Beans 8.0.2, JDK 7.0.

Reference Books

1. Reema Thareja, "Python Programming: Using Problem Solving Approach", Oxford University Press, 2017.
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", Second Edition,Shroff/O'Reilly Publishers, 2016
3. José M. Garrido, "Introduction to Computational Models with Python", CRC Press, 2015.

Web Resources

1. https://searchapparchitecture.techtarget.com/definition/python-programming https://en.wikipedia.org/wiki/python_programming
2. https://www.geeksforgeeks.org/ python -programming /
3. https://www.webopedia.com/TERM/O/ python _programming

CO Vs PO Mapping and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2					2	1	1		1	3	3	2
2	3	2	2					2	1	1		1	3	3	2
3	3	2	2					2	1	1		1	3	3	2
4	3	2	2					2	1	1		1	3	3	2
5	3	2	2					2	1	1		1	3	3	2

COURSE LEVEL ASSESSMENT QUESTIONS

COURSE OUTCOME 1:

1. Write a Python Program to read the unit of electricity consumed in a house and calculate the amount to be paid for the electricity consumed. The bill amount should be calculated as per the given specification:

a. For 0 to 100 units the per unit is ₹ 0/-

b. For 0 to 200 units, for the first 100 unit the per unit cost is zero and the next 100 units, the consumer shall pay ₹ 1.5 per unit.

c. For 0 to 500 units, the consumer shall pay ₹ 0 for the first 100 units, for the next 100 units the consumer shall pay ₹ 2 per unit, for the next 300 units the unit cost is ₹3.00/-

(Apply)

2. Chef and Chefina are at positions X and Y on a number line. They both love badminton. It is known that badminton courts are located at every integer point. They want to find a court such that the maximum distance travelled by either of them is minimized. Formally, suppose they choose the badminton court at position Z. You need to find the minimum value of max (|X-Z|, |Y-Z|)max(|X−Z|,|Y−Z|) across all possible choices of Z. Here, |X| denotes absolute value of X. Write a Python Program to Report this minimum value.

Input Format

The first line of input will contain a single integer T, denoting the number of test cases.
Each test case consists of two space-separated integers Xand Y.
Output Format
For each test case, output the minimum possible value of \max(|X-Z|, |Y-Z|)max(|X−Z|,|Y−Z|).
Constraints
1≤T≤1000
1≤X,Y≤1000
X<=Y

Sample :

Input

4
3 5
7 6
1 10
Output
1
1
5
16

3. Develop a Python Program to Check if a Date is Valid and Print the Incremented Date if it is.

(Apply)

COURSE OUTCOME 2:

Write a Python Program to Read a Number n and Compute n+nn+nnn. (Apply)

1. Write a program to find Sum of Digit of a Number using Recursion in Python. (Apply)
2. Differentiate break and continue. (Understand)

COURSE OUTCOME 3:

Develop Python programs using OOP principles (Understand, Apply)

1. Describe the various features of the Object-Oriented Programming Language. (Understand)
2. Develop a Python program to generate student class to calculate the student performance based on the following criteria: Above 75 percentage as Distinction, 60 to 74 percentage as First Class and Below 60 percentage as Second class. (Apply)
3. Write a Python program to sort set of names stored in an array in alphabetical order. (Apply)

COURSE OUTCOME 4:

What happens if the file is not found in the following Python code? (Apply)

```
a=False
while not a:
try:
f_n = input("Enter file name")
i_f = open(f_n, 'r')
except:
print("Input file not found")
```

Write a Python Program that Reads a Text File and Counts the Number of Times a Certain Letter Appears in the Text File. (Apply)

Write a Python Program to Extract Numbers from Text File. (Apply)

Write a Python Program to merge two files into a third file. (Apply)

COURSE OUTCOME 5:

1.Write a python program to convert RGB image to Black and white Image. (Apply)

2. How will you program GUI with Tkinter Library? Explain. (Understand)

COURSE CONTENT AND LECTURE SCHEDULE

S.NO	TOPIC	NO OF WEEKS REQUIRED
1.	Program to implement Variables , Data Types	1st week
2.	Programs to implement Control Structures	1st week
3.	Programs to implement Functions and Modules	2nd week
4.	Programs to implement Strings	2nd week
5.	Programs to implement List Manipulation	3rd week
6.	Program using Tuples, Sets, and Dictionaries	3rd week

7.	Program to implement String Operations	4th week
8.	Implementing simple OOP concepts in Python	4th week
9.	Program using File Handling	5th week
10.	Program using Exception Handling	5th week
11.	Program to implement Libraries and Frameworks	6th week
12.	Program using Packages	6th week

Prepared By

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Mandatory Course

24HS2103	TECHNOLOGY IN TAMIL CULTURE	L	T	P	C
		1	0	0	1

Preamble:

This course is offered to develop technical thinking based on Tamil tradition and to acquaint students with the fundamentals of various technologies through Tamil culture and history.

Prerequisite: The prerequisite knowledge required to study this course is basic knowledge in English and Tamil Heritage.

UNIT I	WEAVING AND CERAMIC TECHNOLOGY	6

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

UNIT II	DESIGN AND CONSTRUCTION TECHNOLOGY	6

Designing and Structural construction House & Designs in household materials during Sangam Age – Building materials and Hero Stones of Sangam Age– Details of Stage Constructions in Silapathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal -Chetti Nadu Houses, Indo –Saracenic architecture at Madras during British Period.

UNIT III	MANUFACTURING TECHNOLOGY	6

Art of Ship Building - Metallurgical studies- art of Jewelry making - Iron industry - Iron smelting, steel -Copper and gold- Coins as source of history - Minting of Coins – Beads making-industries Stone beads -Glass beads -Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gemstone types described in Silapathikaram.

UNIT IV	AGRICULTURE AND IRRIGATION TECHNOLOGY	6

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-Conceiving-Ancient Knowledge of Ocean-Knowledge Specific Society.

UNIT V	SCIENTIFIC TAMIL & TAMIL COMPUTING	6

Development of Scientific Tamil – Tamil computing–Digitalization of Tamil Books– Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries –Sekai Project.

Total Periods	**30**
Assessment Method	
Continuous Assessment 1	**Continuous Assessment 2**
50 marks	**50 marks**

Course Outcomes:

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

CO1	To learn the techniques adopted in Industries of ancient Tamil culture.
CO2	To assess the technical competence of ancient Tamil.
CO3	To achieve the ability to think about various production technologies in Tamil Culture.
CO4	To explore the recovery and development of agricultural and water management technical skills of Tamil culture.
CO5	To enumerate the technical development that Tamil has achieved in the field of science and computer.

CO PO Mapping:

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12
1								1	2	3	1	3
2								1	3	2	3	2
3								1	3	2	1	2
4								3	2	2	3	2
5								2	3	3	2	3

TEXT-CUM-REFERENCEBOOKS

1. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL–(in print)
2. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
3. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).

4. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
5. Keeladi-'Sangam City Civilization on the bank of river Vaigai'(Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
6. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published By: TheAuthor)
7. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu) Journey of Civilization Industo Vaigai (R.Balakrishnan) (Published by:RMRL)–Reference Book

24HS2103	தமிழரும் தொழில்நுட்பமும்	L	T	P	C
		1	0	0	1

முன்னுரை(Preamble)

இந்தப் பாடத்திட்டம் பொறியியல் பயிலும் முதலாம் ஆண்டு மாணவர்களின் இரண்டாம் பருவத்திற்குரியது. தமிழ் மரபு சார்ந்த தொழில்நுட்ப சிந்தனையை வளர்த்து பல்வேறு தொழில்நுட்பங்களின் அடிப்படை கூறுகளைத் தமிழரின் பண்பாடு மற்றும் வரலாற்றின் மூலம் மாணவர்களை அறியச் செய்தல்.

பாடநெறிக்கான முன்நிபந்தனைகள்(Prerequisites for the course)

தமிழ் மொழியில் எழுத படிக்க தெரிந்திருத்தல் அவசியம்.

அலகு I	நெசவு மற்றும் பானைத் தொழில்நுட்பம்	6

சங்க காலத்தில் நெசவுத்தொழில் - பானைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள்

அலகு II	வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்	6

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

அலகு III	உற்பத்தித் தொழில் நுட்பம்	6

கப்பல் கட்டும் கலை - உலோகவியல் - நகைத் தொழில்நுட்பம் - இரும்பு தொழிற்சாலை - இரும்பை உருக்குதல், எஃகு - வரலாற்று சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் - நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் தொழிற்சாலைகள்

- கல்மணிகள் கண்ணாடி மணிகள் - சுடுமண் மணிகள் - சங்கு மணிகள் - எலும்பு துண்டுகள் - தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்		
அலகு IV	**வேளாண்மை மற்றும் நீர் பாசன தொழில்நுட்பம்**	**6**
அணை , ஏரி, குளங்கள், மதகு - சோழர்காலக் குமிழித் தூம்பின் முக்கியத்துவம் - கால்நடை பராமரிப்பு - கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் - வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மீன்வளம் - முத்து மற்றும் முத்து குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம்		
அலகு V	**அறிவியல் தமிழ் மற்றும் கணினித் தமிழ்**	**6**
அறிவியல் தமிழின் வளர்ச்சி - கணினித் தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணைய கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத் திட்டம்.		
Total Periods		**30**
Assessment Method		
Continuous Assessment 1	**Continuous Assessment 2**	
50 marks	**50 marks**	

எதிர்பார்க்கும் படிப்பின் முடிவுகள்

CO1	மாணவர்கள் பண்டைத் தமிழரின் தொழில்நுட்பங்களை அறிந்து கொள்வர்.
CO2	பண்டைத் தமிழரின் தொழில்நுட்பத் திறனை மதிப்பிடுதல்.
CO3	தாய் மொழியில் பல்வேறு உற்பத்தி தொழில்நுட்பங்களைக் குறித்து சிந்திக்கும் திறனை அடைவார்.
CO4	தமிழரின் வேளாண்மை மற்றும் நீர் மேலாண்மை தொழில்நுட்ப திறன்களை மீட்டு உருவாக்கம் செய்தல் குறித்து அறிதல்.
CO5	அறிவியல் மற்றும் கணினி துறையில் தமிழ்ப் பெற்றுள்ள தொழில் நுட்ப வளர்ச்சியை அறிதல்.

Course Outcomes:

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

CO	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**	**PO**

	1	2	3	4	5	6	7	8	9	10	11	12
1		**1**			**1**		**1**	**1**	**2**	**1**		**3**
2		**2**	**2**		**2**	**1**	**3**	**2**	**1**	**2**		**2**
3		**2**	**3**	**1**	**2**	**1**	**1**	**1**	**2**	**1**		**2**
4			**2**				**2**	**1**	**2**	**2**		**2**
5			**2**				**1**	**2**	**1**	**3**		**1**

TEXT – CUM – REFERENCE BOOKS

1. தமிழக வரலாறு - மக்களும் பண்பாடும் - கே. கே பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித்தமிழ் - முனைவர் இல. சுந்தரம்(விகடன் பிரசுரம்).
3. கீழடி - வைகை நதிக்கரையில் சங்க கால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு).
4. பொருநை - ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)

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