Syllabus

For

I and II Semester B.E.

(Common to All Branches of Engineering)

2022-23

Siddaganga Institute of Technology

An autonomous institution affiliated to VTU, Belagavi,
Approved by AICTE, New Delhi, Accredited by NAAC with 'A' Grade
Awarded Diamond College Rating by QS I-GAUGA and ISO 9001:2015 Certified
Tumakuru - 572 103, Karnataka, INDIA. Web: sit.ac.in

SYLLABUS

FOR

I and II semester B.E.

(All Engineering Streams)

2022 - 2023

Sree Siddaganga Education Society®

Siddaganga Institute of Technology

(An Autonomous Institution affiliated to V.T.U., Belagavi, Approved by AICTE, New Delhi, Accredited by NAAC with 'A' Grade and ISO 9001:2015 Certified)

Dr Sree Sree Sivakumara Swamiji Road, Tumakuru – 572 103, Karnataka, India

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CONTENTS

Code		Programs
CV	:	Civil Engineering
ME	:	Mechanical Engineering
EE	:	Electrical & Electronics Engineering
EC	:	Electronics & Communication Engineering
CH	:	Chemical Engineering
EI	:	Electronics and Instrumentation Engineering
IM	:	Industrial Engineering & Management
CS	:	Computer Science & Engineering
IS	:	Information Science & Engineering
ET	:	Electronics & Telecommunication Engineering
BT	:	Biotechnology
AD	:	Artificial Intelligence and Data Science
CI	:	Computer Science & Engineering (Artificial Intelligence and Machine Learning)

Published by :

PRINCIPAL

SIDDAGANGA INSTITUTE OF TECHNOLOGY

TUMAKURU – 572 103, KARNATAKA

SCHEME OF TEACHING AND EXAMINATION FOR 160 CREDITS SCHEME

(EFFECTIVE FROM THE ACADEMIC YEAR 2022-23)

I Semester (Physics Cycle) **Civil Engineering Stream (CV)**

Sl. No.	Course Category and Course Code		Course Title	Teaching Dept.	Teaching hrs/week				Examination				Credits
					Lecture	Tutorial	Practical/ Drawing	Self-Study Component	Duration in hrs.	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	ASC(IC)	MATC1	Mathematics – I for Civil Engg. Stream	Maths	2	2	2	0	3	50	50	100	**4**
2	ASC(IC)	PHYC	Physics for Civil Engg. Stream	Phy	3	0	2	0	3	50	50	100	**4**
3	ESC	ESCF2	Engineering Mechanics	CV	2	2	0	0	3	50	50	100	**3**
4	ESC1	ESCOx	Engineering Science Course-I	ABE	3	0	0	0	3	50	50	100	**3**
5	ETC	ETCxx	Emerging Technology Course	ABE	3	0	0	0	3	50	50	100	**3**
6	AEC	CC01	Communicative English	T&P	1	0	0	0	1:30	50	50	100	**1**
7	HSMC	CC03 CC04	Balake Kannada Samkruthika Kannada	HS	1	0	0	0	1:30	50	50	100	**1**
8	AEC/SDC	CC06	Innovation and Design Thinking	Any Dept.	1	0	0	0	1:30	50	50	100	**1**
		AAP	AICTE Activity Points	40 hours of work to be documented and produced for the examination at 8th Semester									
Total										400	400	800	**20**

Note: *1) Students have to choose any one course out of four options available in **Engineering Science Courses (Optional)**.*
*2) Students have to choose any one course out of twelve options available in **Emerging Technology Courses***

Code	Engineering Sciences Courses (Optional)	L	T	P	Cr
ESCO2	Introduction to Electrical Engineering	3	0	0	3
ESCO3	Introduction to Electronics Engineering	3	0	0	3
ESCO4	Introduction to Mechanical Engineering	3	0	0	3
ESCO5	Introduction to C Programming	2	0	2	3

Code	Emerging Technology Courses	L	T	P	Cr
ETC01	Smart Materials and Systems	3	0	0	3
ETC02	Green Buildings	3	0	0	3
ETC03	Operation and Maintenance of Solar Electric Systems	3	0	0	3
ETC04	Introduction to Embedded System	3	0	0	3
ETC05	Introduction to Nano Technology	3	0	0	3
ETC06	Introduction to Drone Technology	3	0	0	3
ETC07	Introduction to Sustainable Engineering	3	0	0	3
ETC08	Renewable Energy Sources	3	0	0	3
ETC09	Waste Management	3	0	0	3
ETC10	Emerging Applications of Biotechnology	3	0	0	3
ETC11	Introduction to Internet of Things (IoT)	3	0	0	3
ETC12	Introduction to Cyber Security	3	0	0	3

SCHEME OF TEACHING AND EXAMINATION FOR 160 CREDITS SCHEME

(EFFECTIVE FROM THE ACADEMIC YEAR 2022-23)

II Semester (Chemistry Cycle) **Civil Engineering Stream (CV)**

Sl. No.	Course Category and Course Code		Course Title	Teaching Dept.	Teaching hrs/week				Examination				Credits
					Lecture	Tutorial	Practical/ Drawing	Self-Study Component	Duration in hrs.	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	ASC(IC)	MATC2	Mathematics –II for Civil Engg. Stream	Maths	2	2	2	0	3	50	50	100	**4**
2	ASC(IC)	CHEC	Chemistry for Civil Engg. Stream	Che	3	0	2	0	3	50	50	100	**4**
3	ESC	ESCF1	Computer Aided Engineering Drawing	ME	2	0	2	0	3	50	50	100	**3**
4	ESC2	ESCOx	Engineering Science Course-II	ABE	3	0	0	0	3	50	50	100	**3**
5	PLC	PLCx	Programming Language Course	ABE	2	0	2	0	3	50	50	100	**3**
6	AEC	CC02	Professional Writing Skills in English	T&P	1	0	0	0	1:30	50	50	100	**1**
7	HSMC	CC05	Indian Constitution	HS	1	0	0	0	1:30	50	50	100	**1**
8	AEC/SDC	CC07	Scientific Foundations of Health	Any Dept.	1	0	0	0	1:30	50	50	100	**1**
		AAP	AICTE Activity Points	40 hours of work to be documented and produced for the examination at 8th Semester									
Total										400	400	800	**20**

Note: *1) Students have to choose any one course out of four options available in **Engineering Science Courses (Optional)** excluding Engineering Science Course studied in I Semester.*

*2) Students have to choose any one course out of four options available in **Programming Language Courses***

Code	Engineering Sciences Courses (Optional)	L	T	P	Cr
ESCO2	Introduction to Electrical Engineering	3	0	0	3
ESCO3	Introduction to Electronics Engineering	3	0	0	3
ESCO4	Introduction to Mechanical Engineering	3	0	0	3
ESCO5	Introduction to C Programming	2	0	2	3

Code	Emerging Technology Courses	L	T	P	Cr
PLC1	Introduction to Web Programming	2	0	2	3
PLC2	Introduction to Python Programming	2	0	2	3
PLC3	Basics to JAVA programming	2	0	2	3
PLC4	Introduction to C++Programming	2	0	2	3

ASC(IC)	Applied Science Course (Integrated Course)	**HSMC**	Humanities, Social Science and Management Course
ESC	Engineering Science Course	**AEC**	Ability Enhancement Course
ETC	Emerging Technology Course	**SDC**	Skill Development Course
PLC	Programming Language Course	**ABE**	Appropriate Branch of Engineering

SCHEME OF TEACHING AND EXAMINATION FOR 160 CREDITS SCHEME

(EFFECTIVE FROM THE ACADEMIC YEAR 2022-23)

I Semester (Physics Cycle) — **Computer Sc. & Engg. Stream (CS, IS,AD, CI, BT)**

Sl. No.	Course Category and Course Code		Course Title	Teaching Dept.	Teaching hrs/week				Examination				Credits
					Lecture	Tutorial	Practical/ Drawing	Self-Study Component	Duration in hrs.	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	ASC(IC)	MATS1	Mathematics – I for CSE Stream	Maths	2	2	2	0	3	50	50	100	**4**
2	ASC(IC)	PHYS	Physics for CSE Stream	Phy	3	0	2	0	3	50	50	100	**4**
3	ESC	ESCF6	Principles of Programming Using C	CS/IS	2	2	0	0	3	50	50	100	**3**
4	ESC1	ESCOx	Engineering Science Course-I	ABE	3	0	0	0	3	50	50	100	**3**
5	ETC	ETCxx	Emerging Technology Course	ABE	3	0	0	0	3	50	50	100	**3**
6	AEC	CC01	Communicative English	T&P	1	0	0	0	1:30	50	50	100	**1**
7	HSMC	CC03 CC04	Balake Kannada Samkruthika Kannada	HS	1	0	0	0	1:30	50	50	100	**1**
8	AEC/SDC	CC06	Innovation and Design Thinking	Any Dept.	1	0	0	0	1:30	50	50	100	**1**
		AAP	AICTE Activity Points	40 hours of work to be documented and produced for the examination at 8th Semester									
Total										400	400	800	**20**

Note: *1) Students have to choose any one course out of four options available in **Engineering Science Courses (Optional)**.*
*2) Students have to choose any one course out of twelve options available in **Emerging Technology Courses***

Code	Engineering Sciences Courses (Optional)	L	T	P	Cr
ESCO1	Introduction to Civil Engineering	3	0	0	3
ESCO2	Introduction to Electrical Engineering	3	0	0	3
ESCO3	Introduction to Electronics Engineering	3	0	0	3
ESCO4	Introduction to Mechanical Engineering	3	0	0	3

Code	Emerging Technology Courses	L	T	P	Cr
ETC01	Smart Materials and Systems	3	0	0	3
ETC02	Green Buildings	3	0	0	3
ETC03	Operation and Maintenance of Solar Electric Systems	3	0	0	3
ETC04	Introduction to Embedded System	3	0	0	3
ETC05	Introduction to Nano Technology	3	0	0	3
ETC06	Introduction to Drone Technology	3	0	0	3
ETC07	Introduction to Sustainable Engineering	3	0	0	3
ETC08	Renewable Energy Sources	3	0	0	3
ETC09	Waste Management	3	0	0	3
ETC10	Emerging Applications of Biotechnology	3	0	0	3
ETC11	Introduction to Internet of Things (IoT)	3	0	0	3
ETC12	Introduction to Cyber Security	3	0	0	3

SCHEME OF TEACHING AND EXAMINATION FOR 160 CREDITS SCHEME

(EFFECTIVE FROM THE ACADEMIC YEAR 2022-23)

II Semester (Chemistry Cycle) **Computer Sc. & Engg. Stream (CS, IS,AD, CI, BT)**

Sl. No.	Course Category and Course Code		Course Title	Teaching Dept.	Teaching hrs/week				Examination				Credits
					Lecture	Tutorial	Practical/ Drawing	Self-Study Component	Duration in hrs.	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	ASC(IC)	MATS2	Mathematics - II for CSE Stream	Maths	2	2	2	0	3	50	50	100	**4**
2	ASC(IC)	CHES	Chemistry for CSE Engg. Stream	Che	3	0	2	0	3	50	50	100	**4**
3	ESC	ESCF1	Computer Aided Engineering Drawing	ME	2	0	2	0	3	50	50	100	**3**
4	ESC2	ESCOx	Engineering Science Course-II	ABE	3	0	0	0	3	50	50	100	**3**
5	PLC	PLCx	Programming Language Course	ABE	2	0	2	0	3	50	50	100	**3**
6	AEC	CC02	Professional Writing Skills in English	T&P	1	0	0	0	1:30	50	50	100	**1**
7	HSMC	CC05	Indian Constitution	HS	1	0	0	0	1:30	50	50	100	**1**
8	AEC/SDC	CC07	Scientific Foundations of Health	Any Dept.	1	0	0	0	1:30	50	50	100	**1**
		AAP	AICTE Activity Points	40 hours of work to be documented and produced for the examination at 8th Semester									
Total										400	400	800	**20**

Note: *1) Students have to choose any one course out of four options available in **Engineering Science Courses (Optional)** excluding Engineering Science Course studied in I Semester.*

*2) Students have to choose any one course out of four options available in **Programming Language Courses***

Code	Engineering Sciences Courses (Optional)	L	T	P	Cr
ESCO2	Introduction to Civil Engineering	3	0	0	3
ESCO3	Introduction to Electrical Engineering	3	0	0	3
ESCO4	Introduction to Electronics Engineering	3	0	0	3
ESCO5	Introduction to Mechanical Engineering	3	0	0	3

Code	Emerging Technology Courses	L	T	P	Cr
PLC1	Introduction to Web Programming	2	0	2	3
PLC2	Introduction to Python Programming	2	0	2	3
PLC3	Basics to JAVA programming	2	0	2	3
PLC4	Introduction to C++ Programming	2	0	2	3

ASC(IC)	Applied Science Course (Integrated Course)	**HSMC**	Humanities, Social Science and Management Course
ESC	Engineering Science Course	**AEC**	Ability Enhancement Course
ETC	Emerging Technology Course	**SDC**	Skill Development Course
PLC	Programming Language Course	**ABE**	Appropriate Branch of Engineering

SCHEME OF TEACHING AND EXAMINATION FOR 160 CREDITS SCHEME

(EFFECTIVE FROM THE ACADEMIC YEAR 2022-23)

I Semester (Chemistry Cycle) **Mechanical Engineering Stream (ME, CH, IM)**

Sl. No.	Course Category and Course Code		Course Title	Teaching Dept.	Teaching hrs/week				Examination				Credits
					Lecture	Tutorial	Practical/ Drawing	Self-Study Component	Duration in hrs.	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	ASC(IC)	MATM1	Mathematics –II for Mech. Engg. Stream	Maths	2	2	2	0	3	50	50	100	**4**
2	ASC(IC)	CHEM	Chemistry for Mechanical Engg. Stream	Che	3	0	2	0	3	50	50	100	**4**
3	ESC	ESCF1	Computer Aided Engineering Drawing	ME	2	0	2	0	3	50	50	100	**3**
4	ESC2	ESCOx	Engineering Science Course-I	ABE	3	0	0	0	3	50	50	100	**3**
5	PLC	PLCx	Programming Language Course	ABE	2	0	2	0	3	50	50	100	**3**
6	AEC	CC01	Communicative English	T&P	1	0	0	0	1:30	50	50	100	**1**
7	HSMC	CC05	Indian Constitution	HS	1	0	0	0	1:30	50	50	100	**1**
8	AEC/SDC	CC07	Scientific Foundations of Health	Any Dept.	1	0	0	0	1:30	50	50	100	**1**
		AAP	AICTE Activity Points	40 hours of work to be documented and produced for the examination at 8th Semester									
Total										400	400	800	**20**

Note: *1) Students have to choose any one course out of four options available in **Engineering Science Courses (Optional)**.*
*2) Students have to choose any one course out of four options available in **Programming Language Courses***

Code	Engineering Sciences Courses (Optional)	L	T	P	Cr
ESCO2	Introduction to Civil Engineering	3	0	0	3
ESCO3	Introduction to Electrical Engineering	3	0	0	3
ESCO4	Introduction to Electronics Engineering	3	0	0	3
ESCO5	Introduction to C Programming	2	0	2	3

Code	Emerging Technology Courses	L	T	P	Cr
PLC1	Introduction to Web Programming	2	0	2	3
PLC2	Introduction to Python Programming	2	0	2	3
PLC3	Basics to JAVA programming	2	0	2	3
PLC4	Introduction to C++ Programming	2	0	2	3

ASC(IC)	Applied Science Course (Integrated Course)	**HSMC**	Humanities, Social Science and Management Course
ESC	Engineering Science Course	**AEC**	Ability Enhancement Course
ETC	Emerging Technology Course	**SDC**	Skill Development Course
PLC	Programming Language Course	**ABE**	Appropriate Branch of Engineering

SCHEME OF TEACHING AND EXAMINATION FOR 160 CREDITS SCHEME

(EFFECTIVE FROM THE ACADEMIC YEAR 2022-23)

II Semester (Physics Cycle) **Mechanical Engineering Stream (ME, CH, IM)**

Sl. No.	Course Category and Course Code		Course Title	Teaching Dept.	Teaching hrs/week				Examination				Credits
					Lecture	Tutorial	Practical/ Drawing	Self-Study Component	Duration in hrs.	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	ASC(IC)	MATM2	Mathematics – II for Mech. Engg. Stream	Maths	2	2	2	0	3	50	50	100	**4**
2	ASC(IC)	PHYM	Physics for Mechanical Engg. Stream	Phy	3	0	2	0	3	50	50	100	**4**
3	ESC	ESCF5	Elements of Mechanical Engineering	ME	2	2	0	0	3	50	50	100	**3**
4	ESC1	ESCOx	Engineering Science Course-II	ABE	3	0	0	0	3	50	50	100	**3**
5	ETC	ETCxx	Emerging Technology Course	ABE	3	0	0	0	3	50	50	100	**3**
6	AEC	CC02	Professional Writing Skills in English	T&P	1	0	0	0	1:30	50	50	100	**1**
7	HSMC	CC03 CC04	Balake Kannada Samkruthika Kannada	HS	1	0	0	0	1:30	50	50	100	**1**
8	AEC/SDC	CC06	Innovation and Design Thinking	Any Dept.	1	0	0	0	1:30	50	50	100	**1**
		AAP	AICTE Activity Points	40 hours of work to be documented and produced for the examination at 8th Semester									
Total										400	400	800	**20**

Note: *1) Students have to choose any one course out of four options available in **Engineering Science Courses (Optional)** excluding Engineering Science Course studied in I Semester.*

*2) Students have to choose any one course out of four options available in **Emerging Technology Courses***

Code	Engineering Sciences Courses (Optional)	L	T	P	Cr
ESCO2	Introduction to Civil Engineering	3	0	0	3
ESCO3	Introduction to Electrical Engineering	3	0	0	3
ESCO4	Introduction to Electronics Engineering	3	0	0	3
ESCO5	Introduction to C Programming	2	0	2	3

Code	Emerging Technology Courses		L	T	P	Cr
ETC01	Smart Materials and Systems	(ME)	3	0	0	3
ETC02	Green Buildings	(CV)	3	0	0	3
ETC03	Operation and Maintenance of Solar Electric Systems	(EE)	3	0	0	3
ETC04	Introduction to Embedded System	(EE)	3	0	0	3
ETC05	Introduction to Nano Technology	(ME)	3	0	0	3
ETC06	Introduction to Drone Technology	(ET)	3	0	0	3
ETC07	Introduction to Sustainable Engineering	(ME)	3	0	0	3
ETC08	Renewable Energy Sources	(ME)	3	0	0	3
ETC09	Waste Management	(CH)	3	0	0	3
ETC10	Emerging Applications of Biotechnology	(EI)	3	0	0	3
ETC11	Introduction to Internet of Things (IoT)	(EC)	3	0	0	3
ETC12	Introduction to Cyber Security	(IS)	3	0	0	3

SCHEME OF TEACHING AND EXAMINATION FOR 160 CREDITS SCHEME

(EFFECTIVE FROM THE ACADEMIC YEAR 2022-23)

I Semester (Chemistry Cycle) **Electrical & Electronics Engg. Stream (EE, EC, EI, ET)**

Sl. No.	Course Category and Course Code		Course Title	Teaching Dept.	Teaching hrs/week				Examination				Credits
					Lecture	Tutorial	Practical/ Drawing	Self-Study Component	Duration in hrs.	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	ASC(IC)	MATE1	Mathematics - I for EEE Stream	Maths	2	2	2	0	3	50	50	100	**4**
2	ASC(IC)	CHEE	Chemistry for EEE Stream	Che	3	0	2	0	3	50	50	100	**4**
3	ESC	ESCF1	Computer Aided Engineering Drawing	ME	2	0	2	0	3	50	50	100	**3**
4	ESC2	ESCOx	Engineering Science Course-I	ABE	3	0	0	0	3	50	50	100	**3**
5	PLC	PLCx	Programming Language Course	ABE	2	0	2	0	3	50	50	100	**3**
6	AEC	CC01	Communicative English	T&P	1	0	0	0	1:30	50	50	100	**1**
7	HSMC	CC05	Indian Constitution	HS	1	0	0	0	1:30	50	50	100	**1**
8	AEC/SDC	CC07	Scientific Foundations of Health	Any Dept.	1	0	0	0	1:30	50	50	100	**1**
		AAP	AICTE Activity Points	40 hours of work to be documented and produced for the examination at 8th Semester									
Total										400	400	800	**20**

Note: *1) Students have to choose any one course out of five options available in **Engineering Science Courses (Optional)**.*
*2) Students have to choose any one course out of five options available in **Programming Language Courses***

Code	Engineering Sciences Courses (Optional)	L	T	P	Cr
ESCO1	Introduction to Civil Engineering	3	0	0	3
ESCO2	Introduction to Electrical Engg. (Excluding EE)	3	0	0	3
ESCO3	Introduction to Electronics Engineering(Excluding EC, EI, ET)	3	0	0	3
ESCO4	Introduction to Mechanical Engineering	2	0	2	3
ESCO5	Introduction to C Programming	2	0	2	3

Code	Emerging Technology Courses	L	T	P	Cr
PLC1	Introduction to Web Programming	2	0	2	3
PLC2	Introduction to Python Programming	2	0	2	3
PLC3	Basics to JAVA programming	2	0	2	3
PLC4	Introduction to C++ Programming	2	0	2	3

ASC(IC)	Applied Science Course (Integrated Course)	**HSMC**	Humanities, Social Science and Management Course
ESC	Engineering Science Course	**AEC**	Ability Enhancement Course
ETC	Emerging Technology Course	**SDC**	Skill Development Course
PLC	Programming Language Course	**ABE**	Appropriate Branch of Engineering

SCHEME OF TEACHING AND EXAMINATION FOR 160 CREDITS SCHEME

(EFFECTIVE FROM THE ACADEMIC YEAR 2022-23)

II Semester (Physics Cycle) **Electrical & Electronics Engg. Stream (EE, EC, EI, ET)**

Sl. No.	Course Category and Course Code		Course Title	Teaching Dept.	Teaching hrs/week				Examination				Credits
					Lecture	Tutorial	Practical/ Drawing	Self-Study Component	Duration in hrs.	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	ASC(IC)	MATE2	Mathematics - II for EEE Stream	Maths	2	2	2	0	3	50	50	100	**4**
2	ASC(IC)	PHYE	Physics for EEE Stream	Phy	3	0	2	0	3	50	50	100	**4**
3	ESC	ESCF5	Elements of Mechanical Engineering	ME	2	2	0	0	3	50	50	100	**3**
4	ESC1	ESCOx	Engineering Science Course-II	ABE	3	0	0	0	3	50	50	100	**3**
5	ETC	ETCxx	Emerging Technology Course	ABE	3	0	0	0	3	50	50	100	**3**
6	AEC	CC02	Professional Writing Skills in English	T&P	1	0	0	0	1:30	50	50	100	**1**
7	HSMC	CC03 CC04	Balake Kannada Samkruthika Kannada	HS	1	0	0	0	1:30	50	50	100	**1**
8	AEC/SDC	CC06	Innovation and Design Thinking	Any Dept.	1	0	0	0	1:30	50	50	100	**1**
		AAP	AICTE Activity Points	40 hours of work to be documented and produced for the examination at 8th Semester									
Total										400	400	800	**20**

Note: *1) Students have to choose any one course out of five options available in **Engineering Science Courses (Optional)** excluding Engineering Science Course studied in I Semester.*

*2) Students have to choose any one course out of four options available in **Emerging Technology Courses***

Code	Engineering Sciences Courses (Optional)	L	T	P	Cr
ESCO1	Introduction to Civil Engineering	3	0	0	3
ESCO2	Introduction to Electrical Engg. (Excluding EE)	3	0	0	3
ESCO3	Introduction to Electronics Engg. (Excluding EC, EI, ET)	3	0	0	3
ESCO4	Introduction to Mechanical Engineering	2	0	2	3
ESCO5	Introduction to C Programming	2	0	2	3

Code	Emerging Technology Courses		L	T	P	Cr
ETC01	Smart Materials and Systems	(ME)	3	0	0	3
ETC02	Green Buildings	(CV)	3	0	0	3
ETC03	Operation and Maintenance of Solar Electric Systems	(EE)	3	0	0	3
ETC04	Introduction to Embedded System	(EE)	3	0	0	3
ETC05	Introduction to Nano Technology	(ME)	3	0	0	3
ETC06	Introduction to Drone Technology	(ET)	3	0	0	3
ETC07	Introduction to Sustainable Engineering	(ME)	3	0	0	3
ETC08	Renewable Energy Sources	(ME)	3	0	0	3
ETC09	Waste Management	(CH)	3	0	0	3
ETC10	Emerging Applications of Biotechnology	(EI)	3	0	0	3
ETC11	Introduction to Internet of Things (IoT)	(EC)	3	0	0	3
ETC12	Introduction to Cyber Security	(IS)	3	0	0	3

Mathematics - I for Civil Engineering Stream

Contact Hours/ Week	: 2 (L)+2(T)+2(P)	Credits	: 4.0
Total Lecture Hours	: 26	CIE Marks	: 50
Total Tutorial Hours	: 26	SEE Marks	: 50
Total Practical Hours	: 26	Exam Hours	: 3
Course Type	: Integrated	Course Code	: MATC1

Course Objectives : This course will enable students to:

- **Familiarize** the importance of calculus associated with one variable and two variables for civil engineering.
- **Analyze** Civil engineering problems applying Ordinary Differential Equations.
- **Develop** the knowledge of Linear Algebra refereeing to matrices.

UNIT - I

CALCULUS

Introduction to polar coordinates and curvature relating to Civil engineering:

Polar coordinates, Polar curves, angle between the radius vector and the tangent, angle between two curves. Pedal equations. Curvature and Radius of curvature - Cartesian, Parametric, Polar and Pedal forms. Problems. **08 Hrs**

Self-study: Center and circle of curvature, evolutes and involutes.

Applications: Structural design and paths, Strength of materials, Elasticity.

(BT Levels: L1, L2 and L3)

UNIT - II

SERIES EXPANSION AND MULTIVARIABLE CALCULUS

Introduction to series expansion and partial differentiation in the field of Civil engineering applications:

Taylor's and Maclaurin's series expansion for one variable (Statement only) –problems.Indeterminate forms - L'Hospital's rule, problems.

Partial differentiation, total derivative-differentiation of composite functions. Jacobian and problems. Maxima and minima for a function of two variables. Problems. **08 Hrs**

Self-study: Euler's theorem and problems. Method of Lagrange's undetermined multipliers with single constraint.

Applications: Computation of stress and strain, Errors and approximations, Estimating the criticalpoints and extreme values.

(BT Levels: L1, L2 and L3)

UNIT - III

ORDINARY DIFFERENTIAL EQUATIONS (ODEs) OF FIRST ORDER

Introduction to first order ordinary differential equations pertaining to the applications for the Civil engineering:

Linear and Bernoulli's differential equations. Exact and reducible to exact differential equation. Integrating factors on $\frac{1}{N}\left(\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}\right)$ and $\frac{1}{M}\left(\frac{\partial N}{\partial x}-\frac{\partial M}{\partial y}\right)$.

Applications of ODE's - Orthogonal trajectories, Newton's law of cooling.

Nonlinear differential equations: Introduction to general and singular solutions, Solvable for p only, Clairaut's equations, **r**educible to Clairaut's equations. Problems**.** **08 Hrs**

Self-Study: Applications of ODE's: Solvable for x and y.

Applications: Rate of Growth or Decay, Conduction of heat.

(BT Levels: L1, L2 and L3)

UNIT - IV

ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDER

Importance of higher-order ordinary differential equations in Civil Engineering applications:

Higher-order linear ODE's with constant coefficients - Inverse differential operator, method of variation of parameters, Cauchy's and Legendre's homogeneous differential equations. Problems. **08 Hrs**

Self-Study: Formulation and solution of Cantilever beam. Finding the solution by the method ofundetermined coefficients.

Applications: Oscillations of a spring, Transmission lines, highway engineering.

(BT Levels: L1, L2 and L3)

UNIT - V

LINEAR ALGEBRA

Introduction of liner algebra related to Civil Engineering applications:

Elementary row transformation of a matrix, Rank of a matrix. Consistency and solution of a system of linear equations - Gauss-elimination method,

Gauss-Jordan method and approximate solution by Gauss-Seidel method. Eigenvalues and Eigenvectors, Rayleigh's power method to find the dominant Eigenvalue and Eigenvector. **08 Hrs**

Self-Study: Solution of a system of linear equations by Gauss-Jacobi iterative method. Inverse of a square matrix by Cayley- Hamilton theorem.

Applications: Structural Analysis, Balancing equations.

(BT Levels: L1, L2 and L3)

List of Laboratory experiments using MATLAB

(2 hours/week per batch) 10 lab sessions + 1 Lab Assessment

1	2D plots for Cartesian and polar curves
2	Finding angle between polar curves, curvature and radius of curvature of a given curve
3	Finding partial derivatives, Jacobian and plotting the graph
4	Applications to Maxima and Minima of two variables
5	Solution of first order differential equation and plotting the graphs
6	Solutions of Second order ordinary differential equations with initial/boundary conditions
7	Solution of a differential equation of oscillations of a spring / deflection of a beam with different loads
8	Numerical solution of system of linear equations, test for consistency and graphical Representation
9	Solution of system of linear equations using Gauss-Seidel iteration
10	Compute eigenvalues and eigenvectors and find the largest and smallest eigenvalue by Rayleigh power method.

TEXT BOOKS :

1	B. S. Grewal	Higher Engineering Mathematics, Khanna publishers, 44th Ed., 2021, 9788193328491.
2	E. Kreyszig	Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed., 2018, 978-1-119-44684-2.

REFERENCE BOOKS :

1	V. Ramana	Higher Engineering Mathematics, McGraw-Hill Education, 11th Ed., 2017, 978-0070634190
2	Srimanta Pal & Subodh C. Bhunia	Engineering Mathematics, Oxford University Press,3rd Ed., 2016, 1-68015-886-4
3	N.P Bali and Manish Goyal	A textbook of Engineering Mathematics, Laxmi Publications, 10th Ed., 2022, 978-8131808320.
4	C. Ray Wylie, Louis C. Barrett	Advanced Engineering Mathematics, McGraw – Hill Book Co., Newyork, 6th Ed., 2017, 978-0070722064.
5	Gupta C.B, Sing S.R and Mukesh Kumar	ering Mathematic for Semester I and II, Mc-Graw Hill Education (India) Pvt. Ltd. 2015, 9789339219659
6	H. K. Dass and Er. Rajnish Verma	Higher Engineering Mathematics, S. Chand Publication, 3rd Ed., 2014, 978-8121938907.
7	James Stewart	Calculus, Cengage Publications, 7th Ed., 2019, 9780538497817
8	David C Lay	Linear Algebra and its Applications, Pearson Publishers, 4th Ed., 2018, 978-0134022697
9	Gareth Williams	Linear Algebra with applications, Jones Bartlett Publishers Inc., 6thEd., 2017, 978-1284120097.

Course Outcomes :

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

CO1 : Apply the knowledge of calculus to solve problems related to polar curves and implementation using MATLAB

CO2 : Learn the notion of partial differentiation to compute rate of change of multivariate functions and implementation using MATLAB.

CO3 : Apply the analytical methods to solve first order and first-degree differential equations and implementation using MATLAB.

CO4 : Explain and solve various physical models through higher order linear differential equations and implementation using MATLAB.

CO5 : Apply matrix theory for solving the system of linear equations, compute eigenvalues and eigenvectors and implementation using MATLAB

Mathematics - II for Civil Engineering Stream

Contact Hours/ Week	: 2 (L)+2(T)+2(P)	Credits	: 4.0
Total Lecture Hours	: 26	CIE Marks	: 50
Total Tutorial Hours	: 26	SEE Marks	: 50
Total Practical Hours	: 26	Exam Hours	: 3
Course Type	: Integrated	Course Code	: MATC2

Course Objectives : This course will enable students to:

- **Familiarize** the importance of Integral calculus and Vector calculus essential for civil engineering.
- **Analyze** Civil engineering problems applying Partial Differential Equations.
- **Develop** the knowledge of solving civil engineering problems numerically.

UNIT - I

INTEGRAL CALCULUS

Introduction to Integral Calculus in Civil Engineering applications:

Multiple Integrals: Evaluation of double and triple integrals, evaluation of double integrals by change of order of integration, changing into polar coordinates. Applications to find: Area and Volume by double integral. Problems.

Beta and Gamma functions: Definitions, properties, relation between Beta and Gamma functions. Problems. **08 Hrs**

Self-Study: Volume by triple integration, Center of gravity.

Applications: Applications to mathematical quantities (Area, Surface area, Volume) Analysis ofprobabilistic models.

(BT Levels: L1, L2 and L3)

UNIT - II

VECTOR CALCULUS

Introduction to Vector Calculus in Civil Engineering applications:

Vector Differentiation: Scalar and vector fields. Gradient, directional derivative, curl and divergence - physical interpretation, solenoidal and irrotational vector fields. Problems.

Vector Integration: Line integrals, Surface integrals. Applications to work done by a force andflux. Statement of Green's theorem and Stoke's theorem. Problems. **08 Hrs**

Self-Study: Volume integral and Gauss divergence theorem.

Applications: Heat and mass transfer, oil refinery problems, environmental engineering. Analysis of stream lines, velocity and acceleration of a moving particle.

(BT Levels: L1, L2 and L3)

UNIT - III

PARTIAL DIFFERENTIAL EQUATIONS (PDE's)

Importance of partial differential equations for Civil Engineering application:

Formation of PDE's by elimination of arbitrary constants and functions. Solution of non- homogeneous PDE by direct integration. Homogeneous PDEs involving derivative with respect to one independent variable only. Solution of Lagrange's linear PDE. **Derivation of one-dimensional heat equation and wave equation. 08 Hrs**

Self-Study: Solution of one-dimensional heat equation and wave equation by the method of separation of variables.

Applications: Design of structures (vibration of rod/membrane).

(BT Levels: L1, L2 and L3)

UNIT - IV

NUMERICAL METHODS-1

Importance of numerical methods for discrete data in the field of Civil Engineering:

Solution of algebraic and transcendental equations: Regula-Falsi and Newton-Raphson methods (onlyformulae). Problems,

Finite differences, Interpolation using Newton's forward and backward difference formulae, Newton's divided difference formula and Lagrange's interpolation formula (All formulae withoutproof). Problems.

N**umerical integration**: Trapezoidal, Simpson's $(1/3)^{rd}$ and $(3/8)^{th}$ rules (without proof). Problems. **08 Hrs**

Self-Study: Bisection method, Lagrange's inverse Interpolation**.**

Applications: Estimating the approximate roots, extremum values, Area, volume, surface area. Finding approximate solutions to civil engineering problems.

(BT Levels: L1, L2 and L3)

UNIT - V

NUMERICAL METHODS - 2

Introduction to various numerical techniques for handling Civil Engineering applications. Numerical Solution of Ordinary Differential Equations (ODE's):

Numerical solution of ordinary differential equations of first order and first degree - Taylor's series method, Modified Euler's method, Runge - Kutta method of fourth order and Milne's predictor-corrector formula (No derivations of formulae). Problems. **08 Hrs**

Self-Study: Adam - Bashforth method.

Applications: Finding approximate solutions to ODE related to civil engineering fields.

(BT Levels: L1, L2 and L3)

List of Laboratory experiments using MATLAB

(2 hours/week per batch) 10 lab sessions + 1 Lab Assessment

1	Program to compute surface area, volume and centre of gravity
2	Evaluation of improper integrals
3	Finding gradient, divergent, curl and their geometrical interpretation
4	Verification of Green's theorem
5	Solution of one-dimensional heat equation and wave equation
6	Solution of algebraic and transcendental equations by Regula-Falsi and Newton-Raphson method
7	Interpolation / Extrapolation using Newton's forward and backward difference formula
8	Computation of area under the curve using Trapezoidal, Simpson's $(1/3)^{rd}$ and $(3/8)^{th}$ rule
9	Solution of ODE of first order and first degree by Taylor's series and Modified Euler's method
10	Solution of ODE of first order and first degree by Runge-Kutta 4^{th} order and Milne's predictor-corrector method

TEXT BOOKS :

1	B. S. Grewal	Higher Engineering Mathematics, Khanna publishers, 44^{th} Ed., 2021, 9788193328491.
2	E. Kreyszig	Advanced Engineering Mathematics, John Wiley & Sons, 10^{th} Ed., 2018, 978-1-119-44684-2.

REFERENCE BOOKS :

1	V. Ramana	Higher Engineering Mathematics, McGraw-Hill Education, 11th Ed., 2017, 978-0070634190
2	Srimanta Pal & Subodh C. Bhunia	Engineering Mathematics, Oxford University Press,3rd Ed., 2016, 1-68015-886-4
3	N.P Bali and Manish Goyal	A textbook of Engineering Mathematics, Laxmi Publications, 10th Ed., 2022, 978-8131808320.
4	C. Ray Wylie, Louis C. Barrett	Advanced Engineering Mathematics, McGraw – Hill Book Co., Newyork, 6th Ed., 2017, 978-0070722064.
5	Gupta C.B, Sing S.R and Mukesh Kumar	Engineering Mathematic for Semester I and II, Mc-Graw Hill Education (India) Pvt. Ltd. 2015, 9789339219659
6	H. K. Dass and Er. Rajnish Verma	Higher Engineering Mathematics, S. Chand Publication, 3rd Ed., 2014, 978-8121938907.
7	James Stewart	Calculus, Cengage Publications, 7th Ed., 2019, 9780538497817
8	David C Lay	Linear Algebra and its Applications, Pearson Publishers, 4th Ed., 2018, 978-0134022697
9	Gareth Williams	Linear Algebra with applications, Jones Bartlett Publishers Inc., 6thEd., 2017, 978-1284120097.

Course Outcomes :

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

CO1 : Apply the concept of change of order of integration and variables to evaluate multiple integrals and their usage in computing area and volume and implementation using MATLAB.

CO2 : Learn the concept of vector calculus and apply to solenoidal, irrotational vectors, line integral and surface integral and implementation using MATLAB.

CO3 : Form and solve the partial differential equations and their solutions for physical interpretations and implementation using MATLAB.

CO4 : Apply the Numerical methods for Interpolation, solve algebraic and transcendental equations, numerical integration and implementation using MATLAB.

CO5 : Apply the knowledge of numerical methods in solving ordinary differential equations and implementation using MATLAB.

Mathematics - I for Computer Science & Engg. Stream

Contact Hours/ Week	: 2 (L)+2(T)+2(P)	Credits	: 4.0
Total Lecture Hours	: 26	CIE Marks	: 50
Total Tutorial Hours	: 26	SEE Marks	: 50
Total Practical Hours	: 26	Exam Hours	: 3
Course Type	: Integrated	Course Code	: MATS1

Course Objectives : This course will enable students to:

- **Familiarize** the importance of calculus associated with one variable and multivariable for computer science and engineering.
- **Analyze** computer science and engineering problems applying Ordinary Differential Equations
- **Apply** the knowledge of modular arithmetic to computer algorithms.
- **Develop** the knowledge of Linear Algebra to solve the system of equations.

UNIT - I

CALCULUS

Introduction to polar coordinates and curvature relating to Computer Science and engineering:

Polar coordinates, Polar curves, angle between the radius vector and the tangent, angle between two curves. Pedal equations. Curvature and Radius of curvature - Cartesian, Parametric, Polar and Pedal forms. Problems. **08 Hrs**

Self-study: Center and circle of curvature, evolutes and involutes.

Applications: Computer graphics, Image processing.

(BT Levels: L1, L2 and L3)

UNIT – II

SERIES EXPANSION AND MULTIVARIABLE CALCULUS

Introduction of series expansion and partial differentiation in Computer Science &Engineering applications:

Taylor's and Maclaurin's series expansion for one variable (Statement only) –problems.Indeterminate forms - L'Hospital's rule, problems.

Partial differentiation, total derivative-differentiation of composite functions. Jacobian and problems. Maxima and minima for a function of two variables. Problems. **08 Hrs**

Self-study: Euler's theorem and problems. Method of Lagrange's undetermined multipliers withsingle constraint.

Applications: Series expansion in computer programming, Errors and approximations, calculators.

(BT Levels: L1, L2 and L3)

UNIT – III

ORDINARY DIFFERENTIAL EQUATIONS (ODEs) OF FIRST ORDER

Introduction to first order ordinary differential equations pertaining to the applications forComputer Science & Engineering:

Linear and Bernoulli's differential equations. Exact and reducible to exact differential equation. Integrating factors on $\frac{1}{N}\left(\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}\right)$ and $\frac{1}{M}\left(\frac{\partial N}{\partial x}-\frac{\partial M}{\partial y}\right)$. Applications of ODE's - Orthogonal trajectories, L-R and C-R circuits. Problems.

Nonlinear differential equations: Introduction to general and singular solutions, Solvable for p only, Clairaut's equations, **r**educible to Clairaut's equations. Problems**.** **08 Hrs**

Self-Study: Applications of ODE's, Solvable for x and y.

Applications of ordinary differential equations: L-R & C-R circuits, Rate of Growth or Decay,Conduction of heat.

(BT Levels: L1, L2 and L3)

UNIT – IV

MODULAR ARITHMETIC

Introduction of modular arithmetic and its applications in Computer Science and Engineering:

Introduction to Congruences, Linear Congruences, The Chinese Remainder theorem, Solving Polynomials, Linear Diophantine Equation, System of Linear Congruences, Euler's Theorem, Wilson Theorem and Fermat's little theorem. Applications of Congruences-RSA algorithm. **08 Hrs**

Self-Study: Divisibility, GCD, Properties of Prime Numbers, Fundamental theorem of Arithmetic.

Applications: Cryptography, encoding and decoding, RSA applications in public key encryption.

(BT Levels: L1, L2 and L3)

UNIT - V

LINEAR ALGEBRA

Introduction of liner algebra related to computer science and engineering: Elementary row transformation of a matrix, Rank of a matrix. Consistency and solution of a system of linear equations - Gauss-elimination method, Gauss-Jordan method and approximate solution by Gauss-Seidel method. Eigenvalues and Eigenvectors, Rayleigh's power method to find the dominant Eigenvalue and Eigenvector. **08 Hrs**

Self-Study: Solution of system of equations by Gauss-Jacobi iterative method. Inverse of a square matrix by Cayley- Hamilton theorem.

Applications:

(BT Levels: L1, L2 and L3)

List of Laboratory experiments using MATLAB

(2 hours/week per batch) 10 lab sessions + 1 Lab Assessment

1	2D plots for Cartesian and polar curves
2	Finding angle between polar curves, curvature and radius of curvature of a given curve
3	Finding partial derivatives, Jacobian and plotting the graph
4	Applications to Maxima and Minima of two variables
5	Solution of first order differential equation and plotting the graphs
6	Finding GCD using Euclid's Algorithm
7	Applications of Wilson theorem
8	Numerical solution of system of linear equations, test for consistency and graphical representation
9	Solution of system of linear equations using Gauss-Seidel iteration
10	Compute eigenvalues and eigenvectors and find the largest and smallest eigenvalue by Rayleigh power method.

TEXT BOOKS :

1	B. S. Grewal	Higher Engineering Mathematics, Khanna publishers, 44th Ed., 2021, 9788193328491.
2	E. Kreyszig	Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed., 2018, 978-1-119-44684-2.
3	David M Burton	Elementary Number Theory", 7th Edition, McGraw Hill Education, 2013, 978-1259025761

REFERENCE BOOKS :

1	V. Ramana	Higher Engineering Mathematics, McGraw-Hill Education, 11th Ed., 2017, 978-0070634190
2	Srimanta Pal & Subodh C. Bhunia	Engineering Mathematics, Oxford University Press, 3rd Ed., 2016, 1-68015-886-4
3	N.P Bali and Manish Goyal	A textbook of Engineering Mathematics, Laxmi Publications, 10th Ed., 2022, 978-8131808320.
4	C. Ray Wylie, Louis C. Barrett	Advanced Engineering Mathematics, McGraw – Hill Book Co., Newyork, 6th Ed., 2017, 978-0070722064.
5	Gupta C.B, Sing S.R and Mukesh Kumar	Engineering Mathematic for Semester I and II, Mc-Graw Hill Education (India) Pvt. Ltd. 2015, 9789339219659
6	H. K. Dass and Er. Rajnish Verma	Higher Engineering Mathematics, S. Chand Publication, 3rd Ed., 2014, 978-8121938907.
7	James Stewart	Calculus, Cengage Publications, 7th Ed., 2019, 9780538497817
8	David C Lay	Linear Algebra and its Applications, Pearson Publishers, 4th Ed., 2018, 978-0134022697
9	Gareth Williams	Linear Algebra with applications, Jones Bartlett Publishers Inc., 6thEd., 2017, 978-1284120097.
10	William Stallings	Cryptography and Network Security" Pearson Prentice Hall, 6th Ed.,2013, 978-0-13-335469-0.

Course Outcomes :

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

CO1 : Apply the knowledge of calculus to solve problems related to polar curves and implementation using MATLAB.

CO2 : Learn the notion of partial differentiation to compute rate of change of multivariate functions and implementation using MATLAB.

CO3 : Apply the analytical methods to solve first order and first-degree differential equations and implementation using MATLAB.

CO4 : Apply modular arithmetic to computer algorithms and implementation using MATLAB.

CO5 : Apply matrix theory for solving the system of linear equations, compute eigenvalues and eigenvectors and implementation using MATLAB.

Mathematics - II for Computer Sc. & Engg. Stream

Contact Hours/ Week	: 2 (L)+2(T)+2(P)	Credits	: 4.0
Total Lecture Hours	: 26	CIE Marks	: 50
Total Tutorial Hours	: 26	SEE Marks	: 50
Total Practical Hours	: 26	Exam Hours	: 3
Course Type	: Integrated	Course Code	: MATS2

Course Objectives : This course will enable students to:

- **Familiarize** the importance of Integral calculus and Vector calculus.
- **Learn** vector spaces and linear transformations**.**
- **Develop** the knowledge of numerical method and apply to solve transcendental anddifferential equations

UNIT - I

INTEGRAL CALCULUS

Introduction to Integral Calculus in Computer Science & Engineering:

Multiple Integrals: Evaluation of double and triple integrals, evaluation of double integrals by change of order of integration, changing into polar coordinates. Applications to find Area and Volume by double integral. Problem**s.**

Beta and Gamma functions: Definitions, properties, relation between Beta and Gamma functions. Problems. **08 Hrs**

Self-Study: Center of gravity, Duplication formula.

Applications: Antenna and wave propagation, Calculation of optimum value in various geometries. Analysis of probabilistic models.

(BT Levels: L1, L2 and L3)

UNIT – II

VECTOR CALCULUS

Introduction to Vector Calculus in Computer Science & Engineering:

Scalar and vector fields. Gradient, directional derivative, curl and divergence – physical interpretation, solenoidal and irrotational vector fields. Problems.

Curvilinear coordinates: Scale factors, base vectors, Cylindrical polar coordinates, Spherical polar coordinates, transformation between cartesian and curvilinear systems, orthogonality. Problems. **08 Hrs**

Self-Study: Volume integral.

Applications: Conservation of laws, Electrostatics, Analysis of stream lines.

(BT Levels: L1, L2 and L3)

UNIT - III

VECTOR SPACE AND LINEAR TRANSFORMATIONS

Importance of Vector Space and Linear Transformations in the field of Computer Science & Engineering:

Vector spaces: Definition and examples, subspace, linear span, Linearly independent and dependentsets, Basis and dimension.

Linear transformations: Definition and examples, Algebra of transformations, Matrix of a linear transformation. Change of coordinates, Rank and nullity of a linear operator, Rank-Nullity theorem. Inner product spaces and orthogonality. **08 Hrs**

Self-study: Angles and Projections. Rotation, reflection, contraction and expansion.

Applications: Image processing, AI & ML, Graphs and networks, computer graphics.

(BT Levels: L1, L2 and L3)

UNIT - IV

NUMERICAL METHODS – 1

Importance of numerical methods for discrete data in the field of computer science &engineering:

Solution of algebraic and transcendental equations: Regula-Falsi and Newton-Raphson methods (onlyformulae). Problems,

Finite differences, Interpolation using Newton's forward and backward difference formulae, Newton's divided difference formula and Lagrange's interpolation formula (All formulae withoutproof). Problems.

N**umerical integration**: Trapezoidal, Simpson's $(1/3)^{rd}$ and $(3/8)^{th}$ rules (without proof). Problems. **08 Hrs**

Self-Study: Ramanujan's method, Bisection method, Lagrange's inverse Interpolation, Weddle's rule.

Applications: Estimating the approximate roots, extremum values, Area, volume, surface area. Errorsin finite precision.

(BT Levels: L1, L2 and L3)

UNIT - V

NUMERICAL METHODS – 2

Introduction to various numerical techniques for handling Computer Science & Engineering applications. Numerical Solution of Ordinary Differential Equations (ODE's):

Numerical solution of ordinary differential equations of first order and first degree - Taylor's series method, Modified Euler's method, Runge-Kutta method of fourth order and Milne's predictor-corrector formula (Noderivations of formulae). Problems. **08 Hrs**

Self-Study: Adam-Bashforth method.

Applications: Estimating the approximate solutions of ODE.

(BT Levels: L1, L2 and L3)

List of Laboratory experiments using MATLAB

(2 hours/week per batch) 10 lab sessions + 1 Lab Assessment

1	Program to compute area, surface area, volume and centre of gravity
2	Evaluation of improper integrals
3	Finding gradient, divergent, curl and their geometrical interpretation
4	Computation of basis and dimension for a vector space and Graphical representation of linear transformation
5	Computing the inner product and orthogonality
6	Solution of algebraic and transcendental equation by Ramanujan's, Regula-Falsi and Newton-Raphson method
7	Interpolation/Extrapolation using Newton's forward and backward difference formula
8	Computation of area under the curve using Trapezoidal, Simpson's $(1/3)^{rd}$ and $(3/8)^{th}$ rule
9	Solution of ODE of first order and first degree by Taylor's series and Modified Euler's method
10	Solution of ODE of first order and first degree by Runge-Kutta 4^{th} order and Milne's predictor-corrector method

TEXT BOOKS :

1	B. S. Grewal	Higher Engineering Mathematics, Khanna publishers, 44^{th} Ed., 2021, 9788193328491.
2	E. Kreyszig	Advanced Engineering Mathematics, John Wiley & Sons, 10^{th} Ed., 2018, 978-1-119-44684-2.

REFERENCE BOOKS :

1	V. Ramana	Higher Engineering Mathematics, McGraw-Hill Education, 11th Ed., 2017, 978-0070634190
2	Srimanta Pal & Subodh C. Bhunia	Engineering Mathematics, Oxford University Press, 3rd Ed., 2016, 1-68015-886-4
3	N.P Bali and Manish Goyal	A textbook of Engineering Mathematics, Laxmi Publications, 10th Ed., 2022, 978-8131808320.
4	C. Ray Wylie, Louis C. Barrett	Advanced Engineering Mathematics, McGraw – Hill Book Co., Newyork, 6th Ed., 2017, 978-0070722064.
5	Gupta C.B, Sing S.R and Mukesh Kumar	Engineering Mathematic for Semester I and II, Mc-Graw Hill Education (India) Pvt. Ltd. 2015, 9789339219659
6	H. K. Dass and Er. Rajnish Verma	Higher Engineering Mathematics, S. Chand Publication, 3rd Ed., 2014, 978-8121938907.
7	James Stewart	Calculus, Cengage Publications, 7th Ed., 2019, 9780538497817
8	David C Lay	Linear Algebra and its Applications, Pearson Publishers, 4th Ed., 2018, 978-0134022697
9	Gareth Williams	Linear Algebra with applications, Jones Bartlett Publishers Inc., 6thEd., 2017, 978-1284120097.

Course Outcomes :

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

CO1 : Apply the concept of change of order of integration and variables to evaluate multiple integrals and their usage in computing area and volume and implementation using MATLAB.

CO2 : Learn the concept of vector calculus and apply to solenoidal, irrotational vectors, Curvilinear coordinates and implementation using MATLAB.

CO3 : Demonstrate the idea of Linear dependence and independence of sets in the vector space and linear transformation and implementation using MATLAB.

CO4 : Apply the Numerical methods for Interpolation, solve algebraic and transcendental equations, numerical integration and implementation using MATLAB.

CO5 : Apply the knowledge of numerical methods in solving ordinary differential equations and implementation using MATLAB.

Mathematics - I for Mechanical Engineering Stream

Contact Hours/ Week	: 2 (L)+2(T)+2(P)	Credits	: 4.0
Total Lecture Hours	: 26	CIE Marks	: 50
Total Tutorial Hours	: 26	SEE Marks	: 50
Total Practical Hours	: 26	Exam Hours	: 3
Course Type	: Integrated	Course Code	: MATM1

Course Objectives : This course will enable students to:

- **Familiarize** the importance of calculus associated with one variable and two variables for Mechanical engineering.
- **Analyze** Mechanical engineering problems applying Ordinary Differential Equations.
- **Develop** the knowledge of Linear Algebra refereeing to matrices

UNIT - I

CALCULUS

Introduction to polar coordinates and curvature relating to mechanical engineering:

Polar coordinates, Polar curves, angle between the radius vector and the tangent, angle between two curves. Pedal equations. Curvature and Radius of curvature - Cartesian, Parametric, Polar and Pedal forms. Problems. **08 Hrs**

Self-study: Center and circle of curvature, evolutes and involutes.

Applications: Applied Mechanics, Strength of Materials, Elasticity.

(BT Levels: L1, L2 and L3)

UNIT - II

SERIES EXPANSION AND MULTIVARIABLE CALCULUS

Introduction to series expansion and partial differentiation in the field of mechanical engineering applications:

Taylor's and Maclaurin's series expansion for one variable (Statement only) –problems.Indeterminate forms - L'Hospital's rule, problems.

Partial differentiation, total derivative-differentiation of composite functions. Jacobian and problems. Maxima and minima for a function of two variables. Problems. **08 Hrs**

Self-study: Euler's theorem and problems. Method of Lagrange's undetermined multipliers with asingle constraint.

Applications: Computation of stress and strain, Errors and approximations in manufacturing process, Estimating the critical points and extreme values, vector calculus.

(BT Levels: L1, L2 and L3)

UNIT – III

ORDINARY DIFFERENTIAL EQUATIONS (ODEs) OF FIRST ORDER

Introduction to first order ordinary differential equations pertaining to the applications for mechanical engineering:

Linear and Bernoulli's differential equations. Exact and reducible to exact differential equation. Integrating factors on $\frac{1}{N}\left(\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}\right)$ and $\frac{1}{M}\left(\frac{\partial N}{\partial x}-\frac{\partial M}{\partial y}\right)$.

Applications of ODE's - Orthogonal trajectories, Newton's law of cooling.

Nonlinear differential equations: Introduction to general and singular solutions, Solvable for p only, Clairaut's equations, **r**educible to Clairaut's equations. Problems**.** **08 Hrs**

Self-Study: Applications of ODE's: L-R circuits. Solvable for x and y.

Applications: Rate of Growth or Decay, Conduction of heat.

(BT Levels: L1, L2 and L3)

UNIT – IV

ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDER

Importance of higher-order ordinary differential equations in Mechanical Engineeringapplications:

Higher-order linear ODE's with constant coefficients - Inverse differential operator, method of variation of parameters, Cauchy's and Legendre's homogeneous differential equations. Problems. **08 Hrs**

Self-Study: Formulation and solution of oscillations of a spring. Finding the solution by the methodof undetermined coefficients.

Applications: Applications to oscillations of a spring, Mechanical systems and Transmission lines.

(BT Levels: L1, L2 and L3)

UNIT – V

LINEAR ALGEBRA

Introduction of liner algebra related to Mechanical Engineering applications:

Elementary row transformation of a matrix, Rank of a matrix. Consistency and solution of a system of linear equations - Gauss-elimination method,

Gauss-Jordan method and approximate solution by Gauss-Seidel method. Eigenvalues and Eigenvectors, Rayleigh's power method to find the dominant Eigenvalue and Eigenvector. **08 Hrs**

Self-Study: Solution of a system of equations by Gauss-Jacobi iterative method. Inverse of a squarematrix by Cayley- Hamilton theorem.

Applications:

(BT Levels: L1, L2 and L3)

List of Laboratory experiments using MATLAB

(2 hours/week per batch) 10 lab sessions + 1 Lab Assessment

1	2D plots for Cartesian and polar curves
2	Finding angle between polar curves, curvature and radius of curvature of a given curve
3	Finding partial derivatives, Jacobian and plotting the graph
4	Applications to Maxima and Minima of two variables
5	Solution of first order differential equation and plotting the graphs
6	Solutions of Second order ordinary differential equations with initial/ boundary conditions
7	Solution of differential equation of oscillations of a spring with various load
8	Numerical solution of system of linear equations, test for consistency and graphical representation
9	Solution of system of linear equations using Gauss-Seidel iteration
10	Compute eigenvalues and eigenvectors and find the largest and smallest eigenvalue by Rayleigh power method.

TEXT BOOKS :

1	B. S. Grewal	Higher Engineering Mathematics, Khanna publishers, 44th Ed., 2021, 9788193328491.
2	E. Kreyszig	Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed., 2018, 978-1-119-44684-2.

REFERENCE BOOKS :

1	V. Ramana	Higher Engineering Mathematics, McGraw-Hill Education, 11th Ed., 2017, 978-0070634190
2	Srimanta Pal & Subodh C. Bhunia	Engineering Mathematics, Oxford University Press, 3rd Ed., 2016, 1-68015-886-4
3	N.P Bali and Manish Goyal	A textbook of Engineering Mathematics, Laxmi Publications, 10th Ed., 2022, 978-8131808320.
4	C. Ray Wylie, Louis C. Barrett	Advanced Engineering Mathematics, McGraw – Hill Book Co., Newyork, 6th Ed., 2017, 978-0070722064.
5	Gupta C.B, Sing S.R and Mukesh Kumar	Engineering Mathematic for Semester I and II, Mc-Graw Hill Education (India) Pvt. Ltd. 2015, 9789339219659
6	H. K. Dass and Er. Rajnish Verma	Higher Engineering Mathematics, S. Chand Publication, 3rd Ed., 2014, 978-8121938907.
7	James Stewart	Calculus, Cengage Publications, 7th Ed., 2019, 9780538497817
8	David C Lay	Linear Algebra and its Applications, Pearson Publishers, 4th Ed., 2018, 978-0134022697
9	Gareth Williams	Linear Algebra with applications, Jones Bartlett Publishers Inc., 6thEd., 2017, 978-1284120097.

Course Outcomes :

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

CO1 : Apply the knowledge of calculus to solve problems related to polar curves and implementation using MATLAB.

CO2 : Learn the notion of partial differentiation to compute rate of change of multivariate functions and implementation using MATLAB.

CO3 : Apply the analytical methods to solve first order and first-degree differential equations and implementation using MATLAB.

CO4 : Explain and solve various physical models through higher order linear differential equations and implementation using MATLAB.

CO5 : Apply matrix theory for solving the system of linear equations, compute eigenvalues and eigenvectors and implementation using MATLAB.

Mathematics - II for Mechanical Engineering Stream

Contact Hours/ Week	: 2 (L)+2(T)+2(P)	Credits	: 4.0
Total Lecture Hours	: 26	CIE Marks	: 50
Total Tutorial Hours	: 26	SEE Marks	: 50
Total Practical Hours	: 26	Exam Hours	: 3
Course Type	: Integrated	Course Code	: MATM2

Course Objectives : This course will enable students to:

- **Familiarize** the importance of Integral calculus and Vector calculus essential for Mechanical Engineering.
- **Analyze** Mechanical engineering problems applying Partial Differential Equations.
- **Develop** the knowledge of solving Mechanical engineering problems numerically.

UNIT - I

INTEGRAL CALCULUS

Introduction to Integral Calculus in Mechanical Engineering applications.

Multiple Integrals:

Multiple Integrals: Evaluation of double and triple integrals, evaluation of double integrals by change of order of integration, changing into polar coordinates. Applications to find: Area and Volume by double integral. Problems.

Beta and Gamma functions: Definitions, properties, relation between Beta and Gamma functions. Problems. **08 Hrs**

Self-Study: Volume by triple integration, Center of gravity.

Applications: Applications to mathematical quantities (Area, Surface area, Volume), Analysis of probabilistic models.

(BT Levels: L1, L2 and L3)

UNIT - II

VECTOR CALCULUS

Introduction to Vector Calculus in Mechanical Engineering applications:

Vector Differentiation: Scalar and vector fields. Gradient, directional derivative, curl and divergence - physical interpretation, solenoidal and irrotational vector fields. Problems.

Vector Integration: Line integrals, Surface integrals. Applications to work done by a force andflux. Statement of Green's theorem and Stoke's theorem. Problems. **08 Hrs**

Self-Study: Volume integral and Gauss divergence theorem.

Applications: Heat and mass transfer, oil refinery problems, environmental engineering, velocity and acceleration of moving particle, analysis of stream lines.

(BT Levels: L1, L2 and L3)

UNIT - III

PARTIAL DIFFERENTIAL EQUATIONS (PDE's)

Importance of partial differential equations for Mechanical Engineering application:

Formation of PDE's by elimination of arbitrary constants and functions. Solution of non- homogeneous PDE by direct integration. Homogeneous PDEs involving derivative with respect to one independent variable only. Solution of Lagrange's linear PDE. **Derivation of one-dimensional heat equation and wave equation.** **08 Hrs**

Self-Study: Solution of the one-dimensional heat equation and wave equation by the method ofseparation of variables.

Applications: Vibration of a rod/membrane.

(BT Levels: L1, L2 and L3)

UNIT - IV

NUMERICAL METHODS – 1

Importance of numerical methods for discrete data in the field of Mechanical Engineering:

Solution of algebraic and transcendental equations: Regula-Falsi and Newton-Raphson methods (onlyformulae). Problems,

Finite differences, Interpolation using Newton's forward and backward difference formulae, Newton's divided difference formula and Lagrange's interpolation formula (All formulae withoutproof). Problems.

N**umerical integration:** Trapezoidal, Simpson's $(1/3)^{rd}$ and $(3/8)^{th}$ rules (without proof). Problems. **08 Hrs**

Self-Study: Bisection method, Lagrange's inverse Interpolation, Weddle's rule.

Applications: Finding approximate solutions to solve mechanical engineering problems involvingnumerical data.

(BT Levels: L1, L2 and L3)

UNIT - V

NUMERICAL METHODS – 2

Introduction to various numerical techniques for handling Mechanical Engineering applications. Numerical Solution of Ordinary Differential Equations (ODE's):

Numerical solution of ordinary differential equations of first order and first degree - Taylor's series method, Modified Euler's method, Runge-Kutta method of fourth order and Milne's predictor-corrector formula (Noderivations of formulae). Problems. **08 Hrs**

Self-Study: Adam-Bashforth method.

Applications: Finding approximate solutions to solve mechanical engineering problems.

(BT Levels: L1, L2 and L3)

List of Laboratory experiments using MATLAB

(2 hours/week per batch) 10 lab sessions + 1 Lab Assessment

1	Program to compute surface area, volume and centre of gravity
2	Evaluation of improper integrals
3	Finding gradient, divergent, curl and their geometrical interpretation
4	Verification of Green's theorem
5	Solution of one-dimensional heat equation and wave equation
6	Solution of algebraic and transcendental equations by Regula-Falsi and Newton-Raphson method
7	Interpolation/Extrapolation using Newton's forward and backward difference formula
8	Computation of area under the curve using Trapezoidal, Simpson's $(1/3)^{rd}$ and $(3/8)^{th}$ rule
9	Solution of ODE of first order and first degree by Taylor's series and Modified Euler's method
10	Solution of ODE of first order and first degree by Runge-Kutta 4^{th} order and Milne's predictor-corrector method

TEXT BOOKS :

1	B. S. Grewal	Higher Engineering Mathematics, Khanna publishers, 44^{th} Ed., 2021, 9788193328491.
2	E. Kreyszig	Advanced Engineering Mathematics, John Wiley & Sons, 10^{th} Ed., 2018, 978-1-119-44684-2.

REFERENCE BOOKS :

1	V. Ramana	Higher Engineering Mathematics, McGraw-Hill Education, 11th Ed., 2017, 978-0070634190
2	Srimanta Pal & Subodh C. Bhunia	Engineering Mathematics, Oxford University Press, 3rd Ed., 2016, 1-68015-886-4
3	N.P Bali and Manish Goyal	A textbook of Engineering Mathematics, Laxmi Publications, 10th Ed., 2022, 978-8131808320.
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5	Gupta C.B, Sing S.R and Mukesh Kumar	Engineering Mathematic for Semester I and II, Mc-Graw Hill Education (India) Pvt. Ltd. 2015, 9789339219659
6	H. K. Dass and Er. Rajnish Verma	Higher Engineering Mathematics, S. Chand Publication, 3rd Ed., 2014, 978-8121938907.
7	James Stewart	Calculus, Cengage Publications, 7th Ed., 2019, 9780538497817
8	David C Lay	Linear Algebra and its Applications, Pearson Publishers, 4th Ed., 2018, 978-0134022697
9	Gareth Williams	Linear Algebra with applications, Jones Bartlett Publishers Inc., 6thEd., 2017, 978-1284120097.

Course Outcomes :

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

CO1 : Apply the concept of change of order of integration and variables to evaluate multiple integrals and their usage in computing area and volume and implementation using MATLAB.

CO2 : Learn the concept of vector calculus and apply to solenoidal, irrotational vectors, line integral and surface integral and implementation using MATLAB.

CO3 : Form and solve the partial differential equations and their solutions for physical interpretations and implementation using MATLAB.

CO4 : Apply the Numerical methods for Interpolation, solve algebraic and transcendental equations, numerical integration and implementation using MATLAB.

CO5 : Apply the knowledge of numerical methods in solving ordinary differential equations and implementation using MATLAB.

Mathematics - I for Electrical and Electronics Engineering Stream

Contact Hours/ Week	: 2 (L)+2(T)+2(P)	Credits	: 4.0
Total Lecture Hours	: 26	CIE Marks	: 50
Total Tutorial Hours	: 26	SEE Marks	: 50
Total Practical Hours	: 26	Exam Hours	: 3
Course Type	: Integrated	Course Code	: MATE1

Course Objectives : This course will enable students to:

- **Familiarize** the importance of calculus associated with one variable and two variables for Electrical & Electronics engineering.
- **Analyze** Electrical & Electronics engineering problems applying Ordinary Differential Equations.
- **Develop** the knowledge of Linear Algebra refereeing to matrices.

UNIT - I

CALCULUS

Introduction to polar coordinates and curvature relating to EC & EE Engineering applications:

Polar coordinates, Polar curves, angle between the radius vector and the tangent, angle between two curves. Pedal equations. Curvature and Radius of curvature - Cartesian, Parametric, Polar and Pedal forms. Problems. **08 Hrs**

Self-study: Center and circle of curvature, evolutes and involutes.

Applications: Communication signals, Manufacturing of microphones, and Image processing.

(BT Levels: L1, L2 and L3)

UNIT – II

SERIES EXPANSION AND MULTIVARIABLE CALCULUS

Introduction of series expansion and partial differentiation in EC & EE Engineering applications:

Taylor's and Maclaurin's series expansion for one variable (Statement only) –problems.Indeterminate forms - L'Hospital's rule, problems.

Partial differentiation, total derivative-differentiation of composite functions.

Jacobian and problems. Maxima and minima for a function of two variables. Problems. **08 Hrs**

Self-study: Euler's Theorem and problems. Method of Lagrange's undetermined multipliers with single constraint

Applications: Series expansion in communication signals, Errors and approximations, and vectorcalculus.

(BT Levels: L1, L2 and L3)

UNIT – III

ORDINARY DIFFERENTIAL EQUATIONS (ODES) OF FIRST ORDER

Introduction to first order ordinary differential equations pertaining to the Electrical &Electronics Engineering:

Linear and Bernoulli's differential equations. Exact and reducible to exact differential equation. Integrating factors on $\frac{1}{N}\left(\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}\right)$ and $\frac{1}{M}\left(\frac{\partial N}{\partial x}-\frac{\partial M}{\partial y}\right)$. Applications of ODE's - Orthogonal trajectories, L-R and C-R circuits. Problems

Nonlinear differential equations: Introduction to general and singular solutions, Solvable for p only, Clairaut's equations, **r**educible to Clairaut's equations. Problems**.** **08 Hrs**

Self-Study: Applications of ODE's, Solvable for x and y.

Applications of ordinary differential equations: L-R and C-R circuits, Rate of Growth or Decay,Conduction of heat.

(BT Levels: L1, L2 and L3)

UNIT - IV

INTEGRAL CALCULUS

Introduction to Integral Calculus in EC & EE engineering applications.

Multiple Integrals: Evaluation of double and triple integrals, evaluation of double integrals by change of order of integration, changing into polar coordinates. Applications to find Area and Volume by double integral. Problems.

Beta and Gamma functions: Definitions, properties, relation between Beta and Gamma functions. Problems. **08 Hrs**

Self-Study: Volume by triple integration, Center of gravity.

Applications: Antenna and wave propagation, Calculation of optimum power in electrical circuits,field theory.

(BT Levels: L1, L2 and L3)

UNIT - V

LINEAR ALGEBRA

Introduction of liner algebra related to EC & EE engineering applications:

Elementary row transformation of a matrix, Rank of a matrix. Consistency and solution of a system of linear equations - Gauss-elimination method, Gauss-Jordan method and approximate solution by Gauss-Seidel method. Eigenvalues and Eigenvectors, Rayleigh's power method to find the dominant Eigenvalue and Eigenvector. **08 Hrs**

Self-Study: Solution of system of equations by Gauss-Jacobi iterative method. Inverse of a square matrix by Cayley- Hamilton theorem

(BT Levels: L1, L2 and L3)

List of Laboratory experiments using MATLAB

(2 hours/week per batch) 10 lab sessions + 1 Lab Assessment

1	2D plots for Cartesian and polar curves
2	Finding angle between polar curves, curvature and radius of curvature of a given curve
3	Finding partial derivatives, Jacobian and plotting the graph
4	Applications to Maxima and Minima of two variables
5	Solution of first order differential equation and plotting the graphs
6	Program to compute area, volume and centre of gravity
7	Evaluation of improper integrals
8	Numerical solution of system of linear equations, test for consistency and graphical representation
9	Solution of system of linear equations using Gauss-Seidel iteration
10	Compute eigenvalues and eigenvectors and find the largest and smallest eigenvalue by Rayleigh power method.

TEXT BOOKS :

1	B. S. Grewal	Higher Engineering Mathematics, Khanna publishers, 44th Ed., 2021, 9788193328491.
2	E. Kreyszig	Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed., 2018, 978-1-119-44684-2.

REFERENCE BOOKS :

1	V. Ramana	Higher Engineering Mathematics, McGraw-Hill Education, 11th Ed., 2017, 978-0070634190
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3	N.P Bali and Manish Goyal	A textbook of Engineering Mathematics, Laxmi Publications, 10th Ed., 2022, 978-8131808320.
4	C. Ray Wylie, Louis C. Barrett	Advanced Engineering Mathematics, McGraw – Hill Book Co., Newyork, 6th Ed., 2017, 978-0070722064.
5	Gupta C.B, Sing S.R and Mukesh Kumar	Engineering Mathematic for Semester I and II, Mc-Graw Hill Education (India) Pvt. Ltd. 2015, 9789339219659
6	H. K. Dass and Er. Rajnish Verma	Higher Engineering Mathematics, S. Chand Publication, 3rd Ed., 2014, 978-8121938907.
7	James Stewart	Calculus, Cengage Publications, 7th Ed., 2019, 9780538497817
8	David C Lay	Linear Algebra and its Applications, Pearson Publishers, 4th Ed., 2018, 978-0134022697
9	Gareth Williams	Linear Algebra with applications, Jones Bartlett Publishers Inc., 6thEd., 2017, 978-1284120097.

Course Outcomes :

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

CO1 : Apply the knowledge of calculus to solve problems related to polar curves and implementation using MATLAB.

CO2 : Learn the notion of partial differentiation to compute rate of change of multivariate functions and implementation using MATLAB.

CO3 : Apply the analytical methods to solve first order and first-degree differential equations and implementation using MATLAB.

CO4 : Apply the concept of change of order of integration and variables to evaluate multiple integrals and their usage in computing area and volume and implementation using MATLAB.

CO5 : Apply matrix theory for solving the system of linear equations, compute eigenvalues and eigenvectors and implementation using MATLAB.

Mathematics - II for Electrical and Electronics Engineering Stream

Contact Hours/ Week	: 2 (L)+2(T)+2(P)	Credits	: 4.0
Total Lecture Hours	: 26	CIE Marks	: 50
Total Tutorial Hours	: 26	SEE Marks	: 50
Total Practical Hours	: 26	Exam Hours	: 3
Course Type	: Integrated	Course Code	: MATE2

Course Objectives : This course will enable students to:

- **Familiarize** the importance of Integral calculus and Vector calculus essential for Electrical & Electronics engineering.
- **Analyze** Electrical & Electronics engineering problems applying Partial DifferentialEquations.
- **Develop** the knowledge of solving electronics and electrical engineering problems numerically

UNIT - I

VECTOR CALCULUS

Introduction to Vector Calculus in EC & EE engineering applications:

Vector Differentiation: Scalar and vector fields. Gradient, directional derivative, curl and divergence - physical interpretation, solenoidal and irrotational vector fields. Problems.

Vector Integration: Line integrals, Surface integrals. Applications to work done by a force andflux. Statement of Green's theorem and Stoke's theorem. Problems. **08 Hrs**

Self-Study: Volume integral and Gauss divergence theorem.

Applications: Conservation of laws, Electrostatics, Analysis of stream lines and electric potentials

(BT Levels: L1, L2 and L3)

UNIT – II

VECTOR SPACE AND LINEAR TRANSFORMATIONS

Importance of Vector Space and Linear Transformations in the field of EC & EE engineering applications:

Vector spaces: Definition and examples, subspace, linear span, Linearly independent and dependentsets, Basis and dimension.

Linear transformations: Definition and examples, Algebra of transformations, Matrix of a linear transformation. Change of coordinates, Rank and nullity of a linear operator, Rank-Nullity theorem. Inner product spaces and orthogonality. **08 Hrs**

Self-study: Angles and Projections. Rotation, reflection, contraction and expansion. **Applications:** Image processing, AI & ML, Graphs and networks, computer graphics

(BT Levels: L1, L2 and L3)

UNIT - III

LAPLACE TRANSFORM

Importance of Laplace Transform for EC & EE engineering applications:

Existence and Uniqueness of Laplace transform (LT), transform of elementary functions, region of convergence, Properties–Linearity, Scaling, t-shift property, s-domain shift, differentiation in the s-domain, division by t, differentiation and integration in the time domain, LT of special functions-periodic functions (square wave, saw-tooth wave, triangular wave, full & half wave rectifier), Heaviside Unit step function, Unit impulse function.

Inverse Laplace Transforms:

Definition, properties, evaluation using different methods, convolution theorem (without proof), problems, and Applications to solve ordinary differential equations**.** **08 Hrs**

Self-Study: Verification of convolution theorem.

Applications: Signals and systems, Control systems, LR, CR & LCR circuits

(BT Levels: L1, L2 and L3)

UNIT - IV

NUMERICAL METHODS – 1

Importance of numerical methods for discrete data in the field of EC & EE engineeringapplications:

Solution of algebraic and transcendental equations: Regula-Falsi and Newton-Raphson methods (onlyformulae). Problems,

Finite differences, Interpolation using Newton's forward and backward difference formulae, Newton's divided difference formula and Lagrange's interpolation formula (All formulae withoutproof). Problems.

N**umerical integration:** Trapezoidal, Simpson's $(1/3)^{rd}$ and $(3/8)^{th}$ rules (without proof). Problems. **08 Hrs**

S**elf-Study:** Bisection method, Lagrange's inverse Interpolation, Weddle's rule.

Applications: Estimating the approximate roots, extremum values, Area, volume, surface area.

(BT Levels: L1, L2 and L3)

UNIT - V

NUMERICAL METHODS – 2

Introduction to various numerical techniques for handling EC & EE applications. Numerical Solution of Ordinary Differential Equations (ODE's):

Numerical solution of ordinary differential equations of first order and first degree - Taylor's series method, Modified Euler's method, Runge-Kutta method of fourth order and Milne's predictor-corrector formula (Noderivations of formulae). Problems. **08 Hrs**

Self-Study: Adam-Bashforth method.

Applications: Estimating the approximate solutions of ODE for electric circuits.

(BT Levels: L1, L2 and L3)

List of Laboratory experiments using MATLAB

(2 hours/week per batch) 10 lab sessions + 1 Lab Assessment

1	Finding gradient, divergent, curl and their geometrical interpretation and Verification of Green's theorem
2	Computation of basis and dimension for a vector space and Graphical representation of linear transformation
3	Visualization in time and frequency domain of standard functions
4	Computing inverse Laplace transform of standard functions
5	Laplace transform of convolution of two functions
6	Computing the approximate roots for algebraic and transcendental equation
7	Interpolation/Extrapolation using Newton's forward and backward difference formula
8	Computation of area under the curve using Trapezoidal, Simpson's $(1/3)^{rd}$ and $(3/8)^{th}$ rule
9	Solution of ODE of first order and first degree by Taylor's series and Modified Euler's method
10	Solution of ODE of first order and first degree by Runge-Kutta 4^{th} order and Milne's predictor-corrector method

TEXT BOOKS :

1	B. S. Grewal	Higher Engineering Mathematics, Khanna publishers, 44th Ed., 2021, 9788193328491.
2	E. Kreyszig	Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed., 2018, 978-1-119-44684-2.

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3	N.P Bali and Manish Goyal	A textbook of Engineering Mathematics, Laxmi Publications, 10th Ed., 2022, 978-8131808320.
4	C. Ray Wylie, Louis C. Barrett	Advanced Engineering Mathematics, McGraw – Hill Book Co., Newyork, 6th Ed., 2017, 978 - 0070722064.
5	Gupta C.B, Sing S.R and Mukesh Kumar	Engineering Mathematic for Semester I and II, Mc-Graw Hill Education (India) Pvt. Ltd. 2015, 9789339219659
6	H. K. Dass and Er. Rajnish Verma	Higher Engineering Mathematics, S. Chand Publication, 3rd Ed., 2014, 978-8121938907.
7	James Stewart	Calculus, Cengage Publications, 7th Ed., 2019, 9780538497817
8	David C Lay	Linear Algebra and its Applications, Pearson Publishers, 4th Ed., 2018, 978-0134022697
9	Gareth Williams	Linear Algebra with applications, Jones Bartlett Publishers Inc., 6thEd., 2017, 978-1284120097.

Course Outcomes :

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

CO1 : Learn the concept of vector calculus and apply to solenoidal, irrotational vectors, line integral and surface integral and implementation using MATLAB.

CO2 : Demonstrate the idea of Linear dependence and independence of sets in the vector space and linear transformation and implementation using MATLAB.

CO3 : Learn the concept of Laplace transform and inverse Laplace transform and apply to solve initial value problems and implementation using MATLAB.

CO4 : Apply the Numerical methods for Interpolation, solve algebraic and transcendental equations, numerical integration and implementation using MATLAB.

CO5 : Apply the knowledge of numerical methods in solving ordinary differential equations and implementation using MATLAB.

Physics for Civil Engineering Stream

Contact Hours/ Week	: 3(L)+0(T)+2(P)	Credits	: 4.0
Total Lecture Hours	: 39	CIE Marks	: 50
Total Tutorial Hours	: 00	SEE Marks	: 50
Total Practical Hours	: 26	Exam Hours	: 3
Course Type	: Integrated	Course Code	: PHYC

Course Objectives : This course will enable students :

- To study the elastic properties of materials and failures of engineering materials
- To comprehend theoretical background of laser, the working of He-Ne laser and applications of laser. Also, study the nature of propagation of light in optical fiber, reasons for the fibre loss and optical fibre application.
- To understand the types of oscillation, shock waves & its generation, and applications.
- To Study the acoustics buildings and the essentials of radiometry and photometry.
- To understand the various relevant material characterization techniques.

UNIT - I

ELASTICITY **08 Hrs**

Introduction, Elastic materials (qualitative), Hooke's law, stress-strain curve, strain hardening and softening. Elastic Moduli, Poisson's ratio and its limiting values. Relation between Young's modulus (Y), rigidity modulus (n), bulk modulus (K) and Poisson's ratio (σ) (with derivation), Beams, bending moment and expression for bending moment (No derivation), Cantilever, derivation of expression of Young's modulus of a beam, experimental determination of Young's modulus by single cantilever method, I section girder and their Engineering Applications, Failures of engineering materials – ductile fracture, brittle fracture, stress concentration, fatigue and factors affecting fatigue (only qualitative explanation). Numerical problems.

Prerequisites: Basics of Elasticity.

Self-learning: Stress-Strain Curve, Elastic moduli

UNIT - II

LASERS AND OPTICAL FIBERS **08 Hrs**

Lasers: Introduction, Characteristics of LASER and difference between laser light and ordinary light. Concept of induced absorption, spontaneous emission

and stimulated emission. Expression for energy density in terms of Einstein's coefficients and discussion of results. Requisites of lasers. Condition for laser action. Construction and working of He-Ne laser, Application of lasers - LASER Range Finder, Road Profiling, Bridge Deflection. Numerical Problems.

Optical fibers: Structure of optical fiber, working principle (TIR), Light propagation mechanism - angle of acceptance, numerical aperture, Expression for numerical aperture, Attenuation, and its mechanisms (qualitative). Applications of Optical Fibers - Fiber Optic displacement sensor and pressure sensor. Numerical Problems.

Prerequisite: Properties of light,

Self-learning: Difference between laser and ordinary light, Difference between pulse and continuous laser, Principle of optical fiber

UNIT - III

OSCILLATIONS and SHOCK WAVES **08 Hrs**

Simple Harmonic motion (SHM), differential equation for SHM (No derivation), Sprigs: spring constant and its physical significance, series and parallel combination of springs (Derivation), Types of spring and their applications. Theory of damped oscillations (Qualitative), Types of damping (Graphical Approach). Theory of forced oscillations, resonance, sharpness of resonance. Numerical Problems.

Shock waves: Mach number and Mach Angle, Mach Regimes, definition and Characteristics of Shock waves, Construction and working of Reddy shock tube, Applications of Shock Waves, Numerical problems.

Pre-requisites: Basics of oscillations

Self-learning: Differences between harmonic and un-harmonic oscillations, Basics of SHM

UNIT - IV

ACOUSTICS, RADIOMETRY AND PHOTOMETRY **08 Hrs**

Acoustics: Introduction to acoustics, Types of Acoustics, reverberation and reverberation time, absorption power and absorption coefficient, Requisites for acoustics in auditorium, Sabine's formula (derivation), measurement of absorption coefficient, factors affecting the acoustics and remedial measures, Noise and its measurements, Sound insulation and its measurements. Impact of Noise in Multi-storied buildings, Numerical Problems.

Radiometry and Photometry: Radiation quantities, Spectral Quantities, Relation between luminescence and radiant quantities, Reflectance and

Transmittance, Photometry (cosine law and inverse square law - Qualitative), Numerical Problems

Prerequisites: Basics of Sound, Waves & light properties

Self-learning: Types of acoustics

UNIT - V

INSTRUMENTATION TECHNIQUES FOR MATERIAL CHARACTERISATION **08 Hrs**

Introduction to nanomaterials and nanocomposites, surface area to volume ratio, quantum confinement, characteristics of composites, metal matrix, ceramic matrix, polymer matrix nanocomposites. Bragg's law, principle, construction and working of X-ray Diffractometer, crystallite size determination by Scherrer equation, Principle, construction, working and applications of Atomic Force Microscope (AFM) and Scanning electron microscopy (SEM), Numerical Problems.

Pre requisites: Principle and working of optical Microscope

Self-learning: Bragg's law, condition for diffraction**.**

List of Experiments

1	Rigidity modulus by Torsional Pendulum
2	Determination of Young's modulus using Single Cantilever
3	Series & Parallel Resonance using LCR circuit
4	Spring Constant
5	Verification of Stefan's law
6	Wavelength of Laser by Diffraction
7	Numerical Aperture and Fiber loss
8	Frequency of AC source by Sonometer
9	Reddy Shock tube
10	Resistivity by Four Probe Method
11	Laser Range finder
12	Virtual labs/simulations
13	GNU Step Interactive Simulations
14	Study of motion/Crystallite size determination/Application of Statistics using Spread Sheet
15	PHET Interactive Simulations : https://phet.colorado.edu/en/simulations/
Note: Any ten experiments to be conducted from the above list by covering under a) Exercise b) Demonstration c) Structure Inquiry d) Open Ended. Select at least one simulation/spreadsheet activity	

TEXT BOOKS :

1	R.K. Gaur & S.L. Gupta	Engineering Physics, Dhanpath Rai and Sons, New Delhi, 2016
2	M. N. Avadhanulu, P.G. Kshirsagar & T.V.S. Arun Murthy	A textbook of Engineering Physics, 11th Edition, S Chand and Company Ltd. New Delhi, 2018

REFERENCE BOOKS :

1	Hitendra K. Singh and A. K. Singh,	Engineering Physics, Tata McGraw Hill, New Delhi, 2010
2	A. Marikani	Engineering Physics, 2nd Edition, PHI Learning Pvt. Ltd., New Delhi., 2014
3	Arthur Beiser	Concepts of Modern Physics, 6th Edition, Tata McGraw Hill, New Delhi, 2009
4	Chintoo S Kumar, K. Takayama and K P J Reddy	Shock Waves Made Simple, Wiley India Pvt. Ltd. New Delhi, 2014.
5	K. Ghatak and Thyagarajan,	Optical Electronics, Cambridge University Press (UK), 2012
6	James F. Shackelford and Madanapalli K Muralidhara,	Materials Science for Engineers, 6th Edition, Pearson Education Asia Pvt. Ltd., New Delhi, 2006
7	Mitra P. K	Characterization of Materials, Prentice Hall India Learning Private Limited, Delhi
8	M.S. Ramachandra Rao & Shubra Singh	Nanoscience & Nanotechnology : Fundamentals to Frontiers, Wiley India Pvt Ltd, 2013
9	J. Parameswaran Pillai, N. Hameed, T. Kurian, Yingfeng Yu	Nano Composite Materials - Synthesis, Properties and Applications, CRC Press. 2016

Course Outcomes :

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

CO1 : Apply the knowledge of theory of elasticity to find Young's modulus of the materials experimentally and summarize the reasons for failures of engineering materials.

CO2 : Elucidate the working of He-Ne laser, types of optical fibers, reasons for the fiber loss and their applications in engineering.

CO3 : Elucidate the concepts of oscillations, generation of shock waves in the laboratory and their applications.

CO4 : Summarize concepts of acoustics in buildings, explain the concepts in radiation &photometry and various modern tools for material characterizations.

CO5 : Identify and apply the appropriate analytic, numerical and other mathematical tools necessary to solve physics and engineering problems.

CO6 : Practice working in individual / groups to conduct experiments in Physics and perform precise and host measurements

Physics for Computer Science & Engg. Stream

Contact Hours/ Week	: 3(L)+0(T)+2(P)	Credits	: 4.0
Total Lecture Hours	: 39	CIE Marks	: 50
Total Tutorial Hours	: 00	SEE Marks	: 50
Total Practical Hours	: 26	Exam Hours	: 3
Course Type	: Integrated	Course Code	: PHYS

Course Objectives : This course will enable students :

- To comprehend theoretical background of laser, the working of He-Ne laser and applications of laser. Also, study the nature of propagation of light in optical fiber, reasons for the fiber loss and optical fiber application.
- To study the principles of quantum mechanics and its application in quantum computing.
- To study the essentials of physics for band theory of solids and semiconductor.
- To study the electrical properties of materials.

UNIT - I

LASER AND OPTICAL FIBERS **08 Hrs**

Laser: Basic properties of a LASER beam, Interaction of Radiation with Matter, Einstein's A and B Coefficients, Laser Action, Population Inversion, Metastable State, Requisites of a laser system, He-Ne Laser, Applications: Bar code scanner, Laser Printer, Laser Cooling, Numerical Problems

Optical Fiber: Principle and structure, Acceptance angle and Numerical Aperture (NA) and derivation of Expression for NA, Classification of Optical Fibers, Attenuation and Fiber Losses, Applications: Fiber Optic Communication, advantages and disadvantages, Numerical problems.

Pre requisite: Properties of light

Self-learning: Laser Cooling, Total Internal Reflection & Propagation Mechanism (Optical Fibers)

UNIT - II

QUANTUM MECHANICS **08 Hrs**

de Broglie hypothesis and Matter Waves, de Broglie wavelength and derivation of expression by analogy, Phase Velocity and Group Velocity, Heisenberg's Uncertainty Principle and its application (Nonexistence of electron inside the nucleus-Non Relativistic). Wave Function, Time

independent Schrodinger wave equation, Physical Significance of a wave function and Born Interpretation, Expectation value, Eigen functions and Eigen Values, Motion of a particle in a one dimensional potential well of infinite depth, Waveforms and Probabilities. Numerical Problems.

Pre requisite: Wave–Particle dualism,

Self-learning: de Broglie Hypothesis

UNIT - III

SEMICONDUCTOR PHYSICS **08 Hrs**

Classification of solids based on the formation of bands due to splitting of energy levels at equilibrium inter-nuclear distance: metal (Na & Mg), insulator (diamond) and semiconductor (Si). Types of semiconductor (qualitative). Fermi energy, Fermi level in semiconductors (qualitative).Expression for electrical conductivity for intrinsic and extrinsic semiconductor (no derivation). Photodiode and Power responsivity. Construction and working of Semiconducting Laser. Hall Effect in semiconductor, Expression for Hall coefficient and Hall voltage, Applications of Hall effect, Numerical problems.

Pre requisite: Basics of Semiconductors

Self-learning: p-n junction and its V-I characteristics

UNIT - IV

ELECTRICAL PROPERTIES OF MATERIALS AND APPLICATIONS 08 Hrs

Electrical conductivity in metals, Resistivity, Mobility. Concept of phonon, Matheissen's rule. Introduction to super conductors, Temperature dependence of resistivity, Meissner effect, Critical current, Types of super conductors, Temperature dependence of critical field, BCS theory (qualitative), Quantum tunneling, High temperature superconductivity, Josephson Junction, DC and AC SQUIDs (qualitative), Applications in quantum computing. Numerical problems.

Pre requisites: Basics of electrical conductivity

Self-learning: Resistivity and Mobility

UNIT - V

QUANTUM COMPUTING **08 Hrs**

Wave Function in Ket Notation : Matrix form of wave function, Identity Operator, Determination of I|0> and I|1>,Pauli Matrices and its operations on 0 and 1 states, Mention of Conjugate and Transpose, Unitary Matrix U, Examples : Row and Column Matrices and their multiplication(Inner Product).

Principles of Quantum Information & Quantum Computing: Introduction to Quantum Computing, Moore's law & its end. Single particle quantum

interference, Quantum entanglement (Qualitative), Classical & quantum information comparison. Differences between classical & quantum computing, quantum superposition and the concept of qubit.

Quantum Gates : Single Qubit Gates: Quantum Not Gate, Pauli - Z Gate, Hadamard Gate, Multiple Qubit Gates: Controlled gate, CNOT Gate, Swap gate.

Pre requisites: Basics of Matrices, Classical computing, Concept of bit, https://www.quantum-inspire.com/kbase/cnot/

Self-learning: Moore's law

List of Experiments

1	Wavelength of LASER using Grating
2	Numerical Aperture and fiber loss
3	Plank's Constant using LEDs.
4	Verification of Stefan's law
5	Resistivity of a metal wire by Four Probe Method
6	Photo-Diode Characteristics
7	I-V characteristics of Zener diode
8	Energy gap of a given semiconductor
9	Transistor characteristics
10	Black box
11	Hall effect
12	Virlab/simulation (https://www.vlab.co.in/broad-area-physical-sciences)
13	GNU Step Interactive Simulations.
14	Application of Statistic using Spread Sheets
15	PHET Interactive Simulations https://phet.colorado.edu/en/simulations /filter?subjects =physics&type=html,prototype)
Note: Any ten experiments to be conducted from the above list by covering under a) Exercise b) Demonstration c) Structure Inquiry d) Open Ended. Select at least one simulation/spread sheet activity.	

TEXT BOOKS :

1	M. N. Avadhanulu, P.G. Kshirsagar & T.V.S. Arun Murthy	A textbook of Engineering Physics, 11th Edition, S Chand and Company Ltd. New Delhi, 2018
2	R.K. Gaur & S.L. Gupta	Engineering Physics, Dhanpath Rai and Sons, New Delhi, 2016
3	Vishal Sahani	Quantum Computing, McGraw Hill Education, 2007Edition.

REFERENCE BOOKS :

1	S O Pillai	Solid State Physics, New Age International Private Limited, 8thEdition,2018.
2	Aurthur Beiser	Concepts of Modern Physics, McGraw-Hill, 6th Edition,2009.
3	S P Basavaraj	Engineering Physics, Subhash Publication, 2005 Edition
4	B B Loud	Lasers and Non Linear Optics, New age international, 2011Edition.
5	Michael A. Nielsen & Isaac L. Chuang	Quantum Computation and Quantum Information, Cambridge Universities Press, 2010 Edition.
6	Maria Luisa Dalla Chiara, Roberto Giuntini, Roberto Leporini, Giuseppe Sergioli	Quantum Computation and Logic: How Quantum Computers Have Inspired Logical Investigations Trends in Logic, Volume 48, Springer.
7	V. Rajendran	Engineering Physics, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2008, Edition
8	M.R. Srinivasan	Physics for Engineers, New Age Publication, 2nd Edition, 2009.

Course Outcomes :

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

CO1 : Describe the principles of LASERs and Optical fibers with their relevant applications.

CO2 : Comprehend the wave particle dualism, significance of Heisenberg's uncertainty principle, mathematical formulation of Schrodinger equation and its applications.

CO3 : Analyze the properties of semiconductor materials and their applications.

CO4 : Analyze the properties of superconductor and apply the principles of Quantum Mechanics in Quantum Computing.

CO5 : Identify and apply the appropriate analytic, numerical and other mathematical tools necessary to solve physics and engineering problems.

CO6 : Practice working in groups to conduct experiments in physics and perform precise and honest measurements.

Physics for Mechanical Engineering Stream

Contact Hours/ Week	: 3(L)+0(T)+2(P)	Credits	: 4.0
Total Lecture Hours	: 39	CIE Marks	: 50
Total Tutorial Hours	: 00	SEE Marks	: 50
Total Practical Hours	: 26	Exam Hours	: 3
Course Type	: Integrated	Course Code	: PHYM

Course Objectives : This course will enable students :

- To study the elastic properties of materials and failures of engineering materials
- To comprehend theoretical background of laser, the working of He-Ne laser and applications of laser. Also, study the nature of propagation of light in optical fiber, reasons for the fiber loss and optical fiber application.
- To understand the types of oscillation, shock waves & its generation, and applications.
- To Study the acoustics buildings and the essentials of radiometry and photometry.
- To understand the various relevant material characterization techniques.

UNIT - I

ELASTICITY **08 Hrs**

Introduction, Elastic materials (qualitative). Hooke's law, Stress-Strain curve, Stress hardening and softening. Elastic Moduli, Poisson's ratio and its limiting values. Relation between Young's modulus (Y), rigidity modulus (n), bulk modulus (K) and Poisson's ratio (σ) (with derivation), Beams, bending moment and expression for bending moment (No derivation), Cantilever, derivation of expression of Young's modulus of a beam, experimental determination of Young's modulus by single cantilever method, I section girder and their engineering applications, Failures of engineering materials - ductile fracture, brittle fracture, stress concentration, fatigue and factors affecting fatigue (only qualitative explanation). Numerical problems.

Prerequisites: Basics of Elasticity.

Self-learning: Stress-Strain Curve, Elastic moduli

UNIT - II

Lasers: Introduction, characteristics of LASER and difference between laser light and ordinary light. Concept of induced absorption, spontaneous emission and stimulated emission. Expression for energy density in terms of Einstein's coefficients and discussion of results. Requisites of lasers. Condition for laser

action. Construction and working of He-Ne laser, Material processing with laser beam: Surface modification, surface hardening, drilling, welding, cutting. Numerical Problems.

Optical fibers: Structure of optical fiber, working principle (TIR), Light propagation mechanism - angle of acceptance, numerical aperture, Expression for numerical aperture, Attenuation, and its mechanisms (qualitative). Applications of Optical Fibers - Fiber Optic Displacement Sensor and Pressure sensor. Numerical Problems

Prerequisite : Properties of light,

Self-learning: Difference between laser and ordinary light, Difference between pulse and continuous laser, Principle of optical fiber

UNIT - III

OSCILLATIONS and SHOCK WAVES **08 Hrs**

Simple Harmonic motion (SHM), differential equation for SHM (No derivation), Sprigs: spring constant and its Physical Significance, series and parallel combination of springs (Derivation), Types of spring and their applications. Theory of damped oscillations (Qualitative), Types of damping (Graphical Approach). Theory of forced oscillations, resonance, sharpness of resonance. Numerical Problems.

Shock waves: Mach number and Mach Angle, Mach Regimes, definition and Characteristics of Shock waves, Construction and working of Reddy shock tube, Applications of Shock Waves, Numerical problems.

Pre-requisites: Basics of oscillations

Self-learning: Differences between harmonic and un-harmonic oscillations, Basics of SHM

UNIT - IV

THERMOELECTRIC MATERIALS AND DEVICES **08 Hrs**

Thermo emf and thermos current, Seeback effect, peltier effect, Seeback and peltier coefficients, figure of merit (Mention Expression), laws of thermoelectricity. Expression for thermos emf in terms of T1 and T2, Thermo couples, thermopile, Construction and Working of Thermoelectric generators (TEG) and Thermoelectric coolers (TEC), low, mid and high temperature thermoelectric materials, Applications: Exhaust of Automobiles, Refrigerator, Space Program (RTG), Numerical Problems

Pre requisites: Basics of thermal conductivity

Self-learning: Seeback effect, Thermo emf.

UNIT - V

INSTRUMENTATION TECHNIQUES FOR MATERIAL CHARACTERISATION **08 Hrs**

Introduction to nanomaterials and nanocomposites, surface area to volume ratio, quantum confinement, characteristics of composites, metal matrix, ceramic matrix, polymer matrix nanocomposites. Bragg's law, principle, construction and working of X-ray Diffractometer, crystallite size determination by Scherrer equation, Principle, construction, working and applications of Atomic Force Microscope (AFM) and Scanning electron microscopy (SEM), Numerical Problems.

Pre requisites: Principle and working of optical Microscope

Self-learning: Bragg's law, condition for diffraction.

List of Experiments

1	Rigidity modulus by Torsional Pendulum
2	Determination of Young's modulus using Single Cantilever
3	Wavelength of laser using grating,
4	Numerical aperture and fiber loss
5	Series & Parallel Resonance using LCR
6	Spring Constant
7	Verification of Stefan's law
8	Thermocouple /Seebeck / Peltier effect
9	Frequency of AC source by Sonometer
10	Laser range finder
11	Reddy shock tube
12	Resistivity of a wire by four probe method
13	Virtual labs/simulations
14	GNU Step Interactive Simulations
15	Study of motion/Crystallite size determination/Application of Statistics using Spread Sheet
16	PHET Interactive Simulations : https://phet.colorado.edu/en/simulations/
Note: Any ten experiments to be conducted from the above list by covering under a) Exercise b) Demonstration c) Structure Inquiry d) Open Ended. Select at least one simulation/spread sheet activity.	

TEXT BOOKS :

1	R.K. Gaur & S.L. Gupta	Engineering Physics, Dhanpath Rai and Sons, New Delhi, 2016
2	M. N. Avadhanulu, P.G. Kshirsagar & T.V.S. Arun Murthy	A textbook of Engineering Physics, 11th Edition, S Chand and Company Ltd. New Delhi, 2018
3	J.P Agarwal and Satya Prakash	Thermodynamics and Statistical Physics, Pragati Prakashan, 30th Edition, 2020

REFERENCE BOOKS :

1	Hitendra K. Singh and A. K. Singh,	Engineering Physics, Tata McGraw Hill, New Delhi, 2010
2	A. Marikani	Engineering Physics, 2nd Edition, PHI Learning Pvt. Ltd., New Delhi., 2014
3	Arthur Beiser	Concepts of Modern Physics, 6th Edition, Tata McGraw Hill, New Delhi, 2009
4	Chintoo S Kumar, K. Takayama and K P J Reddy	Shock Waves Made Simple, Wiley India Pvt. Ltd. New Delhi, 2014.
5	K. Ghatak and Thyagarajan,	Optical Electronics, Cambridge University Press (UK), 2012
6	James F. Shackelford and Madanapalli K Muralidhara,	Materials Science for Engineers, 6th Edition, Pearson Education Asia Pvt. Ltd., New Delhi, 2006
7	Mitra P. K	Characterization of Materials, Prentice Hall India Learning Private Limited, Delhi
8	M.S. Ramachandra Rao & Shubra Singh	Nanoscience & Nanotechnology : Fundamentals to Frontiers, Wiley India Pvt Ltd, 2013
9	J. Parameswaran Pillai, N. Hameed, T. Kurian, Yingfeng Yu	Nano Composite Materials - Synthesis, Properties and Applications, CRC Press. 2016

Course Outcomes :

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

CO1 : Apply the knowledge of theory of elasticity to find Young's modulus of the materials experimentally and summarize the reasons for failures of engineering materials.

CO2 : Elucidate the working of He-Ne laser, types of optical fibers, reasons for the fiber loss and their applications in engineering

CO3 : Elucidate the concepts of oscillations, generation of shock waves in the laboratory and their applications.

CO4 : Summarize concepts of the thermoelectric materials and various modern tools for material characterizations.

CO5 : Identify and apply the appropriate analytic, numerical and other mathematical tools necessary to solve physics and engineering problems.

CO6 : Practice working in individual / groups to conduct experiments in Physics and perform precise and host measurements

Physics for Electrical & Electronics Engg. Stream

Contact Hours/ Week	: 3(L)+0(T)+2(P)	Credits	: 4.0
Total Lecture Hours	: 39	CIE Marks	: 50
Total Tutorial Hours	: 00	SEE Marks	: 50
Total Practical Hours	: 26	Exam Hours	: 3
Course Type	: Integrated	Course Code	: PHYE

Course Objectives : This course will enable students :

- To understand the properties of dielectrics and superconductors.
- To study the essentials of LASER and optical fibre for engineering applications.
- To study the principles of quantum mechanics.
- To understand Maxwells equations and the propogation of EM waves in vacuum.
- To study the concept of band formation in solids and Hall effect.

UNIT - I

DIELECTRICS AND SUPERCONDUCTORS 08 Hrs

Dielectric Properties: Dielectrics material, Examples for solid, liquid and gaseous dielectrics. Electric dipole and dipole moment, polarization and polarisability, Dielectric constant, dielectric susceptibility, Polar and non-polar dielectrics, Types of Polarization (electronic, ionic, orientational and space charge - qualitative), Internal fields in solid (derivation), Clausius-Mossotti equation (derivation), Application of dielectrics in transformers and capacitors (qualitative). Numerical Problems.

Superconductivity: Introduction to superconductors, Temperature dependence of resistivity, Meissner effect, Types of super conductors, Temperature dependence of critical field, BCS theory (Qualitative), High temperature superconductivity, Superconducting magnet and MAGLEV, Numerical problems.

Pre-requisites: Basics of dielectrics, Basics of electrical conductivity

Self-learning: Electric dipolemoment

UNIT - II

LASERS AND OPTICAL FIBERS 08 Hrs

Lasers: Introduction, Characteristics of LASER and difference between laser light and ordinary light. Concept of induced absorption, spontaneous emission and stimulated emission. Expression for energy density in terms of Einstein's coefficients and discussion of results. Requisites of lasers. Condition for laser

action. Construction and working of He-Ne laser, Application of lasers - defense (laser range finder) and laser printer (qualitative).

Optical fibers: Structure of optical fiber, working principle (TIR), Light propagation mechanism - angle of acceptance, numerical aperture, Expression for numerical aperture, Attenuation and its mechanisms (qualitative). Block diagram and discussion of point-to-point optical communication, advantages and disadvantages, Numerical problems

Pre requisite: Properties of light

Self-learning: Propagation Mechanism &TIR in optical fiber

UNIT - III

QUANTUM MECHANICS **08 Hrs**

de Broglie Hypothesis of Matter Waves, de Broglie wavelength and derivation of expression for free particle and charged particle, Phase Velocity and Group Velocity (only concept), Heisenberg's Uncertainty Principle and its application (Nonexistence of electron inside the nucleus-Non Relativistic), Wave Function, Time independent Schrodinger wave equation, Physical Significance of a wave function and Born Interpretation, Eigen functions and Eigen Values, Motion of a particle in a one dimensional potential well of infinite depth, Waveforms and Probabilities. Numerical Problems

Pre requisite: Wave–Particle dualism

Self-learning: de Broglie Hypothesis

UNIT - IV

MAXWELL'S EQUATIONS AND EM WAVES **08 Hrs**

Maxwell's equations: Fundamentals of vector calculus. Divergence and curl of electric field and magnetic field (static), Gauss' divergence theorem and Stokes' theorem. Description of laws of electrostatics, magnetism and Faraday's laws of EMI. Current density & equation of Continuity; displacement current (with derivation) Maxwell's equations in vacuum

EM waves: The wave equation in differential form in free space (Derivation of the equation using Maxwell's equations), Plane electromagnetic waves in vacuum, their transverse nature, Numerical problems.

Pre requisite: Electricity& Magnetism

Self-learning: Fundamentals of vector calculus

UNIT - V

SEMICONDUCTOR PHYSICS **08 Hrs**

Classification of solids based on the formation of bands due to splitting of energy levels at equilibrium inter-nuclear distance: metal (Na & Mg), insulator

(diamond) and semiconductor (Si). Types of semiconductor (qualitative). Fermi energy, Fermi level in semiconductors (qualitative). Expression for electrical conductivity for intrinsic and extrinsic semiconductor (no derivation). Photodiode and Power responsivity, Construction and working of Semiconducting Laser. Hall effect in semiconductor, Expression for Hall coefficient and Hall voltage, Applications of Hall effect, Numerical problems.

Pre requisite: Basics of Semiconductors

Self-learning: p-n junction and its V-I characteristics

List of Experiments

1	Dielectric constant by charging and discharging of a capacitor
2	Wavelength of laser using grating
3	Numerical aperture and fiber loss
4	Determination of Planck's constant using LEDs
5	Verification of Stefan's law
6	Fermi energy by four-point probe method
7	Photodiode characteristics
8	Energy gap of the given semiconductor
9	I-V characteristics of Zener diode
10	Black Box
11	Hall Effect
12	Online circuit simulator
13	Virlab/simulation (https://www.vlab.co.in/broad-area-physical-sciences)
14	EM wave generation by simulation
15	Application of Statistic using Spread Sheets
Note: Any ten experiments to be conducted from the above list by covering under a) Exercise b) Demonstration c) Structure Inquiry d) Open Ended. Select at least one simulation/spreadsheet activity.	

TEXT BOOKS :

1	M. N. Avadhanulu & P.G. Kshirsagar	A Text book of Engineering Physics, 10th revised Ed, S. Chand & Company Ltd, New Delhi, 2018
2	R. Murugeshan & Kiruthiga Sivaprasath	Modern Physics, 14th Revised Multicolour Ed., S. Chand & Company Ltd., Ram Nagar, New Delhi, 2007
3	S. O. Pillai	Solid State Physics, 8th Ed- New Age International Publishers-2018

REFERENCE BOOKS :

1	Matthew N. O. Sadiku	Principles of Electromagnetics, Oxford University Press, 4th edition, 2007
2	W. H. Hayt and J. A. Buck	Engineering Electromagnetics, Tata McGraw-Hill, 7th ed, 2006
3	David Griffith	Introduction to Electrodynamics, 4th Edition, Cambridge University press, 2017
4	Arthur Beiser	Concepts of Modern Physics, 6th ED. Tata McGraw Hill Publishing Company Ltd, New Delhi, 2006
5	Gaur and Gupta	Engineering Physics, Dhanpat Rai Publications, 2017
6	B.B. Laud	Lasers and Non Linear Optics, B.B. Laud 3rd Ed, New Age International Publishers, 2011
7	Marikani	Engineering Physics, 2nd Edition, PHI Learning Pvt. Ltd., New Delhi, 2014
8	K. Rajagopal	Engineering Physics, PHI Learning Private Limited, New Delhi, 2011
9	V. Rajendran	Engineering Physics, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2008

Course Outcomes :

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

CO1 : Elucidate the concepts of dielectrics and superconductors.

CO2 : Describe the fundamental principles of the quantum mechanics and the essentials of Photonics.

CO3 : Discuss the fundamentals of vector calculus and their applications in Maxwell's Equations and EM Waves.

CO4 : Summarize the formation of energy bands in semiconductors and determine the type semiconductor by Hall effect.

CO5 : Identify and apply the appropriate analytic, numerical and other mathematical tools necessary to solve physics and engineering problems.

CO6 : Practice working in groups to conduct experiments in physics and perform precise and honest measurements.

Chemistry for Civil Engineering Stream

Contact Hours/ Week	: 3(L)+0(T)+2(P)	Credits	: 4.0
Total Lecture Hours	: 39	CIE Marks	: 50
Total Tutorial Hours	: 00	SEE Marks	: 50
Total Practical Hours	: 26	Exam Hours	: 3
Course Type	: Integrated	Course Code	: CHEC

Course Objectives : This course will enable students to:

- Learn the basic concepts of electrochemistry, electrode potentials that are essential to determine the battery voltage, rate of corrosion and working of analytical instruments.
- Use the analytical instruments for chemical analysis.
  Know the working principle and construction of various batteries and their applications.
- Apply the knowledge of using different types of nanomaterials, synthesis and their applications.
  Understand the green chemistry concepts and extend these ideas to environmental care and sustainability.
- Gain awareness on the polymers required for daily usage and their applications in advanced engineering materials such as polymer composites and polymer nanocomposites.
  Know the mechanism of corrosion, factors affecting the rate of corrosion and corrosion control methods.
- Acquire the meaning of basic terminologies like metals, alloys, cement, their properties and applications.
  Carryout the determination of water quality using various tests.

UNIT - I

ELECTRODE SYSTEMS AND APPLICATIONS **08 Hrs**

Introduction to electrode potential. Electrochemical cells: Classification - galvanic cells and electrolytic cells with examples. Single electrode potential - definition and origin. Derivation of Nernst equation for single electrode potential and effect of temperature and concentration. Standard electrode potential - definition, construction and working of a galvanic cell (e.g, Daniel cell). E.M.F of a cell - definition, notations and sign conventions. Concentration cells – definition, construction, working and derivation of EMF. Electrodes: Types of electrodes: Reference electrodes - construction and working of calomel electrode and Ag-AgCl electrode. Numerical problems on E, E^o and EMF of cells and concentration cells. Glass electrode (Ion-selective electrode) - definition, construction and working of glass electrode. Determination of pH using glass electrode.

Self-learning topics: Determination of single electrode potential, EMF using Poggendroff's compensation principle and concentration of heavy metal ions in industrial effluent. Construction and working of fruit and vegetable electrochemical cell using zinc and copper sheets.

UNIT – II

ANALYTICAL TECHNIQUES AND APPLICATIONS **05+03 Hrs**

Introduction. Types of analysis: Qualitative and quantitative - classical and instrumental methods of analysis. Advantages of instrumental methods of analysis over physical and chemical methods. Electro optical methods: Colorimetry - principle, statement and derivation of Lambert's law, Beer's law, Beer-Lambert's law, instrumentation, advantages and applications. Numerical problems. Electrochemical methods: Potentiometry - principle, instrumentation, advantages and applications in redox titration. Conductometry - principle, instrumentation and advantages. Applications of conductometric titrations - strong acid against a strong base, strong acid against a weak base and mixture of acids (strong acid + weak acid) against a strong base.

ENERGY CONVERSION AND STORAGE

Batteries – basic concepts, components and operation of a battery – discharging and charging. Classification of batteries – primary, secondary and reserve batteries. Classical batteries - construction, working and applications of Lead-acid and Ni-Cd batteries. Modern batteries - construction, working and applications of Zn-air, Li-MnO_2, Lithium-ion and Sodium - ion batteries.

Self-learning topics: Applications of colorimetry in the estimation of iron present in printed circuit board. Study of characteristics of a battery.

UNIT - III

NANO MATERIALS **04+04 Hrs**

Definition and types of nano materials – based on materials (carbon, metal, composite & dendrimers) and based on dimensions (0D, 1D, 2D and 3D). Production of nanomaterials – definition of top down and bottom up process with examples. Synthesis of nanometal oxides – semiconducting nano ZnO by combustion method and nano TiO_2 by hydrothermal method. Carbon nanotubes - definition, types - SWCNT and MWCNT and synthesis of carbon nanotubes by arc discharge method. Techniques used in characterization of nanomaterials – XRD, FTIR, SEM and TEM (No description of techniques).

GREEN CHEMISTRY

Introduction, principles of green chemistry, atom economy - definition and numerical problems. Biomass as a renewable energy source - synthesis and advantages of bio-ethanol, bio-diesel and power alcohol as a fuel. Fuel Cells: Introduction, definition, advantages, construction and working of MeOH-O_2 fuel cell.

Self-learning topics: Synthesis of nanoparticles by sol-gel/co-precipitation method. Construction and working of H_2-O_2 fuel cell.

UNIT - IV

ADVANCED POLYMERIC MATERIALS FOR ENGINEERING APPLICATIONS **04+04 Hrs**

Definition, classification – based on occurrence, structure and effect of heat on polymer (thermoplastic and thermosetting polymers). Polymerization - definition, types – addition and condensation with examples. Mechanism of polymerization - free radical mechanism (vinyl chloride as an example). Number average and weight average molecular weight – definition and numerical problems. Synthesis, properties and applications of Teflon (PTFE) and PMMA. Polymer composites – definition and advantages. Synthesis and applications of polyaramides (Kevlar). Polymer nanocomposites - definition, properties and applications.

CORROSION SCIENCE AND ENGINEERING

Metallic corrosion – definition, corrosion interrelated problems and electrochemical theory of corrosion. Types of corrosion - differential metal corrosion, differential aeration corrosion (waterline corrosion and pitting corrosion), and stress corrosion. Factors affecting the rate of corrosion – primary (electrode potential, nature of corrosion product and area effect) and secondary factors (pH and temperature). Introduction to corrosion penetration rate (CPR), numerical problems. Corrosion control methods - anodizing, phosphating, galvanizing, and tinning. Corrosion control by cathodic protection – impressed voltage method and sacrificial anode method.

Self-learning topics : Biodegradable polymers – definition, types and applications of poly latctic acid (PLA). Corrosion control using anodic and cathodic inhibitors.

UNIT - V

STRUCTURAL MATERIALS **03+05 Hours**

Metals and alloys: Introduction, properties and application of iron and its alloys, aluminium and its alloys. Cement: Introduction, composition, properties, classification, manufacturing process of cement, process of setting and hardening of cement, additives for cement and testing of cement.

WATER TECHNOLOGY

Introduction – impurities present in water. Chemical analysis of water: Determination of total hardness of water using EDTA, chloride by Mohr's

method, dissolved oxygen by Winkler's method, and Chemical Oxygen Demand (COD). Numerical problems on COD. Biological Oxygen Demand (BOD). Water softening by Reverse osmosis (RO) - principle and process.

Self-learning topics: Determination of alkalinity and nitrate in a water sample.

TEXT BOOKS :

1	Suba Ramesh and others	Engineering Chemistry - A text book of Chemistry for Engineers, Wiley India, First Edition, 2011.

REFERENCE BOOKS :

Electrode Systems and Applications		
1	Samuel Glasstone and David Lewis	Elements of Physical Chemistry, The Macmillan Press Limited, Reprint: 1976.
2	Walter J Moore	Physical Chemistry, Longmans Green and Co. Ltd., 1966.
Analytical Techniques and Applications		
3	Douglas A Skoog, F. James Holler and Stanley R. Crouch	Instrumental analysis, Cengage Learning India Pvt. Ltd., 2010.
4	H. H. Willard, L.L. Merritt and J.A. Dean and F. A. Settle	Instrumental Methods of Analysis, CBS Publishers, 7th Edition, 1988.
Energy conversion and storage		
5	Derek Pletcher and Frank C. Walsh	Industrial electrochemistry, Blackie academic and professional, 1993.
6	R. Narayan, B. Viswanathan	Chemical and electrochemical energy systems, University Press (India) Ltd., 1998.
Nano Materials		
7	Bharath Bhushan	Hand book of nanotechnology, Spinger-Verlag Berlin Heidelberg, New York, 2004.
8	B. Viswanathan	Structure and properties of solid state materials, Narosa Publications, 2009.
Green Chemistry		
9	S.S. Dara and D.D. Mishra	A textbook of Environmental Chemistry and Pollution control, S. Chand Publications, 2012.
Advanced polymeric materials for engineering applications		
10	F.W. Billmeyer	Text Book of Polymer Science, Wiley Inter science publications, 1994.

11	V.R. Gowriker, N.V. Viswanathan, Jayadev Sreeshar	Polymer science, New age International (P) Ltd., 1996.
12	P.M. Ajayan, L.S. Schadler, P.V. Braun	Nanocomposite science and technology – Wiley, New York.
Corrosion science and engineering		
13	M.G. Fontana	Corrosion Engineering, McGraw Hill Publications, New York, 1987.
14	Derek Pletcher and Frank C. Walsh	Industrial electro chemistry, Blackie academic and professional, 1993.
Structural materials		
15	S.K. Singh	Basic Engineering Chemistry – New Age International Publishers.
Water technology		
16	S.S. Dara and D.D. Mishra	A textbook of Environmental Chemistry and Pollution control, S. Chand Publications, 2012.
17	B. S. Jai Prakash, R. Venugopal, Shivakumaraiah, Pushpa Iyengar.	Chemistry for Engineering Students.

Course Outcomes :

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

CO1 : Determine the electrode potential of newly constructed electrodes; calculate the voltage of galvanic cells.

CO2 : Apply the knowledge of colorimetry, potentiometry and conductometry in chemical analysis. Develop new materials for the construction of batteries to improve their performance.

CO3 : Gain knowledge about different types of nanomaterials, preparation and its applications. Acquire the green chemistry concepts for environmental care and sustainability.

CO4 : Develop different types of polymers and polymer composites which find applications in the field of engineering. To understand the causes for the corrosion of metals/alloys and corrosion control methods.

CO5 : Recognizing the usage of various types of metals and alloys, identifying the process of manufacturing and testing of cement towards the construction of building. Gain awareness of water quality parameters.

Chemistry for Computer Sc. & Engineering Stream

Contact Hours/ Week	: 3(L)+0(T)+2(P)	Credits	: 4.0
Total Lecture Hours	: 39	CIE Marks	: 50
Total Tutorial Hours	: 00	SEE Marks	: 50
Total Practical Hours	: 26	Exam Hours	: 3
Course Type	: Integrated	Course Code	: CHES

Course Objectives : This course will enable students to:

- Learn the basic concepts of electrochemistry, electrode potentials that are essential to determine the battery voltage, rate of corrosion and working of analytical instruments.
- Use the analytical techniques for chemical analysis.
  Know the working principle and construction of various batteries and their applications.
- Apply the knowledge of using different types of nanomaterials, synthesis and their applications.
  Understand the green chemistry concepts and extend these ideas to environmental care and sustainability.
- Gain awareness on the polymers required for daily usage and their applications in advanced engineering materials such as polymer composites, polymer nanocomposites and conducting polymers.
  Acquire knowledge on the concepts of electronic memory devices, display systems, their types and applications.
- Know the mechanism of corrosion, factors affecting the rate of corrosion and corrosion control methods.
  Learn the sources of E - waste, its management and recycling.

UNIT - I

ELECTRODE SYSTEMS AND APPLICATIONS 8 Hrs

Introduction to electrode potential. Electrochemical cells: Classification - galvanic cells and electrolytic cells with examples. Single electrode potential - definition and origin. Derivation of Nernst equation for single electrode potential and effect of temperature and concentration. Standard electrode potential - definition, construction and working of a galvanic cell (e.g, Daniel cell). E.M.F of a cell - definition, notations and sign conventions. Concentration cells – definition, construction, working and derivation of EMF. Electrodes: Types of electrodes: Reference electrodes - construction and working of calomel electrode and Ag-AgCl electrode. Numerical problems on E, E^o and EMF of cells and concentration cells. Glass electrode (Ion-selective electrode) - definition, construction and working of glass electrode. Determination of pH using glass electrode.

Self-learning topics: Determination of single electrode potential, EMF using Poggendroff's compensation principle and concentration of heavy metal ions in industrial effluent. Construction and working of fruit and vegetable electrochemical cell using zinc and copper sheets.

UNIT - II

ANALYTICAL TECHNIQUES AND APPLICATIONS **05+03 Hrs**

Introduction. Types of analysis: Qualitative and quantitative - classical and instrumental methods of analysis. Advantages of instrumental methods of analysis over physical and chemical methods. Electro optical methods: Colorimetry - principle, statement and derivation of Lambert's law, Beer's law, Beer-Lambert's law, instrumentation, advantages and applications. Numerical problems. Electrochemical methods: Potentiometry - principle, instrumentation, advantages and applications in redox titration. Conductometry - principle, instrumentation and advantages. Applications of conductometric titrations - strong acid against a strong base, strong acid against a weak base and mixture of acids (strong acid + weak acid) against a strong base.

ENERGY CONVERSION AND STORAGE

Batteries – basic concepts, components and operation of a battery – discharging and charging. Classification of batteries – primary, secondary and reserve batteries. Classical batteries - construction, working and applications of Lead-acid and Ni-Cd batteries. Modern batteries - construction, working and applications of Zn-air, Li-MnO_2, Lithium-ion and Sodium - ion batteries.

Self-learning topics: Applications of colorimetry in the estimation of iron present in printed circuit board. Study of characteristics of a battery.

UNIT - III

NANOMATERIALS **04+04 Hrs**

Definition and types of nano materials – based on materials (carbon, metal, composite & dendrimers) and based on dimensions (0D, 1D, 2D and 3D). Production of nanomaterials – definition of top down and bottom up process with examples. Synthesis of nanometal oxides – semiconducting nano ZnO by combustion method and nano TiO_2 by hydrothermal method. Carbon nanotubes - definition, types - SWCNT and MWCNT and synthesis of carbon nanotubes by arc discharge method. Techniques used in characterization of nanomaterials – XRD, FTIR, SEM and TEM (No description of techniques).

GREEN CHEMISTRY

Introduction, principles of green chemistry, atom economy - definition and numerical problems. Biomass as a renewable energy source - synthesis and advantages of bio-ethanol, bio-diesel and power alcohol as a fuel. Fuel Cells:

Introduction, definition, advantages, construction and working of MeOH-O_2 fuel cell.

Self-learning topics: Synthesis of nanoparticles by sol-gel/co-precipitation method. Construction and working of H_2-O_2 fuel cell.

UNIT – IV

ADVANCED POLYMERIC MATERIALS **04+04 Hrs**

Definition, classification - based on occurrence, structure and effect of heat on polymer (thermoplastic and thermosetting polymers). Polymerization - definition, types – addition and condensation with examples. Number average and weight average molecular weight - definition and numerical problems. Synthesis, properties and applications of Teflon and Bakelite. Polymer composites - definition and advantages. Synthesis and applications of polyaramides (Kevlar). Polymer nanocomposites - definition, properties and applications. Conducting polymers - definition, synthesis of polyacetylene and mechanism of conduction in polyacetylene - oxidative and reductive doping.

MATERIALS FOR MEMORY AND DISPLAY SYSTEMS

Introduction, basic concepts of electronic memory, history and classification of electronic memory devices, types of memory devices (organic molecules, polymeric materials, organic-inorganic hybrid materials). Display systems - introduction, types of display systems, working and applications of Liquid Crystal Displays (LCD's), Organic light emitting diodes (OLED's), Quantum Light emitting diodes (QLED's), Light emitting electrochemical cells (LEEC's).

Self-learning topics: Biodegradable polymers - definition, types and applications of poly lactic acid (PLA). Properties and functions of Silicon (Si), Germanium (Ge), Copper (Cu), Aluminum (Al) and brominated flame retardants in computers.

UNIT - V

CORROSION SCIENCE **04+04 Hrs**

Metallic corrosion - definition, corrosion interrelated problems and electrochemical theory of corrosion. Types of corrosion - differential metal corrosion, differential aeration corrosion (waterline and pitting corrosion) and stress corrosion. Factors affecting the rate of corrosion - primary (electrode potential, nature of corrosion product and area effect) and secondary factors (pH and temperature). Introduction to corrosion penetration rate (CPR), numerical problems. Corrosion control methods - anodizing, phosphating, galvanizing and tinning. Corrosion control by cathodic protection - impressed voltage method and sacrificial anode method.

E - waste management: Introduction, sources (E - waste items), toxic materials used in the manufacturing electronic and electrical products, problem of E - waste on environment and human health, solution for E - waste, methods of disposal, advantages of recycling. Extraction of gold from E - waste.

Self-learning topics: Corrosion control using anodic and cathodic inhibitors. Impact of heavy metals on environment and human health, recycling of PCB and battery components.

TEXT BOOKS :

1	Suba Ramesh and others	Engineering Chemistry - A text book of Chemistry for Engineers, Wiley India, First Edition, 2011.

REFERENCE BOOKS :

Electrode Systems and Applications		
1	Samuel Glasstone and David Lewis	Elements of Physical Chemistry, The Macmillan Press Limited, Reprint: 1976.
2	Walter J Moore	Physical Chemistry, Longmans Green and Co. Ltd., 1966.
Analytical Techniques and Applications		
3	Douglas A Skoog, F. James Holler and Stanley R. Crouch	Instrumental analysis, Cengage Learning India Pvt. Ltd., 2010.
4	H. H. Willard, L.L. Merritt and J.A. Dean and F. A. Settle	Instrumental Methods of Analysis, CBS Publishers, 7th Edition, 1988.
Energy conversion and storage		
5	Derek Pletcher and Frank C. Walsh	Industrial electrochemistry, Blackie academic and professional, 1993.
6	R. Narayan, B. Viswanathan	Chemical and electrochemical energy systems, University Press (India) Ltd., 1998.
Nanomaterials		
7	Bharath Bhushan	Hand book of nanotechnology, Spinger-Verlag Berlin Heidelberg, New York, 2004.
8	B. Viswanathan	Structure and properties of solid state materials, Narosa Publications, 2009.
Green chemistry		
9	S.S. Dara and D.D. Mishra	A textbook of Environmental Chemistry and Pollution control, S. Chand Publications, 2012.

10	Sankar P. Dey, Nayim Sepay	A Textbook of Green Chemistry, First Edition, Techno World Publisher, 2021.
Advanced polymeric materials		
11	F.W. Billmeyer	Text Book of Polymer Science, Wiley Inter Science Publications, 1994.
12	V.R. Gowriker, N. V. Viswanathan, Jayadev Sreeshar	Polymer science, New age International (P) Ltd., 1996.
13	P.M. Ajayan, L.S. Schadler, P.V. Braun	Nanocomposite science and technology, Wiley Publishers, New York.
Materials for memory and Display Systems		
14	Sabar D. Hutagalung	Materials science and technology, InTech Publishers, 2012.
15	Anthony C. Lowe, Lindsay MacDonald	Display Systems: Design and Applications (Wiley Series in Display Technology), Wiley Publishers 1997.
Corrosion science		
16	M.G. Fontana	Corrosion Engineering, McGraw Hill Publications, New York, 1987.
17	Derek Pletcher and Frank C. Walsh	Industrial electrochemistry, Blackie academic and professional, 1993.
E-waste management		
18	M.N.V. Prasad, Meththika Vithanage, Anwesha Borthakur	Handbook of Electronic Waste Management, First Edition, Butterworth-Heinemann, 2019.

Course Outcomes :

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

CO1 : Determine the electrode potential of newly constructed electrodes, calculate the voltage of galvanic cells.

CO2 : Apply the knowledge of colorimetry, potentiometry and conductometry in chemical analysis. Develop new materials for construction of batteries to improve their performance.

CO3 : Gain knowledge about different types of nanomaterials, preparation and its applications. Acquire the green chemistry concepts and extend these ideas to environmental care and sustainability.

CO4 : Develop different types of polymers and polymer composites which find applications in the field of engineering. Acquire knowledge on the types of electronic memory devices, display systems and their applications.

CO5 : Understand the causes for the corrosion of metals/alloys and corrosion control methods. Learn the sources of E - waste and its management.

Chemistry for Mechanical Engineering Stream

Contact Hours/ Week	: 3(L)+0(T)+2(P)	Credits	: 4.0
Total Lecture Hours	: 39	CIE Marks	: 50
Total Tutorial Hours	: 00	SEE Marks	: 50
Total Practical Hours	: 26	Exam Hours	: 3
Course Type	: Integrated	Course Code	: CHEM

Course Objectives : This course will enable students to:

- Learn the basic concepts of electrochemistry, electrode potentials that are essential to determine the battery voltage, rate of corrosion and working of analytical instruments.
- Use the analytical instruments for chemical analysis.
  Know the working principle and construction of various batteries and their applications.
- Apply the knowledge of using different types of nanomaterials, synthesis and their applications.
  Understand the green chemistry concepts and extend these ideas to environmental care and sustainability.
- Gain awareness on the polymers required for daily usage and their applications in advanced engineering materials such as polymer composites and polymer nanocomposites.
  Know the mechanism of corrosion, factors affecting the rate of corrosion and corrosion control methods.
- Learn the effect of variables in phase transformations of materials and their correlation to the properties of materials.
  Carryout the determination of water quality using various tests.

UNIT - I

ELECTRODE SYSTEMS AND APPLICATIONS **08 Hrs**

Introduction to electrode potential. Electrochemical cells: Classification - galvanic cells and electrolytic cells with examples. Single electrode potential - definition and origin. Derivation of Nernst equation for single electrode potential and effect of temperature and concentration. Standard electrode potential - definition, construction and working of a galvanic cell (e.g, Daniel cell). E.M.F of a cell - definition, notations and sign conventions. Concentration cells – definition, construction, working and derivation of EMF. Electrodes: Types of electrodes: Reference electrodes - construction and working of calomel electrode and Ag-AgCl electrode. Numerical problems on E, E^o and EMF of cells and concentration cells. Glass electrode (Ion-selective electrode) - definition, construction and working of glass electrode. Determination of pH using glass electrode.

Self-learning topics: Determination of single electrode potential, EMF using Poggendroff's compensation principle and concentration of heavy metal ions in industrial effluent. Construction and working of fruit and vegetable electrochemical cell using zinc and copper sheets.

UNIT – II

ANALYTICAL TECHNIQUES AND APPLICATIONS **05+03 Hrs**

Introduction. Types of analysis: Qualitative and quantitative - classical and instrumental methods of analysis. Advantages of instrumental methods of analysis over physical and chemical methods. Electro optical methods: Colorimetry - principle, statement and derivation of Lambert's law, Beer's law, Beer-Lambert's law, instrumentation, advantages and applications. Numerical problems. Electrochemical methods: Potentiometry - principle, instrumentation, advantages and applications in redox titration. Conductometry - principle, instrumentation and advantages. Applications of conductometric titrations - strong acid against a strong base, strong acid against a weak base and mixture of acids (strong acid + weak acid) against a strong base.

ENERGY CONVERSION AND STORAGE

Batteries – basic concepts, components and operation of a battery – discharging and charging. Classification of batteries – primary, secondary and reserve batteries. Classical batteries - construction, working and applications of Lead-acid and Ni-Cd batteries. Modern batteries - construction, working and applications of Zn-air, Li-MnO_2, Lithium-ion and Sodium - ion batteries.

Self-learning topics: Applications of colorimetry in the estimation of iron present in printed circuit board. Study of characteristics of a battery.

UNIT - III

NANO MATERIALS **04+04 Hrs**

Definition and types of nano materials – based on materials (carbon, metal, composite & dendrimers) and based on dimensions (0D, 1D, 2D and 3D). Production of nanomaterials – definition of top down and bottom up process with examples. Synthesis of nanometal oxides – semiconducting nano ZnO by combustion method and nano TiO_2 by hydrothermal method. Carbon nanotubes - definition, types - SWCNT and MWCNT and synthesis of carbon nanotubes by arc discharge method. Techniques used in characterization of nanomaterials – XRD, FTIR, SEM and TEM (No description of techniques).

GREEN CHEMISTRY

Introduction, principles of green chemistry, atom economy - definition and numerical problems. Biomass as a renewable energy source - synthesis and advantages of bio-ethanol, bio-diesel and power alcohol as a fuel. Fuel Cells: Introduction, definition, advantages, construction and working of MeOH-O_2 fuel cell.

Self-learning topics: Synthesis of nanoparticles by sol-gel/co-precipitation method. Construction and working of H_2-O_2 fuel cell.

UNIT - IV

ADVANCED POLYMERIC MATERIALS FOR ENGINEERING APPLICATIONS **04+04 Hrs**

Definition, classification – based on occurrence, structure and effect of heat on polymer (thermoplastic and thermosetting polymers). Polymerization - definition, types – addition and condensation with examples. Mechanism of polymerization - free radical mechanism (vinyl chloride as an example). Number average and weight average molecular weight – definition and numerical problems. Synthesis, properties and applications of Teflon (PTFE) and PMMA. Polymer composites – definition and advantages. Synthesis and applications of polyaramides (Kevlar). Polymer nanocomposites - definition, properties and applications.

CORROSION SCIENCE AND ENGINEERING

Metallic corrosion – definition, corrosion interrelated problems and electrochemical theory of corrosion. Types of corrosion - differential metal corrosion, differential aeration corrosion (waterline corrosion and pitting corrosion), and stress corrosion. Factors affecting the rate of corrosion – primary (electrode potential, nature of corrosion product and area effect) and secondary factors (pH and temperature). Introduction to corrosion penetration rate (CPR), numerical problems. Corrosion control methods - anodizing, phosphating, galvanizing, and tinning. Corrosion control by cathodic protection – impressed voltage method and sacrificial anode method.

Self-learning topics : Biodegradable polymers – definition, types and applications of poly latctic acid (PLA). Corrosion control using anodic and cathodic inhibitors.

UNIT - V

PHASE EQUILIBRIA **03+05 Hours**

The phase rule – statement and explanation of the terms (phase, component and degress of freedom) involved in the phase rule with examples. Application of phase rule to one component system – water system and two component system - Pb-Ag system. Concept of desilverization of lead – Pattinson's process.

WATER TECHNOLOGY

Introduction – impurities present in water. Chemical analysis of water: Determination of total hardness of water using EDTA, chloride by Mohr's method, dissolved oxygen by Winkler's method, and Chemical Oxygen Demand (COD). Numerical problems on COD. Biological Oxygen Demand (BOD). Water softening by Reverse osmosis (RO) - principle and process.

Self-learning topics: Determination of alkalinity and nitrate in a water sample.

TEXT BOOKS :

1	Suba Ramesh and others	Engineering Chemistry - A text book of Chemistry for Engineers, Wiley India, First Edition, 2011.

REFERENCE BOOKS :

Electrode Systems and Applications		
1	Samuel Glasstone and David Lewis	Elements of Physical Chemistry, The Macmillan Press Limited, Reprint: 1976.
2	Walter J Moore	Physical Chemistry, Longmans Green and Co. Ltd., 1966.
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4	H. H. Willard, L.L. Merritt and J.A. Dean and F. A. Settle	Instrumental Methods of Analysis, CBS Publishers, 7th Edition, 1988.
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6	R. Narayan, B. Viswanathan	Chemical and electrochemical energy systems, University Press (India) Ltd., 1998.
Nano Materials		
7	Bharath Bhushan	Hand book of nanotechnology, Spinger-Verlag Berlin Heidelberg, New York, 2004.
8	B. Viswanathan	Structure and properties of solid state materials, Narosa Publications, 2009.
Green Chemistry		
9	S.S. Dara and D.D. Mishra	A textbook of Environmental Chemistry and Pollution control, S. Chand Publications, 2012.

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10	F.W. Billmeyer	Text Book of Polymer Science, Wiley Inter science publications, 1994.
11	V.R. Gowriker, N.V. Viswanathan, Jayadev Sreeshar	Polymer science, New age International (P) Ltd., 1996.
12	P.M. Ajayan, L.S. Schadler, P.V. Braun	Nanocomposite science and technology – Wiley, New York.
Corrosion science and engineering		
13	M.G. Fontana	Corrosion Engineering, McGraw Hill Publications, New York, 1987.
14	Derek Pletcher and Frank C. Walsh	Industrial electro chemistry, Blackie academic and professional, 1993.
Phase Equilibria		
15	Wiley India Editorial Team	A Text book for engineers, Wiley India Pvt. Ltd., First edition 2011.
Water technology		
16	S.S. Dara and D.D. Mishra	A textbook of Environmental Chemistry and Pollution control, S. Chand Publications, 2012.
17	B. S. Jai Prakash, R. Venugopal, Shivakumaraiah, Pushpa Iyengar.	Chemistry for Engineering Students.

Course Outcomes :

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

CO1 : Determine the electrode potential of newly constructed electrodes; calculate the voltage of galvanic cells.

CO2 : Apply the knowledge of colorimetry, potentiometry and conductometry in chemical analysis. Develop new materials for construction of batteries to improve their performance.

CO3 : Gain knowledge about different types of nanomaterials, preparation and its applications. Acquire the green chemistry concepts and extend these ideas to environmental care and sustainability.

CO4 : Develop different types of polymers and polymer composites which find applications in the field of engineering. To understand the causes for the corrosion of metals/alloys and corrosion control methods.

CO5 : Identify the change of phases on variation of pressure, temperature and composition and correlate the changes in micro structure to the properties and mechanical applications. Gain awareness of water quality parameters.

Chemistry for Electrical & Electronics Engg. Stream

Contact Hours/ Week	: 3(L)+0(T)+2(P)	Credits	: 4.0
Total Lecture Hours	: 39	CIE Marks	: 50
Total Tutorial Hours	: 00	SEE Marks	: 50
Total Practical Hours	: 26	Exam Hours	: 3
Course Type	: Integrated	Course Code	: CHEE

Course Objectives : This course will enable students to:

- Learn the basic concepts of electrochemistry, electrode potentials that are essential to determine the battery voltage, rate of corrosion and working of analytical instruments.
- Use the analytical techniques for chemical analysis.
  Know the working principle and construction of various batteries and their applications.
- Apply the knowledge of using different types of nanomaterials, synthesis and their applications.
  Understand the green chemistry concepts and extend these ideas to environmental care and sustainability.
- Know the mechanism of corrosion, factors affecting the rate of corrosion and corrosion control methods.
  Learn the sources, problems and removable methodologies of E-waste.
- Gain awareness on the polymers required for daily usage and their advanced engineering applications such as conducting polymers.
  Acquire knowledge on different category of materials (polymers & liquid crystals), synthetic protocols, properties and applications as electronic materials for display systems.

UNIT - I

ELECTRODE SYSTEMS AND APPLICATIONS 08 Hrs

Introduction to electrode potential. Electrochemical cells: Classification - galvanic cells and electrolytic cells with examples. Single electrode potential - definition and origin. Derivation of Nernst equation for single electrode potential and effect of temperature and concentration. Standard electrode potential - definition, construction and working of a galvanic cell (e.g, Daniel cell). E.M.F of a cell - definition, notations and sign conventions. Concentration cells – definition, construction, working and derivation of EMF. Electrodes: Types of electrodes: Reference electrodes - construction and working of calomel electrode and Ag-AgCl electrode. Numerical problems on E, E^o and EMF of cells and concentration cells. Glass electrode (Ion-selective electrode) - definition, construction and working of glass electrode. Determination of pH using glass electrode.

Self-learning topics: Determination of single electrode potential, EMF using Poggendroff's compensation principle and concentration of heavy metal ions in industrial effluent. Construction and working of fruit and vegetable electrochemical cell using zinc and copper sheets.

UNIT - II

ANALYTICAL TECHNIQUES AND APPLICATIONS **05+03 Hrs**

Introduction, Types of analysis: Qualitative and quantitative - classical and instrumental methods of analysis. Advantages of instrumental methods of analysis over physical and chemical methods. Electro optical methods: Colorimetry - principle, statement and derivation of Lambert's law, Beer's law, Beer-Lambert's law, instrumentation, advantages and applications. Numerical problems. Electrochemical methods: Potentiometry - principle, instrumentation, advantages and applications in redox titration. Conductometry - principle, instrumentation and advantages. Applications of conductometric titrations - strong acid against a strong base, strong acid against a weak base and mixture of acids (strong acid + weak acid) against a strong base.

ENERGY CONVERSION AND STORAGE

Batteries – basic concepts, components and operation of a battery – discharging and charging. Classification of batteries – primary, secondary and reserve batteries. Classical batteries - construction, working and applications of Lead-acid and Ni-Cd batteries. Modern batteries - construction, working and applications of Zn-air, Li-MnO_2, Lithium-ion and Sodium - ion batteries.

Self-learning topics: Applications of colorimetry in the estimation of iron present in printed circuit board. Study of characteristics of a battery.

UNIT - III

NANO MATERIALS **04+04 Hrs**

Definition and types of nano materials – based on materials (carbon, metal, composite & dendrimers) and based on dimensions (0D, 1D, 2D and 3D). Production of nanomaterials – definition of top down and bottom up process with examples. Synthesis of nanometal oxides – semiconducting nano ZnO by combustion method and nano TiO_2 by hydrothermal method. Carbon nanotubes - definition, types - SWCNT and MWCNT and synthesis of carbon nanotubes by arc discharge method. Techniques used in characterization of nanomaterials – XRD, FTIR, SEM and TEM (No description of techniques).

GREEN CHEMISTRY

Introduction, principles of green chemistry, atom economy - definition and numerical problems. Biomass as a renewable energy source - synthesis and advantages of bio-ethanol, bio-diesel and power alcohol as a fuel. Fuel Cells: Introduction, definition, advantages, construction and working of MeOH-O_2 fuel cell.

Self-learning topics: Synthesis of nanoparticles by sol-gel/co-precipitation method. Construction and working of H_2-O_2 fuel cell.

UNIT - IV

CORROSION SCIENCE AND E - WASTE MANAGEMENT **08 Hrs**

Metallic corrosion **-** definition, corrosion interrelated problems and electrochemical theory of corrosion. Types of corrosion - differential metal corrosion, differential aeration corrosion (waterline corrosion and pitting) and stress corrosion. Factors affecting the rate of corrosion - primary (electrode potential, nature of corrosion product and area effect) and secondary factors (pH and temperature). Introduction to corrosion penetration rate (CPR), numerical problems. Corrosion control methods - anodizing, phosphating, galvanizing and tinning. Corrosion control by cathodic protection - impressed voltage method and sacrificial anode method.

E-WASTE MANAGEMENT

Introduction, sources (E-waste items), toxic materials used in manufacturing electronic and electrical products, problem of E-waste on environment and human health, solution for E-waste, methods of disposal, advantages of recycling. Extraction of gold from E-waste.

Self-learning topics: Corrosion control using anodic and cathodic inhibitors. Impact of heavy metals on environmental and human health, recycling of PCB and battery components.

UNIT - V

MATERIALS FOR ELECTRONIC APPLICATIONS

AND DISPLAY SYSTEMS **08 Hrs**

Materials: Definition, classification of materials as conductors and insulators, mechanism of conduction in case of solids.

Polymers: Introduction, definition, classification - based on occurrence, structure and effect of heat on polymer (thermoplastic and thermosetting polymers). Number average and weight average molecular weight - definition and numerical problems. Synthesis, properties and applications of PMMA and

Teflon. Conducting polymers - mechanism of conduction in polyacetylene (oxidative and reductive doping).

Liquid crystals: Introduction, classification (Thermotropic and Lyotropic liquid crystals), Types (chiral nematic liquid crystals, smectic liquid crystals). Electro - optic effect and application of liquid crystals in liquid crystal display (LCD).

Light emitting diodes (LED): Definition, working, properties and uses of LED's and difference between LCD and LED.

Self - learning topics: Use of carbon nanotubes and graphene in LCD and printed circuit board.

TEXT BOOKS :

1	Suba Ramesh and others	Engineering Chemistry - A text book of Chemistry for Engineers, Wiley India, First Edition, 2011.

REFERENCE BOOKS :

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5	Derek Pletcher and Frank C. Walsh	Industrial electrochemistry, Blackie academic and professional, 1993.
6	R. Narayan, B. Viswanathan	Chemical and electrochemical energy systems, University Press (India) Ltd., 1998.
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10	Sankar P. Dey, Nayim Sepay	A Textbook of Green Chemistry, First Edition, Techno World Publisher, 2021.
Corrosion science and E-waste management		
11	M.G. Fontana	Corrosion Engineering, McGraw Hill Publicat New York, 1987.
12	Derek Pletcher and Frank C. Walsh	Industrial electrochemistry, Blackie academic and professional, 1993.
13	M.N.V. Prasad, Meththika Vithanage, Anwesha Borthakur	Handbook of Electronic Waste Management, Butterworth-Heinemann, First Edition, 2019.
Materials for Electronic Applications and Display Systems		
14	Sabar D. Hutagalung	Materials science and technology, InTech Publishers, 2012.
15	Anthony C. Lowe, Lindsay MacDonald	Display Systems: Design and Applications (Wiley Series in Display Technology), Wiley Publishers 1997.
17	F.W. Billmeyer	Text Book of Polymer Science, Wiley Inter Science Publications, 1994.
18	V.R. Gowriker, N. V. Viswanathan, Jayadev Sreeshar	Polymer science, New age International (P) Ltd., 1996.

Course Outcomes :

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

CO1 : Determine the electrode potential of newly constructed electrodes, calculate the voltage of galvanic cells.

CO2 : Apply the knowledge of colorimetry, potentiometry and conductometry in chemical analysis. Develop new materials for construction of batteries to improve their performance.

CO3 : Gain knowledge about different types of nanomaterials, preparation and its applications. Acquire the green chemistry concepts and extend these ideas to environmental care and sustainability.

CO4 : Understand the reasons for corrosion of metals/alloys, mechanism of corrosion, control methods. Gain more insight into E-wastes, its sources, effects and disposal methodologies.

CO5 : Develop different types of polymeric materials which find applications in the field of engineering. Learn fundamentals, classifications of liquid crystals and application of liquid crystals in display technology.

Computer Aided Engineering Drawing

Contact Hours/ Week	:	2(L)+0(T)+2(P)	Credits	:	3.0
Total Lecture Hours	:	48	CIE Marks	:	50
Total Tutorial Hours	:	00	SEE Marks	:	50
Total Practical Hours	:	00	Exam Hours	:	3
Course Type	:	Practical	Course Code	:	ESCF1

Course Objectives : This course will enable students :

- To expose the students to standards and conventions followed in preparation of engineering drawings.
- To make them understand the concepts of orthographic projections, Development of surfaces and isometric projections.
- Develop the ability of conveying the engineering information through drawings.
- To make them understand the relevance of engineering drawings to different engineering domains.
- To expose them to Computer aided drafting package and generation of computer assisted drawings.

Teaching-Learning (General Instructions) :

- Students should be made aware of powerful engineering communication tool –Drawing.
- For application problems use very generally available actual objects. (Example: For rectangular prism / object; matchbox, carton boxes, book, etc can be used. Similarly for other shapes).
- Use Solid Edge software for generating orthographic and pictorial views.
- Make use of drawing sheets and mini drafter for manual drawing

UNIT - I

INTRODUCTION TO COMPUTER AIDED DRAWING **16 Hrs**

Introduction, Drawing Instruments and their uses, BIS conventions, Lettering, Dimensioning and free hand practicing. Computer screen, layout of the software, standard tool bar/menus and description of most commonly used tool bars, navigational tools.

Co-ordinate system and reference planes HP, VP, RPP & LPP of 2D environment. Selection of drawing sheet size and scale of a drawing, Commands and creation of Lines, Co-ordinate points, axes, poly- lines, square, rectangle, polygons, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints viz. tangency, inclination and perpendicularity. Dimensioning, line conventions, material conventions.

ORTHOGRAPHIC PROJECTIONS OF POINTS, STRAIGHT LINES AND PLANES

Introduction, Orthographic projection, Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants.

Projections of straight lines (located in First quadrant/First angle only), True and apparent lengths, True and apparent inclinations to reference planes, (No mid point problems).

Application problems on Projection of Lines (For CIE only)

PROJECTIONS OF PLANE SURFACES

Orthographic projections of regular plane Surfaces – triangle, square, rectangle, pentagon, hexagon and circle in simple positions inclined to both the planes, planes in different positions by change of position method only. (No problems on punched plates, composite plates, Lamina resting on VP)

UNIT - II

PROJECTIONS OF SOLIDS **12 Hrs**

Introduction, Classification of Solids, Projections of prisms, pyramids, cylinders and cones with axis inclined to both the planes, Solids in different positions by change of position method only.(No problems on octahedrons, freely suspended solids, Solid resting on VP).

PROJECTIONS OF FRUSTUM OF CONE AND PYRAMIDS

(For practice only, not for CIE and SEE)

UNIT - III

DEVELOPMENT OF LATERAL SURFACES OF SOLIDS **8 Hrs**

Introduction to section planes and sectional views, Development of lateral surfaces of right regular prisms, cylinders, pyramids, cones resting with base on HP only, Development of lateral surfaces of their frustums and truncations.

Application problems on development of lateral surfaces like funnels and trays ***(For CE only).***

UNIT - IV

ISOMETRIC PROJECTION **08 Hrs**

Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of hexahedron(cube), right regular prisms, pyramids, cylinders, cones, spheres. Isometric view of combination of two simple solids.

Conversion of simple isometric drawings into orthographic views. Problems on applications of Isometric projections of simple objects / engineering components. Introduction to drawing views using 3D environment. ***(For CIE only)***

UNIT - V

MULTIDISCIPLINARY APPLICATIONS & PRACTICE **04 Hrs**

(For CIE Only)

Free hand Sketching: True free hand, Guided Free hand, Roads, Buildings, Hand tools & Furniture's etc.

Drawing Simple Mechanisms: Four bar mechanism, Engine mechanism, Gear trains.

Electric Wiring and lighting diagrams: Like, Call bell system, UPS system using suitable software.

Basic Building Drawing: Like, Architectural floor plan, basic foundation drawing using Auto CAD or suitable software.

Electronics Engineering Drawings: Like, Simple Electronics Circuit Drawing**.**

TEXT BOOKS :

1	K.R. Gopalakrishna	Engineering Graphics 32nd Edition, 2005 – Subhash Publishers Bangalore.
2	N.D. Bhatt & V.M. Panchal	Engineering Drawing - 48th Edition, 2005 - Charotar Publishing House, Gujarat.

REFERENCE BOOKS :

1	S. Trymbaka Murthy	Computer Aided Engineering Drawing - I.K. International Publishing House Pvt. Ltd., New Delhi, 3rd revised edition-2006.
2	Dr. M H Annaiah, Dr C N Chandrappa and Dr. B Sudheer Premkumar,	Computer Aided Engineering Drawing - Fifth edition, New Age International Publishers.

Course Outcomes :

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

CO1 : Draw orthographic projections of Lines and Planes according to the constraints of the problem.

CO2 : Draw orthographic projections of solids both in conventional way and using modern engineering tool according to the constraints of the problem.

CO3 : Develop the lateral surfaces of the objects both in conventional way and using modern engineering tool.

CO4 : Draw the isometric projection of combination of solids both in conventional way and using modern engineering tool.

CO5 : Identify the interdisciplinary engineering components or systems through its graphical representation.

Engineering Mechanics

Contact Hours/ Week	: 2(L) + 2(T)	Credits	: 3.0
Total Lecture Hours	: 25	CIE Marks	: 50
Total Tutorial Hours	: 25	SEE Marks	: 50
Total Practical Hours	: 00	Exam Hours	: 3
Course Type	: Theory	Course Code	: ESCF2

Course Objectives : This course will enable students :

- To develop students' ability to analyze the problems involving forces, moments with their applications.
- To make students to learn the effect of friction on different planes
- To develop the student's ability to find out the centre of gravity and moment of inertia and their applications.
- To make the students learn about kinematics and kinetics and their applications.

UNIT - I

FUNDAMENTALS OF MECHANICS **5+5 Hrs**

Basic idealization- particle, continuum and rigid body, laws of mechanics, force and its characteristics, classification of force system, concept of free body diagram, Principle of Transmissibility.

RESULTANT OF COPLANAR CONCURRENT FORCE SYSTEM

Law of parallelogram of forces, triangle law of forces, polygon law of forces, and problems related to determination of the resultant.

EQUILIBRIUM OF COPLANAR CONCURRENT FORCE SYSTEM

Conditions of equilibrium, Lami's theorem and problems related to equilibrium of concurrent force system. Illustrative problems specific to engineering applications.

UNIT - II

RESULTANT OF COPLANAR NON-CONCURRENT FORCE SYSTEM **5+5 Hrs**

Concept of moment, couple, equivalent force and couple system, Varignon's theorem, analysis of resultant of the System.

EQUILIBRIUM OF COPLANAR NON-CONCURRENT FORCE SYSTEM

Types of loads, Types of supports, types of beams. Determination of support reaction for beams subjected to different types of loads (Concentrated loads,

UDL, UVL, pure moment and their combinations), introduction to the concepts of determinacy and indeterminacy in components subjected to forces/loads.

UNIT - III

FRICTION **5+5 Hrs**

Introduction, laws of Coulomb friction, equilibrium of blocks on horizontal plane, equilibrium of blocks on inclined plane, ladder friction, wedge friction Numerical examples.

UNIT - IV

CENTROID OF PLANE AREAS **5+5 Hrs**

Introduction, Locating the centroid of rectangle, triangle, circle, semicircle, quadrant and sector of a circle using method of integration (No derivations), centroid of composite areas and simple built-up sections, Numerical examples.

MOMENT OF INERTIA OF PLANE AREAS

Introduction, Rectangular moment of inertia, polar moment of inertia, product of inertia, radius of gyration, parallel axes theorem, perpendicular axis theorem, moment of inertia of rectangular, triangular and circular areas from the method of integration (No derivations), moment of inertia of composite areas and simple built up sections, Numerical examples.

UNIT - V

KINEMATICS **5+5 Hrs**

Linear motion: Introduction, Displacement, speed, velocity, acceleration, acceleration due to gravity, Numerical examples on linear motion

PROJECTILES

Introduction, numerical examples on projectiles.

KINETICS

Introduction, D'Alembert's principle of dynamic equilibrium and its application in-plane motion and connected bodies including pulleys, Numerical examples.

TEXT BOOKS :

1	J L Merrium, L G Kraige, and J N Bolten	Engineering Mechanics – Statics, 8th edition, John Wiley Publications, 2016. ISBN: 978-1-119-04467-3.
2	A Nelson	Engineering Mechanics: Statics and Dynamics, Tata Mc_Graw Hill Publications, 2009. ISBN: 978-0-07-014614-3.

REFERENCE BOOKS :

1	Beer F.P. and Johnston E. R	Mechanics for Engineers, Statics and Dynamics, 1987, McGraw Hill
2	Irving H. Shames	Engineering Mechanics, 2019, Prentice-Hall
3	Hibbler R. C	Engineering Mechanics: Principles of Statics and Dynamics, 2017, Pearson Press.
4	Timoshenko S, Young D. H., Rao J. V	Engineering Mechanics, 5th Edition, 2017, Pearson Press
5	Bhavikatti S S	Engineering Mechanics, 2019, New Age International
6	Reddy Vijaykumar K and Suresh Kumar K	Engineering Mechanics, 2011, BS publication
7	Kolhapure B K	Elements of Civil Engineering and Engineering Mechanics, 2014, EBPB
8	Bansal R. K., Rakesh Ranjan Beohar and Ahmad Ali Khan	Basic Civil Engineering and Engineering Mechanics, 2015, Laxmi Publications.

Course Outcomes :

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

CO1 : Identify system of forces and to solve complex engineering problems by applying principles of engineering, science, and mathematics.

CO2 : Apply equations of statics to analyze non concurrent force system and to determine support reactions and internal forces in a system.

CO3 : Apply the concept of friction for a given real world problem and analyse the frictional resistance offered by different planes.

CO4 : Locate the centroid and compute the moment of inertia of plane and built-up sections using First Principles of Engineering Science.

CO5 : Apply the Principles of Kinematics and Kinetics to solve plane motion and connected bodies for the solution of engineering problems.

Elements of Electrical Engineering

Contact Hours/ Week	: 2(L) + 2(T) + 0(P)	Credits	: 3.0
Total Lecture Hours	: 30	CIE Marks	: 50
Total Tutorial Hours	: 30	SEE Marks	: 50
Total Practical Hours	: 00	Exam Hours	: 3
Course Type	: Theory	Course Code	: ESCF3

Course Objectives : This course will enable students :

- To introduce fundamental concepts of electric circuits and electromagnetism.
- To expose different electrical measuring techniques.
- To study the domestic wiring, tariff and electrical safety practices.

UNIT - I

DC CIRCUITS **6+6 Hrs**

Ohm's law and Kirchhoff's laws, analysis of series, parallel and series-parallel circuits. Power and energy. **Numerical.**

ELECTROMAGNETISM

Faraday's Laws of Electromagnetic Induction, Lenz's Law, Fleming's rules, statically and dynamically induced EMF; concepts of self and mutual inductance. Coefficient of Coupling. Energy stored in magnetic field **Numerical.**

UNIT - II

SINGLE - PHASE AC CIRCUITS **6+6 Hrs**

Generation of sinusoidal voltage, frequency of generated voltage, average value, RMS value, form factor and peak factor of sinusoidal voltage and currents. Phasor representation of alternating quantities. Analysis of R, L, C, R-L, R-C and R-L-C circuits with phasor diagrams, Real power, reactive power, apparent power, and Power factor. Series, Parallel and Series-Parallel circuits. **Numerical.**

UNIT – III

THREE - PHASE AC CIRCUITS **6+6 Hrs**

Necessity and advantage of 3-phase system. Generation of 3-phase power. Definition of phase sequence. Balanced supply and balanced load. Relationship between line and phase values of balanced star and delta connections. Power in balanced 3-phase circuits. Measurement of 3- ϕ power by 2 - wattmeter method. **Numerical.**

UNIT - IV

MEASURING INSTRUMENTS . **6+6 Hrs**

Construction and working principle of whetstone's bridge, Kelvin's double bridge, Megger, Maxwel's bridge for inductance, Schering's bridge for capacitance, concepts of current transformer and potential transformer. (Only balance equations and excluding Vector diagram approach), **Numerical.**

DOMESTIC WIRING

Requirements, Types of wiring: conduit wiring and casing & capping. Two way and three-way control of lamp load.

UNIT – V

ELECTRICAL ENERGY CONSUMPTION AND TARIFF **6+6 Hrs**

Power rating of household appliances including air conditioners, PCs, laptops, printers, etc. Definition of "unit" used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers.

SAFETY MEASURES

Domestic electric circuit including protective devices, working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits.

Electric Shock, Earthing, types (Plate and pipe earthing), Safety Precautions to avoid shock, and introduction to Residual Current Circuit Breaker (RCCB) and Earth Leakage Circuit Breaker (ELCB).

TEXT BOOKS :

1	D C Kulshreshtha	Basic Electrical Engineering, Tata McGraw Hill, 1st Ed., 2019
2	D. P. Kothari and I. J. Nagrath	Basic Electrical Engineering, Tata McGraw Hill, 4th Ed., 2019

REFERENCE BOOKS :

1	V. K. Mehta, Rohit Mehta	Principles of Electrical Engineering & Electronics, S. Chand & Company Publications, 2nd Ed., 2015.
2	E. Hughes	Electrical Technology, Pearson, 12th Ed., 2016.
3	A K Sawhney	Electrical and Electronic measurements and instrumentation, Dhanapat Rai and Co. Edition, 2015.

Course Outcomes :

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

CO1 : Apply the concepts of basic laws to solve electric circuits.

CO2 : Apply Faraday's laws to solve electromagnetic circuits.

CO3 : Understand the concepts of measuring techniques.

CO4 : Explain the concepts of domestic wiring, electrical energy consumption, protective devices and safety measures.

Basic Electronics

Contact Hours/ Week	: 3(L) + 2(T) + 0(P)	Credits	: 3.0
Total Lecture Hours	: 30	CIE Marks	: 50
Total Tutorial Hours	: 30	SEE Marks	: 50
Total Practical Hours	: 00	Exam Hours	: 3
Course Type	: Theory	Course Code	: ESCF4

Pre-requisite : Semiconductor Physics

Course Objectives : This course will enable students to:

- Analyze & design different stages of DC power supply
- Get knowledge of the working and application of transistors
- Build the analog computational circuits using OPAMP and generate AC signal of required frequency using Oscillator circuits
- Understand basics of digital electronics
- Understand different analog modulation techniques and get the knowledge of transducers

UNIT - I

SEMICONDUCTOR DIODE AND ITS APPLICATIONS **8 Hrs**

Review of PN–junction, diode equation, VI characteristics, effect of temperature, Zener diode: Working, VI characteristics. Basic building blocks of a regulated DC power supply: Full wave rectifier, Capacitor filter (qualitative analysis), Zener regulator (includes numericals on diode equation, rectifier, filter and Zener regulator)

UNIT - II

TRANSISTORS AND THEIR APPLICATIONS **8 Hrs**

Review of Bipolar junction transistor, CE configuration and characteristics, BJT as switch & amplifier, Fixed bias and voltage divider bias (approximate analysis), DC load line and operating point, Single stage RC coupled amplifier and its frequency response, MOSFET: Classification, Construction and drain characteristics of N-channel enhancement type MOSFET.

UNIT - III

OPERATIONAL AMPLIFIER AND OSCILLATORS **8 Hrs**

Block diagram of an Operational amplifier, Schematic symbol, differential amplifier, Characteristics of an ideal operational amplifier, Concept of virtual ground, Op-amp applications: Inverting and non-inverting amplifier, Voltage follower, Adder, Subtractor, Integrator and differentiator, Open-loop configuration

Concept of feedback, Types of feedback, Barkhausen criteria for oscillations, RC phase-shift oscillator and Wein's bridge oscillator.

UNIT - IV

FUNDAMENTALS OF DIGITAL ELECTRONICS **8 Hrs**

Introduction to number systems: Octal, Hexadecimal, Binary numbers: Binary addition and subtraction using 1's and 2's complement method, Review of logic gates, Universal gates, Boolean Algebra, De Morgan's theorems, Simplification and realization of Boolean expressions using basic gates and NAND gates, Half adder, Full adder and Parallel adder.

UNIT - V

COMMUNICATION SYSTEM **7 Hrs**

Block diagram of communication system, Need for modulation, Analog Modulation: AM, FM, PM (Definition waveforms, expressions and comparisons)

TRANSDUCERS

Introduction, Resistive Transducers, Inductive Transducers, Capacitive Transducers, Thermal Transducers, Optoelectronic Transducers and Piezoelectric transducers.

TEXT BOOKS :

1	David A Bell	Electronic Devices and Circuits, Oxford, 5th Edition, 2016.
2	Ramakanth A Gayakwad	Op-amps and Linear Integrated Circuits, Pearson Education, 4th Edition, 2015.
3	M. Morris Mano	Digital Logic & Computer Design, PHI Learning, 2008
4	David A. Bell	Electronic Instrumentation & Measurements, Oxford, 3rd Edition
5	George Kennedy	Electronic Communication Systems, TMH, 6th Edition, 2017.

Course Outcomes :

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

CO1 :	Analyze PN junction diodes & design different stages of DC power supply.
CO2 :	Analyze characteristics, biasing of transistors & illustrate the application of transistor as an amplifier.
CO3 :	Analyze the characteristics of OPAMP, develop its applications, and design oscillator circuits using OPAMP
CO4 :	Simplify and realize Boolean expressions, analyze & implement combinational logic circuits.
CO5 :	Compare different analog modulation techniques and describe various transducers.

Elements of Mechanical Engineering

Contact Hours/ Week	:	3(L) + 0(T) + 0(P)	Credits	:	3.0
Total Lecture Hours	:	39	CIE Marks	:	50
Total Tutorial Hours	:	30	SEE Marks	:	50
Total Practical Hours	:	00	Exam Hours	:	3
Course Type	:	Theory	Course Code	:	ESCF5

Course Objectives : This course will enable students to:

- Acquiring a basic understanding about scope of mechanical engineering, fundamentals about steam and non-conventional energy resources.
- Acquire a basic knowledge about conventional and advanced manufacturing processes.
- Students will be introduced to fundamentals of IC engines and refrigeration systems.
- Students will be exposed to power transmission and joining processes.
- Acquiring a basic insight into future mobility such as Mechatronics, CNC and Additive Manufacturing

UNIT - I

INTRODUCTION TO MECHANICAL ENGINEERING (Overview Only) 08 Hrs

Role on Mechanical Engineering in Industries and Society : Emerging Trends and technologies in different sectors such as Energy, Manufacturing, Automotive. **(PO1)**

Energy : Forms of energy, sources and classification of energy sources, non-conventional energy sources (Solar Energy (FPC only), Wind Energy (Wind Mill).

Formation of steam : Formation of steam, Types of steam, Steam properties - specific volume, enthalpy and internal energy, Simple numerical problems **(PO2)**

UNIT - II

MACHINE TOOLS 08 Hrs

Lathe : Principle of Working, Construction of Centre Lathe, Lathe operations – Turning, Facing, Knurling. **(PO1)**

Drilling : Principle of working, Construction and Working of Bench drilling machine. Drilling operations - Drilling, Boring, Reaming, Tapping. **(PO1)**

Milling : Principle of working, Construction and working of horizontal milling machine. Milling operations - Slot milling, Form milling, Angular milling **(PO1)**

UNIT - III

IC ENGINES AND REFRIGERATION **08 Hrs**

Introduction to IC engines : Components and working principles, 4 stroke Petrol and Diesel engine. Simple problems on IP, BP, FP **(PO2)**

Introduction to Refrigeration : Principle of refrigeration, working principle of Vapour compression refrigeration and vapour absorption refrigeration, List of commonly used refrigerants **(PO2)**

UNIT - IV

MECHANICAL POWER TRANSMISSION **08 Hrs**

Belt drives : Types of belt drives (Open and closed), Stepped cone pulley, Velocity ratio in belt drives (No derivation), Slip and Creep in belts drives. **(PO2)**

Gear Drives : Types of gears- Spur, Helical, Bevel, Worm gears, Rack and Pinion, and Velocity ratio in Gears. (No derivation) **(PO2)**

Gear Trains: Types of Gear trains, Working and derivation on Simple gear train, Compound gear train, Simple numerical problems on gear trains. **(PO2)**

UNIT - V

JOINING PROCESS, MECHATRONICS, CNC AND ADDITIVE MANUFACTURING **08 Hrs**

Joining Processes : Soldering, Brazing, and welding definitions only, working of Gas welding. **(PO1)**

Introduction to Mechatronics : Systems of Mechatronics, advantages and disadvantages, Measurement Systems and Control Systems - Open loop control system and close loop control system (with simple block diagrams). **(PO1)**

Introduction to CNC Machine: Advantages and disadvantages of CNC, CNC system configuration **(PO1)**

Introduction to Additive Manufacturing : classification and any one concept of Additive Manufacturing (3D printing by Stereo lithography process) **(PO1)**

TEXT BOOKS :

1	K R Gopala Krishna	Elements of Mechanical Engineering, Subhash Publications, 2008
2	Hazra Choudhry and Nirzar Roy	Elements of Workshop Technology (Vol. 1 & 2), Media Promoters and Publishers Pvt. Ltd., 2010.

REFERENCE BOOKS :

1	Jonathan Wickert and Kemper Lewis	An Introduction to Mechanical Engineering, Third Edition 2012
2	P.N.Rao	Manufacturing Technology- Foundry, Forming and Welding, Tata McGraw Hill 3rdEd., 2003
3	P.N.Rao	CAD/CAM principles and applications, Tata McGraw Hill 2nd Edition.

WEB LINKS AND VIDEO LECTURES (e-RESOURCES)

1	https://www.tlv.com/global/TI/steam-theory/principal-applications-for steam.html.
2	https://www.forbesmarshall.com/Knowledge/SteamPedia/AboutSteam/ Fundamental-Applications-of-Steam.
3	https://rakhoh.com/en/applications-and-advantages-of-steam-in-manufacturing – and process-industry/.
4	Videos Makino (For Machine Tool Operation).

Course Outcomes :

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

CO1 : Explain the role of mechanical engineering in industry and society, fundamentals of steam and non- conventional energy sources and study the basic principles of formation of steam.

CO2 : Describe different conventional and advanced machining tools such as Lathe, drilling and milling machines.

CO3 : Describe the performance parameters of IC engines and working principles of VAR and VCR refrigeration system.

CO4 : Describe the working of various mechanical power transmission for engineering applications.

CO5 : Enumerate various aspects of future mobility such as Mechatronics, CNC and 3D printing technology.

Principles of Programming using C

Contact Hours/ Week	:	2(L) + 0(T) + 2(P)	Credits	:	3.0
Total Lecture Hours	:	26	CIE Marks	:	50
Total Tutorial Hours	:	00	SEE Marks	:	50
Total Practical Hours	:	26	Exam Hours	:	3
Course Type	:	Integrated	Course Code	:	ESCF6

Course Objectives : This course will enable students to:

- Elucidate the basic architecture and functionalities of a Computer.
- Apply programming constructs of C language to solve the real-world problems.
- Explore user-defined data structures like arrays, structures and pointers in implementing solutions to problems.
- Design and Develop Solutions to problems using structured programming constructs such as functions and procedures.

UNIT - I

INTRODUCTION TO C **4L+2P Hrs**

Introduction to computers, input and output devices, designing efficient programs. Introduction to C, Structure of C program, Files used in a C program, Compilers, Compiling and executing C programs, variables, constants, Input/output statements in C.

Textbook: Chapter 1.1 - 1.9, 2.1 - 2.2, 8.1 - 8.6, 9.1 - 9.14

UNIT - II

DECISION CONTROL AND LOOPING STATEMENTS **5L+6P Hrs**

Operators in C, Type conversion and typecasting, **Decision control and LOOPING STATEMENTS**

Introduction to decision control, Conditional branching statements, iterative statements, nested loops, break and continue statements,goto statement.

Textbook: Chapter 9.15 - 9.16, 10.1 - 10.6

UNIT - III

FUNCTIONS AND ARRAYS **6L+6P Hrs**

Functions - Introduction using functions, Function definition, function declaration, function call, return statement, passing parameters to functions, scope of variables, storage classes, recursive functions.

Arrays - Declaration of arrays, accessing the elements of an array, storing values in arrays, Operations on arrays, Passing arrays to functions, two dimensional arrays, operations on two-dimensional arrays, two- dimensional arrays to functions, multidimensional arrays, applications of arrays.

Textbook: Chapter 11.1 - 11.10, 12.1 - 12.10, 12.12

UNIT - IV

STRINGS AND POINTERS **5L+6P Hrs**

Introduction, string taxonomy, operations on strings, Miscellaneous string and character functions, arrays of strings. Pointers: Introduction to pointers, declaring pointer variables, Types of pointers, Passing arguments to functions using pointers

Textbook: Chapter 13.1 - 13.6, 14 - 14.7

UNIT - V

STRUCTURE, UNION, AND ENUMERATED DATA TYPE 5L+6P Hrs

Introduction, structures and functions, Unions, unions inside structures, Enumerated data type.

FILES

Introduction to files, using files in C, reading and writing data files. , Detecting end of file

Textbook: Chapter 15.1 - 15.10, 16.1 - 16.5

PROGRAMMING ASSIGNMENTS

1. Simulation of a Simple Calculator.
2. Compute the roots of a quadratic equation by accepting the coefficients. Print appropriate messages.
3. An electricity board charges the following rates for the use of electricity: for the first 200 units 80 paise per unit:for the next 100 units 90 paise per unit: beyond 300 units Rs 1 per unit. All users are charged a minimum of Rs. 100 as meter charge. If the total amount is more than Rs 400, then an additional surcharge of 15% of total amountis charged. Write a program to read the name of the user, number of units consumed and print out the charges.
4. Write a C Program to display the following by reading the number of rows as input

	1	
1	2	1
1 2	3	2 1
1 2 3	4	3 2 1

n^{th} row

5. Implement Binary Search on Integers.
6. Implement Matrix multiplication and validate the rules of multiplication.
7. Compute sin(x) / cos(x) using Taylor series approximation. Compare your result with the built-in library function. Print both the results with appropriate inferences.
8. Sort the given set of N numbers using Bubble sort.
9. Write functions to implement string operations such as compare, concatenate, and find string length. Use theparameter passing techniques.
10. Implement structures to read, write and compute average- marks of the students, list the students scoring aboveand below the average marks for a class of N students.
11. Develop a program using pointers to compute the sum, mean and standard deviation of all elements stored inan array of N real numbers.
12. Write a C program to copy a text file to another, read both the input file name and target file name.

WEB LINKS AND VIDEO LECTURES (e-RESOURCES)

1	elearning.vtu.ac.in/econtent/courses/video/BS/15PCD23.html
2	https://nptel.ac.in/courses/106/105/106105171/ MOOC courses can be adopted for more clarity in understanding the topics and verities of problem solving methods.
3	https://tinyurl.com/4xmrexre

TEXT BOOKS :

1	Reema Thareja	Computer fundamentals and programming in C, Oxford University, Second edition, 2017.

REFERENCE BOOKS :

1	E. Balaguruswamy	Programming in ANSI C, 7th Edition, Tata McGraw-Hill.
2	Brian W. Kernighan and Dennis M. Ritchie	The 'C' Programming Language, Prentice Hall of India

Course Outcomes :

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

CO1 : Elucidate the basic architecture and functionalities of a computer and also recognizethe hardware parts.

CO2 : Apply programming constructs of C language to solve the real world problem.

CO3 : Explore user-defined data structures like arrays in implementing solutions to problems like searching and sorting.

CO4 : Explore structures, unions, pointers & files in implementing solutions.

CO5 : Design and Develop Solutions to problems using modular programming constructsusing functions

Introduction to Civil Engineering

Contact Hours/ Week	:	3(L)	Credits	:	3.0
Total Lecture Hours	:	50	CIE Marks	:	50
Total Tutorial Hours	:	00	SEE Marks	:	50
Total Practical Hours	:	00	Exam Hours	:	3
Course Type	:	Theory	Course Code	:	ESCO1

Course Objectives : This course will enable the students to :

- Understand the scope of various specializations of civil engineering.
- Understand the concepts of sustainable infrastructure.
- Develop student's ability to analyze the problems involving forces and moments with their applications.
- Develop the student's ability to determine the center of gravity and moment of inertia and their applications.

UNIT - I

INTRODUCTION TO CIVIL ENGINEERING **10 Hrs**

Surveying, Structural Engineering, Geotechnical Engineering, Hydraulics & Water Resources, Transportation Engineering, Environmental Engineering, Construction planning & Project management.

BASIC MATERIALS OF CONSTRUCTION

Bricks, Cement & Mortars, Plain, Reinforced & Pre-stressed Concrete, Structural steel, Construction Chemicals. Structural elements of a building: Foundation, Plinth, Lintel, Chejja, Masonry wall, Column, Beam, Slab and Staircase.

INFRASTRUCTURE

Introduction to sustainable development goals, Smart city concept, Clean city concept, Safe city concept.

UNIT - II

FUNDAMENTALS OF MECHANICS **10 Hrs**

Basic idealization- particle, continuum and rigid body, laws of mechanics, force and its characteristics, classification of force system, concept of free body diagram, Principle of Transmissibility.

RESULTANT OF COPLANAR CONCURRENT FORCE SYSTEM

Parallelogram law of forces, Triangular law of forces, Polygon law of forces, and numerical problems related to determination of the resultant.

EQUILIBRIUM OF COPLANAR CONCURRENT FORCE SYSTEM

Conditions of equilibrium, Lami's theorem and problems related to equilibrium of concurrent force system. Numerical problems specific to engineering applications.

UNIT - III

RESULTANT OF COPLANAR NON-CONCURRENT FORCE SYSTEM **10 Hrs**

Concept of moment, couple, equivalent force and couple system, Varignon's theorem, analysis of resultant of the system.

EQUILIBRIUM OF COPLANAR NON-CONCURRENT FORCE SYSTEM

Types of loads, Types of supports, types of beams. Determination of support reaction for beams subjected to different types of loads (Concentrated loads, UDL, UVL, pure moment and their combinations), introduction to the concepts of determinacy and indeterminacy in components subjected to forces/loads.

UNIT - IV

CENTROID **10 Hrs**

Importance of centroid and centre of gravity, methods of determining the centroid, locating the centroid of plane lamina from first principles, centroid of built-up sections. Numerical Problems.

UNIT - V

MOMENT OF INERTIA **10 Hrs**

Importance of Moment of Inertia, method of determining the second moment of area (moment of inertia) of plane sections from first principles, parallel axis theorem and perpendicular axis theorem, section modulus, radius of gyration, moment of inertia of built-up sections, Numerical Problems.

TEXT BOOKS :

1	A Nelson	Engineering Mechanics; Statics and Dynamics Tata McGraw Hill Publications, 2009. ISBN: 978-0-07-014614-3.
2	Bansal R. K., Rakesh Ranjan Beohar and Ahmad Ali Khan	Basic Civil Engineering Mechanics 2015, Laxmi Publications.

REFERENCE BOOKS :

1	Beer F.P. and Johnston E. R	Mechanics for Engineers: Statics and Dynamics, 1987, McGraw Hill
2	Irving H. Shames	Engineering Mechanics, 2019, Prentice-Hall.
3	Hibbler R. C	Engineering Mechanics: Principles of Statics and Dynamics, 2017, Pearson Press.
4	Timoshenko S, Young D. H., Rao J. V	Engineering Mechanics, 5th Edition, 2017, Pearson Press.
5	Bhavikatti S S	Engineering Mechanics, 2019, New Age International
6	Reddy Vijaykumar K and Suresh Kumar K	Engineering Mechanics, 2011, BS publication
7	Kolhapure B K	Elements of Civil Engineering and Engineering Mechanics, 2014, EBPB

Course Outcomes :

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

CO1 : Comprehend the various disciplines of civil engineering.

CO2 : Identify the system of forces and solve engineering problems by applying equations of statics to analyze the concurrent force system.

CO3 : Apply equations of statics to analyze the non concurrent force system and determine the support reactions in a system.

CO4 : Locate the centroid of plane and built-up sections.

CO5 : Determine the moment of inertia of plane and built-up sections.

Introduction to Electrical Engineering

Contact Hours/ Week	:	3(L) + 0(T) + 0(P)	Credits	:	3.0
Total Lecture Hours	:	40	CIE Marks	:	50
Total Tutorial Hours	:	00	SEE Marks	:	50
Total Practical Hours	:	00	Exam Hours	:	3
Course Type	:	Theory	Course Code	:	ESCO2

Course Objectives : This course will enable students :

- To introduce different types of electric power systems.
- To expose the fundamental concepts of electric circuits.
- To impart knowledge of construction and operation of electrical machines.
- To study the domestic wiring, tariff and electrical safety practices.

UNIT - I

INTRODUCTION **08 Hrs**

Conventional and non-conventional energy resources; General structure of electrical power systems using single line diagram approach.

POWER GENERATION

Hydel, thermal, nuclear, Solar & wind power generation (Block Diagram approach).

DC CIRCUITS

Ohm's Law and its limitations. KCL & KVL, series, parallel, series-parallel circuits. **Numerical.**

UNIT - II

A.C. FUNDAMENTALS **08 Hrs**

Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor. (only definitions)

Voltage and current relationship with phasor diagrams in R, L, and C circuits. Concept of Impedance. Analysis of R-L, R-C, R-L-C Series circuits. Active power, reactive power and apparent power. Concept of power factor. **Numerical.**

THREE PHASE CIRCUITS

Generation of Three phase AC quantity, advantages and limitations; star and delta connection, relationship between line and phase quantities (excluding proof). **Numerical.**

UNIT - III

DC MACHINES **08 Hrs**

DC GENERATOR

Principle of operation, constructional details, induced emf expression, types of generators. Relation between induced emf and terminal voltage. **Numerical.**

DC MOTOR

Principle of operation, back emf and its significance. Torque equation, types of motors, characteristics and speed control (armature & field) of DC motors (series & shunt only). Rating, cost, size and applications of DC motors. **Numerical.**

UNIT - IV

TRANSFORMERS **08 Hrs**

Necessity of transformer, principle of operation, Types and construction of single- phase transformers, EMF equation, losses, variation of losses with respect to load. Efficiency. Rating, cost, size and applications. **Numerical.**

THREE-PHASE INDUCTION MOTORS

Concept of rotating magnetic field, Principle of operation, constructional features of motor, types - squirrel cage and wound rotor. Slip and its significance Rating, cost, size and applications. **Numerical.**

UNIT - V

DOMESTIC WIRING **08 Hrs**

Requirements, Types of wiring: conduit, casing & capping. Two way and three-way control of load.

ELECTRICAL ENERGY CONSUMPTION AND TARIFF

Power rating of household appliances including air conditioners, PCs, laptops, printers, etc. Definition of “unit” used for consumption of electrical energy, two-part electricity tariff, calculation of electrical energy consumption for domestic applications.

SAFETY MEASURES

Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits. Electric Shock, Earthing and its types, Safety Precautions to avoid shock.

TEXT BOOKS :

1	D C Kulshreshtha	Basic Electrical Engineering, Tata McGraw Hill, 1st Ed., 2019
2	D. P. Kothari and I. J. Nagrath	Basic Electrical Engineering, Tata McGraw Hill, 4th Ed., 2019

REFERENCE BOOKS :

1	V. K. Mehta, Rohit Mehta	Principles of Electrical Engineering & Electronics, S. Chand and Company Publications, 2nd Ed., 2015.
2	E. Hughes	Electrical Technology, Pearson, 12th Ed., 2016.

Course Outcomes :

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

CO1 : Explain the concepts of various energy sources and Electric circuits.

CO2 : Apply the basic Electrical laws to solve circuits.

CO3 : Explain the construction and operation of various Electrical Machines.

CO4 : Determine the performance parameters of different Electrical Machines.

CO5 : Explain the concepts of domestic wiring, circuit protective devices and safety measures.

Introduction to Electronics Engineering

Contact Hours/ Week	:	3(L) + 0(T) + 0(P)	Credits	:	3.0
Total Lecture Hours	:	39	CIE Marks	:	50
Total Tutorial Hours	:	00	SEE Marks	:	50
Total Practical Hours	:	00	Exam Hours	:	3
Course Type	:	Theory	Course Code	:	ESCO3

Course Objectives : This course will enable students to:

- Analyze & design different stages of DC power supply.
- Get knowledge of the working and application of transistors amplifiers.
- Build the analog computational circuits using OP-AMP and generate AC signal of required frequency using Oscillator circuits.
- Equip students with basic foundations of embedded systems.
- Understand basics of digital electronics.
- Understand basics of analog and digital modulation techniques.

UNIT - I

POWER SUPPLIES **8 Hrs**

Block diagram, Half-wave rectifier, Full-wave rectifiers, C- filter (Qualitative analysis), Zener voltage regulator, Line and load regulation, Voltage multipliers.

AMPLIFIERS

Review of BJT, BJT as a switch; Cut-off and saturation modes; RC coupled CE amplifier, Multi-stage amplifier.

UNIT - II

OPERATIONAL AMPLIFIERS **8 Hrs**

Ideal op-amp; characteristics of ideal and practical op-amp; Practical op-amp circuits: Inverting and non-inverting amplifiers, voltage follower, summer, subtractor, integrator, differentiator.

OSCILLATORS

Barkhausen criterion, sinusoidal and non-sinusoidal oscillators, RC phase shift oscillator, Wein bridge oscillator, Multivibrators, Single-stage astable oscillator, Crystal controlled oscillators (using Op-amp, qualitative analysis).

UNIT - III

BOOLEAN ALGEBRA AND LOGIC CIRCUITS **7 Hrs**

Binary numbers, Number Base Conversion, octal & Hexa Decimal Numbers, Complements, Basic definitions, Axiomatic Definition of Boolean Algebra, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Other Logic Operations, Digital Logic Gates

COMBINATIONAL LOGIC

Introduction, Design procedure, Adders- Half adder, Full adder.

UNIT - IV

EMBEDDED SYSTEMS **8 Hrs**

Definition, Embedded systems vs general computing systems, Classification of Embedded Systems, Major application areas of Embedded Systems, Elements of an Embedded System, Core of the Embedded System, Microprocessor vs Microcontroller, RISC vs CISC

SENSORS AND INTERFACING

Instrumentation and control systems, Transducers, Sensors, Actuators, LED, 7-Segment LED Display.

UNIT - V

ANALOG COMMUNICATION SCHEMES **8 Hrs**

Modern communication system scheme, Information source, input transducer, Transmitter, Channel or Medium – Hardwired and Soft wired, Noise, Receiver, Multiplexing, Types of communication systems. Types of modulation (only concepts) – AM, FM, Concept of Radio wave propagation (Ground, space, sky)

DIGITAL MODULATION SCHEMES

Advantages of digital communication over analog communication, ASK, FSK, PSK, Radio signal transmission Multiple access techniques.

TEXT BOOKS :

1	Mike Tooley	'Electronic Circuits, Fundamentals & Applications', Elsevier, 4th Edition, 2015. https://doi.org/10.4324/9781315737980.

2	M. Morris Mano	Digital Logic and Computer Design, PHI Learning, 2008 ISBN-978-81-203-0417-84.
3	D P Kothari, I J Nagrath	'Basic Electronics', McGraw Hill Education (India) Private Limited, 2nd edition, 2018.
4	Shibu K V	Introduction to Embedded Systems, Tata Mc Graw Hill Education Pvt. Ltd., 2nd edition, 2017.

Course Outcomes :

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

CO1 : Analyze different stages of DC power supply, transistor characteristics and amplifier.

CO2 : Analyze the characteristics of OPAMP, develop the applications using OPAMP.

CO3 : Simplify and realize Boolean expressions, analyze & implement combinational logic circuits.

CO4 : Differentiate embedded systems versus general computing systems and analyze different embedded architectures.

CO5 : Analyze different analog and digital modulation techniques.

Introduction to Mechanical Engineering

Contact Hours/ Week	:	3(L) + 0(T) + 0(P)	Credits	:	3.0
Total Lecture Hours	:	39	CIE Marks	:	50
Total Tutorial Hours	:	00	SEE Marks	:	50
Total Practical Hours	:	00	Exam Hours	:	3
Course Type	:	Theory	Course Code	:	ESCO4

Course Objectives : This course will enable students :

- To develop basic Knowledge on Mechanical Engineering, Fundamentals and Energy Sources.
- Understand the concept of different types of Machine tool operations and ModernManufacturing Processes like CNC, 3D printing.
- To know the concept of IC engines and Future Mobility vehicles.
- To give exposure in the field of Engineering Materials and Manufacturing ProcessesTechnology and its applications
- To acquire a basic understanding role of Mechanical Engineering in the Robotics andAutomation in industry.

UNIT - I

INTRODUCTION **7 Hrs**

Role of Mechanical Engineering in Industries and Society, Emerging Trends and Technologies in different sectors such as Energy, Manufacturing, Automotive and Aerospace.

ENERGY

Introduction to various Energy Sources, Basic working principles of Thermal power plant, nuclear power plant, Solar power plant (Photovoltaic based) and Wind power plant. Environmental issues like Global warming and Ozone depletion.

UNIT - II

MACHINE TOOL OPERATIONS **8 Hrs**

Working Principle of lathe, Lathe operations: Plain Turning, facing, knurling. Working principles of Bench Type Drilling Machine, drilling operations: drilling, boring, reaming. Working of Horizontal Milling Machine, Milling operations: plane milling and slot milling.

INTRODUCTION TO ADVANCED MANUFACTURING SYSTEMS

Introduction, components of CNC, advantages and application of CNC, Introduction to 3D printing and 3D printing by stereolithography process.

UNIT - III

INTRODUCTION TO IC ENGINES **8 Hrs**

Topic / contents Components and Working Principles, 4-Strokes Petrol and Diesel Engines, comparison of 4-stroke Petrol and Diesel engine, Application of IC Engines.

INSIGHT INTO FUTURE MOBILITY

Electric and Hybrid Vehicles, Components of Electric and Hybrid Vehicles. Advantages and disadvantages of EVs and Hybrid vehicles.

UNIT - IV

ENGINEERING MATERIALS **8 Hrs**

Properties and applications of Ferrous & Nonferrous Metals, silica, ceramics, glass, graphite, diamond and polymer, Shape Memory Alloys.

JOINING PROCESSES

Soldering, Brazing and Welding, Definitions, classification of welding process, Arc welding, Gas welding and types of flames

UNIT - V

INTRODUCTION TO MECHATRONICS AND ROBOTICS **8 Hrs**

open-loop and closed-loop mechatronic systems, Classification of Robots: Robot Anatomy, Application, Advantages and Disadvantages.

AUTOMATION IN INDUSTRY

Definition, types – Fixed, programmable and flexible automation, basic elements with block diagrams, advantages.

INTRODUCTION TO IOT

Definition and Characteristics, Physical design, protocols, Logical design of IoT, Functional blocks, and communication models.

TEXT BOOKS :

1	K R Gopala Krishna	Elements of Mechanical Engineering, Subhash Publications, 2008
2	Jonathan Wickert and Kemper Lewis	An Introduction to Mechanical Engineering, Third Edition, 2012

REFERENCE BOOKS :

1	Hazra Choudhry and Nirzar Roy	Elements of Workshop Technology (Vol. 1 and 2), Media Promoters and Publishers Pvt. Ltd., 2010.
2	P.N.Rao	Manufacturing Technology- Foundry, Forming and Welding, Tata McGraw Hill 3rd Ed, 2003.
3	V. Ganesan	Internal Combustion Engines, Tata McGraw Hill Education; 4th edition, 2017
4	Appu Kuttan	Robotics, K K. International Pvt Ltd, volume 1
5	Dr SRN Reddy, Rachit Thukral, Manasi Mishra	"Introduction to Internet of Things: A Practical Approach", ETI Labs
6	Raj Kamal	"Internet of Things: Architecture and Design", McGraw hill.

WEB LINKS AND VIDEO LECTURES (e-RESOURCES) :

1	Videos | Makino (For Machine Tool Operation)
2	https://www.youtube.com/watch?v=vIJ50aUiBgM

Course Outcomes :

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

CO1 : Explain the Role of Mechanical Engineering in Industries and Society, various Energy sources and its impact on environment.

CO2 : Describe the Machine Tool Operations and Advanced Manufacturing process.

CO3 : Explain the Working Principle of IC engines, Electric and Hybrid vehicles.

CO4 : Discuss the Properties of Common Engineering Materials and various Metal Joining Processes.

CO5 : Explain the Concepts of Mechatronics, Robotics and Automation in IoT.

Introduction to C Programming

Contact Hours/ Week	:	2(L) + 0(T) + 2(P)	Credits	:	3.0
Total Lecture Hours	:	26	CIE Marks	:	50
Total Tutorial Hours	:	00	SEE Marks	:	50
Total Practical Hours	:	26	Exam Hours	:	3
Course Type	:	Theory	Course Code	:	ESCO5

Course Objectives : This course will enable students to:

- Elucidate the basic architecture and functionalities of a Computer.
- Apply programming constructs of C language to solve the real-world problems.
- Explore user-defined data structures like arrays, structures and pointers in implementing solutions to problems.
- Design and Develop Solutions to problems using modular programming constructs such as functions and procedures

UNIT - I

INTRODUCTION TO C **5L + 2P Hrs**

Introduction to computers, input and output devices, designing efficient programs. Introduction to C, Structure of C program, Files used in a C program, Compilers, Compiling and executing C programs, variables, constants, Input/output statements in C

Textbook: Chapter 1.1 - 1.9, 2.1 - 2.2, 8.1 - 8.6, 9.1 - 9.14

UNIT - II

DECISION CONTROL AND LOOPING STATEMENTS **5L + 6P Hrs**

Operators in C, Type conversion and typecasting. Introduction to decision control, Conditional branching statements, iterative statements, nested loops, break and continue statements, goto statement.

Textbook: Chapter 9.15 - 9.16, 10.1 - 10.6

UNIT - III

FUNCTIONS & ARRAY **6L + 6P Hrs**

Functions- Introduction using functions, Function definition, function declaration, function call, return statement, passing parameters to functions, scope of variables, storage classes, recursive functions.

ARRAYS

Declaration of arrays, accessing the elements of an array, storing values in arrays, Operations on arrays, Passing arrays to functions.

Textbook: Chapter 11.1 - 11.13, 12.1 - 12.6

UNIT - IV

Two dimensional arrays, operations on two-dimensional arrays, two-dimensional arrays to functions, multidimensional arrays **5L + 6P Hrs**

APPLICATIONS OF ARRAYS AND INTRODUCTION TO STRINGS

Applications of arrays, case study with sorting techniques.

INTRODUCTION TO STRINGS

Reading strings, writing strings, summary of functions used to read and write characters.Suppressing input using a Scanset.

Textbook: Chapter 12.7 - 12.12

UNIT - V

STRINGS **5L + 6P Hrs**

String taxonomy, operations on strings, Miscellaneous string and character functions, arrays of strings.

POINTERS

Understanding the Computers Memory, Introduction to Pointers, Declaring Pointer Variables.

STRUCTURES

Introduction to structures

Textbook: Chapter 13.1 - 13.6, 14.1 - 14.3, 15.1

Lab Assignments

1	C Program to find Mechanical Energy of a particle using E = mgh+1/2 mv2.
2	C Program to convert Kilometers into Meters and Centimeters.
3	C Program To Check the Given Character is Lowercase or Uppercase or Special Character.
4	Program to balance the given Chemical Equation values x, y, p, q of a simple chemical equation of the type: The task is to find the values of constants b_1, b_2, b_3 such that the equation is balanced on both sides and it must be the reduced form.
5	Implement Matrix multiplication and validate the rules of multiplication

6	Compute sin(x)/cos(x) using Taylor series approximation. Compare you result with the built-in library function. Print both the results with appropriate inferences.
7	Sort the given set of N numbers using Bubblesort.
8	Write functions to implement string operations such as compare, concatenate,string length Convince the parameter passing techniques.
9	Implement structures to read, write and compute average-marks and the students scoring above and below the average marks for a class of N students
10	Develop a program using pointers to compute the sum, mean and standard deviation of all elements stored in an array of N real numbers

WEB LINKS AND VIDEO LECTURES (e-RESOURCES) :

1	elearning.vtu.ac.in/econtent/courses/video/BS/15PCD23.html
2	https://nptel.ac.in/courses/106/105/106105171/ MOOC courses can be adopted for more clarity in understanding the topics and verities of problem solving methods.

TEXT BOOKS :

1	Reema Thareja	Computer fundamentals and programming in C, Oxford University, Second edition, 2017.

REFERENCE BOOKS :

1	E. Balaguruswamy	Programming in ANSI C, 7th Edition, Tata McGraw-Hill.
2	Brian W. Kernighan and Dennis M. Ritchie	The 'C' Programming Language, Prentice Hall of India.

Course Outcomes :

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

CO1 : Elucidate the basic architecture and functionalities of a computer and also recognize the hardware parts.

CO2 : Apply programming constructs of C language to solve the real world problem.

CO3 : Explore user-defined data structures like arrays in implementing solutions to problems like searching and sorting.

CO4 : Explore user-defined data structures like structures and pointers in implementing solutions.

CO5 : Design and Develop Solutions to problems using modular programming constructs using functions.

Introduction to Web Programming

Contact Hours/ Week	:	2(L) + 0(T) + 2(P)	Credits	:	3.0
Total Lecture Hours	:	26	CIE Marks	:	50
Total Tutorial Hours	:	00	SEE Marks	:	50
Total Practical Hours	:	26	Exam Hours	:	3
Course Type	:	Integrated	Course Code	:	PLC1

Course Objectives : This course will enable students :

- To use the syntax and semantics of HTML and XHTML
- To develop different parts of a web page
- To understand how CSS can enhance the design of a webpage.
- To create and apply CSS styling to a webpage
- To get familiarity with the JavaScript language and understand Document ObjectModel handling of Java Script

UNIT - I

TRADITIONAL HTML AND XHTML **5L + 5P Hrs**

First Look at HTML and XHTML, Hello HTML and XHTML World, HTML and XHTML: Version History, HTML and XHTML DTDs: The Specifications Up Close, (X)HTML Document Structure, Browsers and (X)HTML, The Rules of (X)HTML, Major Themes of (X)HTML, The Future of Markup - Two Paths.

Text Book 1: Chapter 1

UNIT - II

HTML5 **5L + 5P Hrs**

Hello HTML5, Loose Syntax Returns, XHTML5, HTML5: Embracing the Reality of Web Markup, Presentational Markup Removed and Redefined, HTML5 Document Structure Changes, Adding Semantics, HTML5's Open Media Effort, Client-Side Graphics with <canvas>, HTML5 Form Changes, Emerging Elements and Attributes to Support Web Applications.

Text Book 1: Chapter 2

UNIT - III

CASCADING STYLE SHEETS (CSS) **5L + 5P Hrs**

Introduction, CSS Overview , CSS Rules, Example with Type Selectors and the Universal Selector, CSS Syntax and Style, Class Selectors, ID Selectors, span and div Elements, Cascading, style Attribute, style Container, External CSS Files, CSS Properties, Color Properties, RGB Values for Color, Opacity

Values for Color, HSL and HSLA Values for Color, Font Properties, line-height

Property, Text Properties, Border Properties, Element Box, padding Property, margin Property , Case Study: Description of a Small City's Core Area.

Text Book 2 : Chapter 3

UNIT - IV

TABLES AND CSS, LINKS AND IMAGES **6L + 6P Hrs**

Table Elements, Formatting a Data Table: Borders, Alignment, and Padding, CSS Structural Pseudo- Class Selectors, thead and tbody Elements, Cell Spanning, Web Accessibility, CSS display Property with Table Values, a Element, Relative URLs, Navigation Within a Web Page, CSS for Links, Bitmap Image Formats: GIF, JPEG, PNG, img Element, Responsive Images, Positioning Images, Shortcut Icon, iframe Element.

Text Book 2: 5.2 to 5.8, 6.2, 6.3, 6.6., 6.7, 6.9, 6.10, 6.12, 7.2 to 7.4

UNIT - V

INTRODUCTION TO JAVASCRIPT: FUNCTIONS, DOM, FORMS, AND EVENT HANDLERS **5L + 5P Hrs**

History of JavaScript, Hello World Web Page, Buttons, Functions, Variables, Identifiers, Assignment Statements and Objects, Document Object Model, Forms and How They're Processed: Client-Side Versus Server-Side, form Element, Controls, Text Control, Accessing a Form's Control Values, reset and focus Methods

Text Book 2: 8.2 to 8,13, 8.15, 8.16

Programming Assignments

1. Create an XHTML page using tags to accomplish the following:
   i. A paragraph containing text "All that glitters is not gold". Bold face and italicize this text
   ii. Create equation:
   $x = 1/3\ (y^2 + z^2)$
   iii. Put a background image to a page and demonstrate all attributes of background image
   iv. Create unordered list of 5 fruits and ordered list of 3 flowers
2. Create following table using XHTML tags. Properly align cells, give suitable cell padding and cell spacing, and apply background color, bold and emphasis necessary.

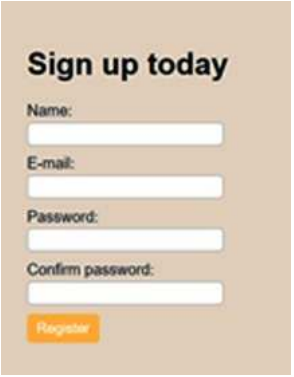
Department	**Sem 1**	**Subject A**
		Subject B
		Subject C
	Sem 2	**Subject E**
		Subject F
		Subject G
	Sem 3	**Subject H**
		Subject I
		Subject J

3. Use HTML5 for performing following tasks:
   i. Draw a square using HTML5 SVG , fill the square with green color and make 6px brownstroke width
   ii. Write the following mathematical expression by using HTML5 MathML.d=x^2-y^2
   iii. Redirecting current page to another page after 5 seconds using HTML5 meta tag
4. Demonstrate the following HTML5 Semantic tags- <article>, <aside>, <details>, <figcaption>, <figure>, <footer>, <header>, <main>, <mark>, <section> for a webpage that gives information about travel experience
5. Create a class called **income**, and make it a background color of #off. Create a class called **expenses**, and make it a background color of #f0f. Create a class called **profit**, and make it a background color of#f00. Throughout the document, any text that mentions income, expenses, or profit, attach the appropriate class to that piece of text. Further create following line of text in the same document:

   ~~The current price is 50₹~~ and new price is 40₹
6. Change the tag **li** to have the following properties:
   i. A display status of inline
   ii. A medium, double-lined, black border
   iii. No list style type

   Add the following properties to the style for **li**:
   iv. Margin of 5px
   v. Padding of 10px to the top, 20px to the right, 10px to the bottom, and 20px tothe left
   vi. Also demonstrate list style type with user defined image logos

7. Create following web page using HTML and CSS with tabular layout



8. Create following calculator interface with HTML and CSS.

9. Write a Java Script program that on clicking a button, displays scrolling text which moves from left to right with a small delay.
10. Create a webpage containing 3 overlapping images using HTML, CSS and JS. Further when the mouse is over any image, it should be on the top and fully displayed.

TEXT BOOKS :

1	Thomas A. Powell,	HTML & CSS: The Complete Reference Fifth Edition, TataMcGraw Hill
2	John Dean, Jones and Bartlett Learning,	WEB PROGRAMMING with HTML5, CSS and JavaScript, First Edition

WEB LINKS AND VIDEO LECTURES (e-RESOURCES) :

1	https://onlinecourses.swayam2.ac.in/aic20_sp11/preview

REFERENCE BOOKS :

1	E. Balaguruswamy	Programming in ANSI C, 7th Edition, Tata McGraw-Hill.
2	Brian W. Kernighan and Dennis M. Ritchie	The 'C' Programming Language, Prentice Hall of India.

Course Outcomes :

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

CO1 : Explain the historical context and justification for HTML over XHTML.

CO2 : Develop HTML5 documents and adding various semantic markup tags.

CO3 : Analyse various attributes, values and types of CSS.

CO4 : Implement core constructs and event handling mechanisms of JavaScript.

Introduction to Python Programming

Contact Hours/ Week	:	2(L) + 0(T) + 2(P)	Credits	:	3.0
Total Lecture Hours	:	26	CIE Marks	:	50
Total Tutorial Hours	:	00	SEE Marks	:	50
Total Practical Hours	:	26	Exam Hours	:	3
Course Type	:	Integrated	Course Code	:	PLC2

Course Objectives : This course will enable students to:

- Learn the syntax and semantics of the Python programming language.
- Illustrate the process of structuring the data using lists, tuples
- Appraise the need for working with various documents like Excel, PDF, Word and Others.
- Demonstrate the use of built-in functions to navigate the file system.
- Implement the Object Oriented Programming concepts in Python.

UNIT - I

PYTHON BASICS **6L + 4P Hrs**

Entering Expressions into the Interactive Shell, The Integer, Floating-Point, and String Data Types, String Concatenation and Replication, Storing Values in Variables, Your First Program, Dissecting Your Program, **Flow control:** Boolean Values, Comparison Operators, Boolean Operators, Mixing Boolean and Comparison Operators, Elements of Flow Control, Program Execution, Flow Control Statements, Importing Modules, Ending a Program Early with sys. exit(), **Functions:** def Statements with Parameters, Return Values and return Statements, The None Value, Keyword Arguments and print(), Local and Global Scope, The global Statement, Exception Handling, A Short Program: Guess the Number

Text book 1: Chapters 1 – 3

UNIT - II

LISTS **4L + 6P Hrs**

The List Data Type, Working with Lists, Augmented Assignment Operators, Methods, Example Program: Magic 8 Ball with a List, List-like Types: Strings and Tuples, References

DICTIONARIES AND STRUCTURING DATA

The Dictionary Data Type, Pretty Printing, Using Data Structures to Model Real-World Things.

Text book 1: Chapters 4 - 5

UNIT - III

MANIPULATING STRINGS **6L + 6P Hrs**

Working with Strings, Useful String Methods, Project: Password Locker, Project: Adding Bullets to Wiki Markup

READING AND WRITING FILES

Files and File Paths, The os.path Module, The File Reading/Writing Process, Saving Variables with the shelve Module, Saving Variables with the print. Format() Function, Project: Generating Random Quiz Files, Project: Multiclipboard.

Text book 1: Chapters 6, 8

UNIT - IV

ORGANIZING FILES **4L + 4P Hrs**

The shutil Module, Walking a Directory Tree, Compressing Files with the zip file Module, Project: Renaming Files with American-Style Dates to European-Style Dates, Project: Backing Up a Folder into a ZIP File.

DEBUGGING

Raising Exceptions, Getting the Trace back as a String, Assertions, Logging, IDLE‟s Debugger.

Text book 1: Chapters 9 - 10

UNIT - V

CLASSES AND OBJECTS **6L + 6P Hrs**

Programmer-defined types, Attributes, Rectangles, Instances as return values, Objects are mutable, Copying.

CLASSES AND FUNCTIONS

Time, Pure functions, Modifiers, Prototyping versus planning.

CLASSES AND METHODS

Object-oriented features, Printing objects, Another example, A more complicated example, Theinit method, The str method, Operator overloading, Type-based dispatch, Polymorphism, Interface and implementation.

Text book 2: Chapters 15 – 17

Programming Exercises

1	Develop a program to read the student details like Name, USN, and Marks in three subjects. Display the student details, total marks and percentage with suitable messages
	Develop a program to read the name and year of birth of a person. Display whether the person is a senior citizen or not.
2	Develop a program to generate Fibonacci sequence of length (N). Read N from the console.
	Write a function to calculate factorial of a number. Develop a program to compute binomial coefficient (Given N and R).
3	Read N numbers from the console and create a list. Develop a program to print mean, variance and standard deviation with suitable messages.
4	Read a multi-digit number (as chars) from the console. Develop a program to print the frequency of each digit with suitable message.
5	Develop a program to print 10 most frequently appearing words in a text file. [Hint: Use dictionary with distinct words and their frequency of occurrences. Sort the dictionary in the reverse order of frequency and display dictionary slice of first 10 items]
6	Develop a program to sort the contents of a text file and write the sorted contents into a separate text file. [Hint: Use string methods strip(), len(), list methods sort(), append(), and file methods open(), readlines(), and write()].
7	Develop a program to backing Up a given Folder (Folder in a current working directory) into a ZIP File by using relevant modules and suitable methods.
8	Write a function named DivExp which takes TWO parameters a, b and returns a value c (c=a/b). Write suitable assertion for a>0 in function DivExp and raise an exception for when b=0. Develop a suitable program which reads two values from the console and calls a function DivExp.
9	Define a function which takes TWO objects representing complex numbers and returns new complex number with a addition of two complex numbers. Define a suitable class 'Complex' to represent the complex number. Develop a program to read N (N >=2) complex numbers and to compute the addition of N complex numbers.
10	Develop a program that uses class Student which prompts the user to enter marks in three subjects and calculates total marks, percentage and displays the score card details. [Hint: Use list to store the marks in three subjects and total marks. Use_init_() method to initialize name, USN and the lists to store marks and total, Use get Marks() method to read marks into the list, and display() method to display the score card details.]

WEB LINKS AND VIDEO LECTURES (e-RESOURCES) :

1	https://www.learnbyexample.org/python/
2	https://www.learnpython.org/
3	https://pythontutor.com/visualize.html#mode=edit

TEXT BOOKS :

1	Al Sweigart	**"Automate the Boring Stuff with Python",** 1st Edition, No Starch Press, 2015. (Available under CC-BY-NC-SA license at https://automatetheboringstuff.com/) (Chapters 1 to 18, except 12) for lambda functions use this link: https://www.learnbyexample.org/python-lambda-function/
2	Allen B. Downey	**"Think Python: How to Think Like a Computer Scientist**", 2nd Edition, Green Tea Press, 2015. (Available under CC-BY-NC license at http://greenteapress.com/thinkpython2/thinkpython2.pdf (Chapters 13, 15, 16, 17, 18) (Download pdf/html files from the above link)

Course Outcomes :

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

CO1 : Demonstrate proficiency in handling loops and creation of functions.

CO2 : Identify the methods to create and manipulate lists, tuples and dictionaries.

CO3 : Develop programs for string processing and file organization.

CO4 : Interpret the concepts of Object-Oriented Programming as used in Python.

Basics of JAVA Programming

Contact Hours/ Week	:	2(L) + 0(T) + 2(P)	Credits	:	3.0
Total Lecture Hours	:	26	CIE Marks	:	50
Total Tutorial Hours	:	00	SEE Marks	:	50
Total Practical Hours	:	26	Exam Hours	:	3
Course Type	:	Integrated	Course Code	:	PLC3

Course Objectives : This course will enable students to:

- Learn fundamental features of object oriented language and JAVA
- Set up Java JDK environment to create, debug and run simple Java programs.
- Learn object oriented concepts using programming examples.
- Study the concepts of importing of packages and exception handling mechanism.

UNIT - I

AN OVERVIEW OF JAVA **6L + 4P Hrs**

Object-Oriented Programming, A First Simple Program, A Second Short Program, Two Control Statements, Using Blocks of Code, Lexical Issues, The Java Class Libraries, Data Types, Variables, and Arrays: Java Is a Strongly Typed Language, The Primitive Types, Integers, Floating-Point Types, Characters, Booleans, A Closer Look at Literals, Variables, Type Conversion and Casting, Automatic Type Promotion in Expressions, Arrays, A Few Words About Strings.

Text book 1: Ch 2, Ch 3

UNIT - II

OPERATORS **4L + 6P Hrs**

Arithmetic Operators, The Bitwise Operators, Relational Operators, Boolean Logical Operators, The Assignment Operator, The ? Operator, Operator Precedence, Using Parentheses, Control Statements: Java‟s Selection Statements, Iteration Statements, Jump Statements.

Text book 1: Ch 4, Ch 5

UNIT - III

INTRODUCING CLASSES **6L + 6P Hrs**

Class Fundamentals, Declaring Objects, Assigning Object Reference Variables, Introducing Methods, Constructors, The this Keyword, Garbage Collection, The finalize( ) Method, A Stack Class, A Closer Look at Methods

and Classes: Overloading Methods, Using Objects as Parameters, A Closer Look at Argument Passing, Returning Objects, Recursion, Introducing Access Control, Understanding static, Introducing final, Arrays Revisited.

Text book 1: Ch 6, Ch 7 (7.1-7.9)

UNIT - IV

INHERITANCE **6L + 6P Hrs**

Inheritance, Using super, Creating a Multilevel Hierarchy, When Constructors Are Called, Method Overriding, Dynamic Method Dispatch, Using Abstract Classes, Using final with Inheritance, The Object Class.

Text book 1: Ch 8

UNIT - V

PACKAGES AND INTERFACES **4L + 4P Hrs**

Packages, Access Protection, Importing Packages, Interfaces, Exception Handling: Exception-Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch Clauses, Nested try Statements, throw, throws, finally, Java"s Built-in Exceptions, Creating Your Own Exception Subclasses, Chained Exceptions, Using Exceptions.

Text book 1: Ch 9, Ch 10

Programming Assignments

1	Write a JAVA program that prints all real solutions to the quadratic equation $ax^2+bx+c=0$. Read in a,b, c and use the quadratic formula.
2	Write a JAVA program for multiplication of two arrays.
3	Demonstrate the following operations and sign extension with Java programs (i) << (ii) >> (iii) >>>
4	Write a JAVA program to sort list of elements in ascending and descending order using bubble sort.
5	Create a JAVA class called Student with the following details as variables within it. USN NAME BRANCH PHONE PERCENTAGE Write a JAVA program to create n Student objects and print the USN, Name, Branch, Phone, and percentage of these objects with suitable headings.

6	Write a JAVA program demonstrating Method overloading and Constructor overloading.
7	Design a super class called Staff with details as StaffId, Name, Phone, Salary. Extend this class by writing three subclasses namely Teaching (domain, publications), Technical (skills), and Contract (period). Write a JAVA program to read and display atleast 3 staff objects of all three categories.
8	Demonstrate dynamic dispatch using abstract class in JAVA.
9	Create two packages P1 and P2. In package P1, create class A, class B inherited from A, class C . In package P2, create class D inherited from class A in package P1 and class E. Demonstrate working of access modifiers (private, public, protected, default) in all these classes using JAVA.
10	Write a JAVA program to read two integers a and b. Compute a/b and print, when b is not zero. Raise an exception when b is equal to zero. Also demonstrate working of Array Index Out Of Bound Exception.

WEB LINKS AND VIDEO LECTURES (e-RESOURCES) :

1	https://onlinecourses.nptel.ac.in/noc22_cs47/preview

TEXT BOOKS :

1	Herbert Schildt	Java The Complete Reference, 7th Edition, Tata McGraw Hill, 2007

Course Outcomes :

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

CO1 : Explain the features and object oriented concepts in JAVA programming

CO2 : Analyse working of bitwise operators in JAVA.

CO3 : Develop simple programs based on polymorphism and Inheritance.

CO4 : Describe the concepts of importing packages and exception handling mechanics.

Introduction to C++ Programming

Contact Hours/ Week	:	2(L) + 0(T) + 2(P)	Credits	:	3.0
Total Lecture Hours	:	26	CIE Marks	:	50
Total Tutorial Hours	:	00	SEE Marks	:	50
Total Practical Hours	:	26	Exam Hours	:	3
Course Type	:	Integrated	Course Code	:	PLC4

Course Objectives : This course will enable students to:

- Understanding about object oriented programming and Gain knowledge about thecapability to store information together in an object.
- Understand the capability of a class to rely upon another class and functions.
- Understand about constructors which are special type of functions.
- Create and process data in files using file I/O functions.
- Use the generic programming features of C++ including Exception handling.

UNIT - I

Introduction to Object Oriented Programming: Computer programming background- C++ overview. First C++ Program -Basic C++ syntax, Object Oriented Programming: What is an object, Classes, methods and messages, abstraction and encapsulation, inheritance, abstract classes, polymorphism.

Text book 1: Chapter 1 (1.1 to 1.8) **6L + 4P Hrs**

UNIT - II

Functions in C++: Tokens – Keywords – Identifiers and constants – Operators in C++ – Scope resolution operator – Expressions and their types – Special assignment expressions – Function prototyping – Call by reference – Return by reference – Inline functions -Default arguments – Function overloading**.**

Text book 2: Chapter 3 (3.2, 3.3, 3.4, 3.13, 3.14, 3.19, 3.20),

Chapter 4 (4.3, 4.4, 4.5, 4.6, 4.7, 4.9) **4L + 6P Hrs**

UNIT - III

Inheritance & Polymorphism: Derived class Constructors, destructors- Types of Inheritance- Defining Derived classes, Single Inheritance, Multiple, Hierarchical Inheritance, Hybrid Inheritance.

Text book 2: Chapter 6 (6.2, 6.11) Chapter 8 (8.1 to 8.8) **6L + 6P Hrs**

UNIT - IV

I/O Streams: C++ Class Hierarchy- File Stream-Text File Handling - Binary File Handling during fileoperations.

Text book 1: Chapter 12 (12.5), Chapter 13 (13.6, 13.7) 6L + 6P Hrs

UNIT - V

Exception Handling: Introduction to Exception - Benefits of Exception handling - Try and catch blockThrow statement- Pre-defined exceptions in C++.

Text book 2: Chapter 13 (13.2 to 13.6) 4L + 4P Hrs

Programming Assignments

1	Write a C++ program to sort the elements in ascending and descending order using bubble sort.
2	Write a C++ program to find the sum of all the natural numbers from 1 to n.
3	Write a C++ program to swap 2 values by writing a function that uses call by reference technique.
4	Write a C++ program to demonstrate function overloading for the following prototypes. add(int a, int b) add(double a, double b)
5	Create a class named Shape with a function that prints "This is a shape". Create another class named Polygon inheriting the Shape class with the same function that prints "Polygon is a shape". Create two other classes named Rectangle and Triangle having the same function which prints "Rectangle is a polygon" and "Triangle is a polygon" respectively. Again, make another class named Square havingthe same function which prints "Square is a rectangle". Now, try calling the function by the object of each of these classes.
6	Suppose we have three classes Vehicle, Four Wheeler, and Car. The class Vehicle is the base class, the class Four Wheeler is derived from it and the class Car is derived from the class Four Wheeler. Class Vehicle has a method 'vehicle' that prints 'I am a vehicle', class Four Wheeler has a method 'Four Wheeler' that prints 'I have four wheels', and class Car has a method 'car' that prints 'I am a car'. So, as this is a multi-level inheritance; we can have access to all the other classes methods from the object of the class Car. We invoke all the methods from a Car object and print the corresponding outputs of the methods.

	So, if we invoke the methods in this order, car(), fourWheeler(), and vehicle(), then the output will be I am a car I have four wheels I am a vehicle Write a C++ program to demonstrate multilevel inheritance using this.
7	Write a C++ program to create a text file, check file created or not, if created it will write some textinto the file and then read the text from the file.
8	Write a C++ program to write and read time in/from binary file using f stream
9	Write a function which throws a division by zero exception and catch it in catch block. Write a C++program to demonstrate usage of try, catch and throw to handle exception.
10	Write a C++ program function which handles array of bounds exception using C++.

WEB LINKS AND VIDEO LECTURES (e-RESOURCES) :

1	Basics of C++ - https://www.youtube.com/watch?v=BCIS40yzssA
2	Functions of C++ - https://www.youtube.com/watch?v=p8ehAjZWjPw

TUTORIAL LINK (e-RESOURCES) :

1	https://www.w3schools.com/cpp/cpp_intro.asp
2	https://www.edx.org/course/introduction-to-c-3

TEXT BOOKS :

1	Bhushan Trivedi	"Programming with ANSI C++", Oxford Press, 2nd Edition, 2012.
2	Balagurusamy E	Object Oriented Programming with C++, Tata McGraw Hill Education Pvt.Ltd ,4th Edition 2010.

Course Outcomes :

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

CO1 : Able to understand and design the solution to a problem using object-orientedprogramming concepts.

CO2 : Able to reuse the code with extensible Class types, User-defined operators andfunction Overloading.

CO3 : Achieve code reusability and extensibility by means of Inheritance and Polymorphism.

CO4 : Implement the features of C++ including templates, exceptions and file handling forproviding programmed solutions to complex problems.

Smart Materials and Systems

Contact Hours/ Week	:	3(L) + 0(T) + 0(P)	Credits	:	3.0
Total Lecture Hours	:	39	CIE Marks	:	50
Total Tutorial Hours	:	00	SEE Marks	:	50
Total Practical Hours	:	00	Exam Hours	:	3
Course Type	:	Theory	Course Code	:	ETC01

Course Objectives : This course will enable students :

- To develop the students ability to learn emerging materials.
- To make students to learn prefabricated Smart material components.
- To understand the sensors deployed in smart materials.
- To learn the concepts of 3D Printing.
- To learn the concepts of different 3D Printing process

UNIT - I

INTRODUCTION TO SMART MATERIALS **08 Hrs**

General Characteristics of Materials, Types and classification of materials, Smart materials, Classification of smart materials, General principles of smart materials Smart Structures, potential Smart Structure systems or devices. **PO1**

UNIT - II

SMART STRUCTURES **08 Hrs**

Principle, Mechanism of working of piezoelectric, Magneto strictive, Electro strictive, Magnetorheological, Electrorheological materials, Smart gels, Chromic Materials etc., Applications of these smart materials. **PO1**

UNIT - III

SHAPE MEMORY ALLOYS (SMAS) OR
THERMO RESPONSIVE MATERIALS **08 Hrs**

Shape Memory Alloy, Principles of working properties (Shape memory effect and super elasticity) and preparation of shape memory alloys, types of SMAs, Determination of strain recovery by SME, Determination of Transformation temperatures. **PO2**

UNIT - IV

3-D PRINTING **08 Hrs**

Importance, Historic development, advantages, common terminologies, classification, Process chain, 3 – D modelling, Data conversion and transmission, checking and preparation, Building, Post processing, Applications. **PO2**

UNIT - V

STEREOLITHOGRAPHY **07 Hrs**

Stereolithography, Process parameter, applications. Fused Deposition Modelling, Process parameters, Applications, Selective laser Sintering, Process Parameter, Application, Solid Ground Curing, Process parameters, Applications. **PO2**

TEXT BOOKS :

1	Mel Schwartz	**Encyclopedia of Smart Materials**, John Wiley & Sons, New York, 2002

REFERENCE BOOKS :

1	K.Otsuka and C.M. Wayman	Shape Memory Materials, Cambridge University Press, London, 1998.
2	T.W.Duerig et al.	Engineering Aspects of Shape Memory Alloys, Butterworth and Heinemann editions, London, 1990.
3	M.V.Gandhi and B.S.Thompson	Smart Materials and Structure, Chapman and Hall, London, 1992.
4	Mohamed Gad-El-Hak (Eds.)	Handbook of MEMS, CRC Press, Florida, USA, 2001.
5	Pham D.T. and Dinjoy S.S	"Rapid Manufacturing" Verlog London 2001.
6	Rapid Prototyping Materials	By Gurumurthi, IISc Bangalore.

Course Outcomes :

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

CO1 : Identify and differentiate various Emerging Smart Materials and its Engineering Applications

CO2 : Describe the principle of working of Smart materials and describe the applications of these smart materials.

CO3 : Describe and distinguish the Shape Memory alloy and describe the fabrication of components using SMAs.

CO4 : Describe 3D printing process and Prepare CAD Data and Print 3 Dimensional components.

CO5 : Decide suitable Additive Manufacturing Process for 3D printing of materials.

Green Buildings

Contact Hours/ Week	:	3(L) + 0(T) + 0(P)	Credits	:	3.0
Total Lecture Hours	:	50	CIE Marks	:	50
Total Tutorial Hours	:	00	SEE Marks	:	50
Total Practical Hours	:	00	Exam Hours	:	3
Course Type	:	Theory	Course Code	:	ETC02

Course Objectives : This course will enable students to:

- Understand the Definition, Concept & Objectives of the terms cost effective construction and green building.
- Apply cost effective techniques in construction.
- Apply cost effective Technologies and Methods in Construction.
- Understand the Problems due to Global Warming.
- State the Concept of Green Building.
- Understand Green Buildings.

UNIT - I

INTRODUCTION TO THE CONCEPT OF COST EFFECTIVE CONSTRUCTION **08 Hrs**

Uses of different types of materials and their availability -Stone and Laterite blocks- Burned Bricks-Concrete Blocks- Stabilized Mud Blocks- Lime Pozzolana Cement- Gypsum Board-Light Weight Beams- Fiber Reinforced Cement Components- Fiber Reinforced Polymer Composite- Bamboo- Availability of different materials- Recycling of building materials – Brick- Concrete- Steel- Plastics - Environmental issues related to quarrying of building materials.

UNIT - II

ENVIRONMENT FRIENDLY AND COST EFFECTIVE BUILDING TECHNOLOGIES **08 Hrs**

Different substitute for wall construction Flemish Bond - Rat Trap Bond – Arches – Panels - Cavity Wall - Ferro Cement and Ferro Concrete constructions – different pre cast members using these materials - Wall and Roof Panels – Beams – columns - Door and Window frames - Water tanks - Septic Tanks - Alternate roofing systems - Filler Slab - Composite Beam and Panel Roof - Pre-engineered and ready to use building elements - wood products - steel and plastic - Contributions of agencies - COSTFORD - Nirmithi Kendra – Habitat.

UNIT - III

GLOBAL WARMING **08 Hrs**

Definition - Causes and Effects - Contribution of Buildings towards Global Warming - Carbon Footprint – Symbolic problem to calculate carbon footprints

for automobiles, Global Efforts to reduce carbon Emissions, Green Buildings – Definition - Features- Necessity – Environmental benefit - Economical benefits - Health and Social benefits - Major Energy efficient areas for buildings – Embodied Energy in Materials Green Materials - Comparison of Initial cost of Green V/s Conventional Building - Life cycle cost of Buildings.

UNIT - IV

GREEN BUILDING RATING SYSTEMS **08 Hrs**

BREEAM – LEED - GREEN STAR -GRIHA (Green Rating for Integrated Habitat Assessment) for new buildings – Purpose – Key highlights - Point System with Differential weight age. Green Design – Definition - Principles of sustainable development in Building Design - Characteristics of Sustainable Buildings – Sustainably managed Materials - Integrated Lifecycle design of Materials and Structures (Concepts only).

UNIT - V

UTILITY OF SOLAR ENERGY IN BUILDINGS **08 Hrs**

Utility of Solar energy in buildings concepts of Solar Passive Cooling and Heating of Buildings. Low Energy Cooling. Symbolic problem to calculate solar energy from solar panels. Case studies of Solar Passive Cooled and Heated Buildings.

GREEN COMPOSITES FOR BUILDINGS

Concepts of Green Composites. Water Utilisation in Buildings, Low Energy Approaches to Water Management. Management of Solid Wastes. Management of Sullage Water and Sewage. Urban Environment and Green Buildings. Green Cover and Built Environment.

TEXT BOOKS :

1	Harhara Iyer G	Green Building Fundamentals, Notion Press
2	Dr. Adv. Harshul Savla	Green Building: Principles & Practices

Course Outcomes :

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

- **CO1 :** Explain the concepts and objectives of cost-effective constructions. (PO6 & PO7)
- **CO2 :** Explain cost effective methods and technologies in green building constructions. (PO6 & PO7)
- **CO3 :** Explain causes and problems of global warming and benefits of green building approach. (PO6 & PO7)
- **CO4 :** Explain the green rating of buildings as per different organizations. (PO6 & PO7)
- **CO5 :** Explain low-energy approaches; water, waste-water and soil waste management in green buildings. (PO6 & PO7)

ETC03

Operation and Maintenance of Solar Electric Systems

Contact Hours/ Week	:	3(L) + 0(T) + 0(P)	Credits	:	3.0
Total Lecture Hours	:	40	CIE Marks	:	50
Total Tutorial Hours	:	00	SEE Marks	:	50
Total Practical Hours	:	00	Exam Hours	:	3
Course Type	:	Theory	Course Code	:	ETC03

Course Objectives : This course will enable students :

- To discuss basics of solar resource data, its acquisition and usage.
- To discuss PV technology, characteristics and interconnections of modules.
- To discuss batteries, converters and inverters, system components for standalone SPV system and designing of standalone SPV system.
- To explain the functioning of grid connected system and different applications of SPV systems.
- To explain maintenance of PV systems.

UNIT - I

FUNDAMENTALS OF SOLAR ENERGY **08 Hrs**

Energy Scenarios, Physics of propagation of solar radiation from the sun to the earth, solar radiation and sunshine measuring instruments, Geometry, angles and measurement. Estimation of radiation under different climatic conditions, Estimation of radiation in horizontal and inclined surface.

UNIT - II

FUNDAMENTALS OF SOLAR PV CELL **08 Hrs**

A historical perspective of PV cells, Semiconductor physics, Model of PV cell, Performance characterization of PV cells, Datasheet study, Effect of temperature and irradiance, Photovoltaic modules and arrays.

UNIT - III

FUNDAMENTALS OF SOLAR PV SYSTEM **08 Hrs**

Overview of solar energy conversion devices and applications, Basics of Batteries, Applications of Batteries in Solar PV Systems, Charge Controller, MPPT and Inverters Components of and functioning of standalone PV system, Design of standalone PV system.

UNIT - IV

APPLICATIONS OF SPV SYSTEMS **08 Hrs**

Functioning and components of grid connected PV system, PV and Water Pumping, Solar energy applications in cooking, desalination, and refrigeration and electricity generation.

UNIT - V

MAINTENANCE OF SOLAR PV SYSTEM **08 Hrs**

System maintenance, PV array maintenance, Inverter maintenance, System integrity, Troubleshooting, Identifying the problem, Troubleshooting PV arrays, troubleshooting underperforming systems, Troubleshooting inverters, other common problems.

TEXT BOOKS :

1	Solanki C.S.	**"Solar Photovoltaics - Fundamentals, Technologies and Applications"**, Prentice Hall India Learning Private Limited; 3rd edition, ASIN: 8120351118
2	Solanki C.S.	**"Solar Photovoltaic Technology and Systems: A Manual for Technicians, Trainers and Engineers"**, Prentice Hall India Learning Private Limited, ISBN-13: 978-8120347113

REFERENCE BOOKS :

1	J. N. Roy D. N. Bose	**"Photovoltaic Science and Technology"**, Cambridge University Press; 1st edition, ISBN-13: 978-1108415248
2	Arno Smets Klaus Jäger, Olindo Isabella, René van Swaaij, Miro Zeman	**"Solar Energy: The Physics and Engineering of Photovoltaic Conversion, Technologies and Systems"** UIT Cambridge LTD, ISBN-13 : 978-1906860325

Course Outcomes :

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

CO1 : Explain the basics of solar resource data, its acquisition and usage.

CO2 : Explain PV technology, characteristics and connecting the modules to form arrays.

CO3 : Explain the applications of batteries, inverters, other system components, used to design and connect the components of standalone PV system.

CO4 : Explain the operation of grid connected system and different applications of SPV systems.

CO5 : Explain the operation and maintenance of SPV systems.

Introduction to Embedded System

Contact Hours/ Week	:	3(L) + 0(T) + 0(P)	Credits	:	3.0
Total Lecture Hours	:	40	CIE Marks	:	50
Total Tutorial Hours	:	00	SEE Marks	:	50
Total Practical Hours	:	00	Exam Hours	:	3
Course Type	:	Theory	Course Code	:	ETC04

Course Objectives : This course will enable students to:

- Acquire the Knowledge and understanding of fundamentals of embedded systems.
- Describe the differences between the general computing system and the embedded system, also recognize the classification of embedded systems.
- Develop familiarity with tools used to develop in an embedded environment.
- Understand the role of embedded systems in industry.
- Learn the method of designing and program an Embedded Systems for real time applications.

UNIT - I

INTRODUCTION **8 Hrs**

Embedded Systems and general-purpose computer systems, history, classifications, applications and purpose of embedded systems. Core of Embedded Systems: Microprocessors and microcontrollers, RISC and CISC controllers, Big endian and Little-endian processors, Application specific ICs, Programmable logic devices, COTS, sensors and actuators, communication interface, embedded firmware, other system components, PCB and passive components.

UNIT - II

CHARACTERISTICS AND QUALITY ATTRIBUTES OF EMBEDDED SYSTEMS **8 Hrs**

Characteristics, Operational and non- operational quality attributes, application specific embedded system - washing machine, domain specific - automotive.

UNIT - III

EMBEDDED HARDWARE **8 Hrs**

Memory map, i/o map, interrupt map, processor family, external peripherals, memory - RAM, ROM, types of RAM and ROM, memory testing, CRC, Flash memory.

UNIT - IV

PERIPHERALS **8 Hrs**

Control and Status Registers, Device Driver, Timer Driver-Watchdog Timers, Embedded Operating System, Real-Time Characteristics, Selection Process.

UNIT - V

DESIGN AND DEVELOPMENT **8 Hrs**

Embedded System development environment - IDE, Types of files generated on cross compilation, disassembler / decompiler, simulator, emulator and debugging, embedded product development life-cycle, trends in embedded industry.

TEXT BOOKS :

1	Shibu K V	"Introduction to embedded systems", Tata McGraw Hill Education Private Limited (1 January 2009), ISBN-10: 0070678790

REFERENCE BOOKS :

1	Rajkamal	"Embedded Systems", Tata McGraw Hill Education (1 January 2003), ISBN-10: 0070494703

Course Outcomes :

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

CO1 : Acquire knowledge and understand fundamental embedded systems design.

CO2 : Analyze a system both as whole and in the included parts, to understand how these parts interact in the functionality and properties of the system.

CO3 : Integrating embedded subsystems and applications in building a fully functional autonomous robot.

CO4 : Apply formal method, testing, verification for Embedded system.

CO5 : Develop simple embedded systems for real time operations.

Introduction to Nanotechnology

Contact Hours/ Week	:	3(L) + 0(T) + 0(P)	Credits	:	3.0
Total Lecture Hours	:	40	CIE Marks	:	50
Total Tutorial Hours	:	00	SEE Marks	:	50
Total Practical Hours	:	00	Exam Hours	:	3
Course Type	:	Theory	Course Code	:	ETC05

Course Objectives : This course will enable students :

- To provide a comprehensive overview of synthesis and characterization of nanoparticles, nanocomposites and hierarchical materials with nanoscale features.
- To provide the engineering students with necessary background for understanding various nanomaterials characterization techniques.
- To develop an understanding of the basis of the choice of material for device applications.
- To give an insight into complete systems where nanotechnology can be used to improve our everyday life.

UNIT - I

INTRODUCTION TO NANOMATERIALS **7 Hrs**

Nanotechnology, Frontier of future-an overview, Length Scales, Variation of physical properties from bulk to thin films to nanomaterials, Confinement of electron in 0D, 1D, 2D and 3D systems, Surface to Volume Ratio, Synthesis of Nanomaterials : Bottom-Up approach: Chemical Routes for Synthesis of Nanomaterials-Sol-gel, Precipitation, Solution Combustion synthesis, Hydrothermal, SILAR, Chemical Bath Deposition. Top-Down approach- Ball milling technique, Sputtering, Laser Ablation.

UNIT - II

CHARACTERIZATION OF NANOMATERIALS **9 Hrs**

Topic / contents Basic principles and instrumentations of Electron Microscopy –Transmission Electron Microscope, Scanning Electron Microscope, Scanning Probes- Scanning Tunnelling microscope, Atomic Force Microscope –different imaging modes, comparison of SEM and TEM, AFM and STM, AFM and SEM.

Basic principles of working of X-ray diffraction, derivation of Debye-Scherrer equation, numericals on Debye Scherrer equation, Optical Spectroscopy-Instrumentation and application of IR, UV/VIS (Band gap measurement).

UNIT - III

CARBON BASED MATERIALS **8 Hrs**

Topic / contents . Introduction, Synthesis, Properties (electrical, Electronic and Mechanical), and Applications of Graphene, SWCNT, MWCNT, Fullerenes and other Carbon Materials: Carbon nanocomposites, nanofibres, nanodiscs, nanodiamonds.

UNIT - IV

NANOTECHNOLOGY IN ENERGY STORAGE AND CONVERSION **9 Hrs**

Solar cells: First generation, second generation and third generation solar cells: Construction and working of Dye sensitized and Quantum dot sensitized solar cells.

BATTERIES: Nanotechnology in Lithium ion battery- working, Requirements of anodic and cathodic materials, classification based on ion storage mechanisms, limitations of graphite anodes, Advances in Cathodic materials, Anodic materials, Separators

FUEL CELLS: Introduction, construction, working of fuel cells and nanotechnology in hydrogen storage and proton exchange membranes

SELF-STUDY FOR LIFELONG LEARNING: Super capacitors: Introduction, construction and working of super capacitor.

UNIT - V

APPLICATIONS OF NANOTECHNOLOGY **7 Hrs**

Nanotech Applications and Recent Breakthroughs : Introduction, Significant Impact of Nanotechnology and Nanomaterial, Medicine and Healthcare Applications, Biological and Biochemical Applications (Nano biotechnology), Electronic Applications (Nano electronics), Computing Applications (Nano computers), Chemical Applications (Nano chemistry), Optical Applications (Nano photonics), Agriculture and Food Applications, Recent Major Breakthroughs in Nanotechnology.

SELF STUDY FOR LIFELONG LEARNING

Nano coatings (Photocatalysts) and super hydrophobic coatings (Lotus effect).

TEXT BOOKS :

1	A.K. Bandyopadhyay	Nano Materials – New Age Publishers
2	C.N.R. Rao, P. John Thomas and G. U. Kulkarni	Nanocrystals: Synthesis, Properties and Applications – Springer Series in Materials Science
3	T. Pradeep	Nano Essentials- TMH
4	Peter J. F. Harris	Carbon nanotube science: synthesis, properties, and applications. Cambridge University Press, 2011
5	M.A. Shah, K.A. Shah	"Nanotechnology: The Science of Small", Wiley India.

REFERENCE BOOKS :

1	C. P. Poole and F. J. Owens	Introduction to Nanotechnology, Wiley, 2003
2	Scientific American	Understanding Nanotechnology, 2002
3	M. Ratner and D. Ratner	Nanotechnology, Prentice Hall 2003.
4	M. Wildon, K. Kannagara, G. Smith, M. Simmons and B. Raguse	Nanotechnology, CRC Press, Boca Raton 2002
5	M.A. Shah, K.A. Shah	Recent reviews on Li-ion batteries, solar cells and fuel cells

Course Outcomes :

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

CO1 : Demonstrate the synthesis of nanoparticles by various techniques and classify the nanomaterials based on the dimensions

CO2 : Identify the basic instruments required for the characterization of given nanoparticles or nanomaterial.

CO3 : Select appropriate Carbon based material based on Electrical, Electronic and Mechanical properties.

CO4 : Discuss the application of nanotechnology to mechanical domains such as Solar Cells, batteries, fuel cells and so on.

CO5 : Assess the suitability of nanomaterials for various device applications in various fields.

Introduction to Sustainable Engineering

Contact Hours/ Week	:	3(L) + 0(T) + 0(P)	Credits	:	3.0
Total Lecture Hours	:	40	CIE Marks	:	50
Total Tutorial Hours	:	00	SEE Marks	:	50
Total Practical Hours	:	00	Exam Hours	:	3
Course Type	:	Theory	Course Code	:	ETC07

Course Objectives : This course will enable students :

- To familiarize the students to the area of sustainability and concepts of sustainability engineering.
- To enable students with an understanding of principles and frame work of sustainable engineering.
- To provide students with an understanding of Life Cycle Assessment tool in sustainable engineering.
- To provide students with understanding of integration of sustainability with design.

UNIT - I

SUSTAINABLE DEVELOPMENT AND ROLE OF ENGINEERS **08 Hrs**

Introduction, Why and What is Sustainable Development, THE SDFs, Paris Agreement and Role of Engineering, Sustainable Development and the Engineering Profession, Key attributes of the Graduate Engineering.

SUSTAINABLE ENGINEERING CONCEPTS

Key concepts – Factor 4 and Factor 10: Goals of sustainability, System Thinking, Life Cycle Thinking and Circular Economy.

UNIT - II

SUSTAINABLE ENGINEERING AND CONCEPTS, PRINCIPLES AND FRAME WORK **08 Hrs**

Green Economy and Low Carbon Economy, Eco Efficiency, Triple bottom Line, Guiding principles of sustainable engineering, Frameworks for sustainable Engineering.

TOOLS FOR SUSTAINABILITY ASSESSMENT

Environmental Management System, Environmental Auditing, Cleaner Production Assessment, Environmental Impact Assessment, Strategic Environmental.

UNIT - III

FUNDAMENTALS OF LIFE CYCLE ASSESSMENT **08 Hrs**

Why and What is LCA, LCA Goal and Scope, Life cycle inventory, Life Cycle Impact Assessment, Interpretation and presentation of Results, Iterative Nature of LCA, Methodological Choices, LCI Databases and LCA Software's, Strength and Limitations of LCA.

UNIT - IV

ENVIRONMENTAL LIFE CYCLE COSTING, SOCIAL LIFE CYCLE ASSESSMENT & LIFE CYCLE SUSTAINABILITY ASSESSMENT **08 Hrs**

Introduction, Environmental Life Cycle Costing, Social Life Cycle Assessment, Life Cycle Sustainability, LCA Applications in Engineering: Environmental Product Declarations and Product Category Rules, Carbon and Water Foot Printing, Energy systems, Buildings and the Built Environment**,** Chemical and Chemical Production Food and Agriculture.

INTRODUCTION TO ENVIRONMENTAL ECONOMICS

Introduction – What Is Environmental Economics, Valuing the Environment, Market-based Incentives (or Economic Instruments) for Sustainability, Command-and-Control versus Economic Instruments, A Simple Model of Pollution Control.

UNIT - V

INTEGRATING SUSTAINABILITY IN ENGINEERING DESIGN **08 Hrs**

Problems Solving in Engineering, conventional to Sustainable Engineering Design Process, Design for Life Guidelines and Strategies, Measuring Sustainability, Sustainable Design through sustainable procurement criteria, Case studies on sustainable Engineering Design Process– Sustainable Process Design, Sustainable Production Design Sustainable Product design in Electronic Engineering.

TEXT BOOKS :

1	Toolseeram Ramjeawon	Introduction to Sustainability for Engineers, CRC Press, 1st Edition, 2020.
2	David Allen, David R. Shonnard	Sustainability Engineering: Concepts, Design and Case studies, Prentice Hall, 1st Edition, 2015.

REFERENCE BOOKS :

1	Ni Bin Chang	System Analysis for sustainable Engineering: Theory and applications, Ni bin Chang, McGraw Hill Publications, 1st Edition, 2010.
2	Rag. R.L. and Ramesh Lakshmi Dinachandran	Introduction to Sustainable Engineering, PHI Learning Pvt. Ltd., 2nd Edition, 2016.

Course Outcomes :

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

CO1 : Elucidate the basics of sustainable development, sustainable engineering and its role in engineering.

CO2 : Application of Sustainable Engineering Concepts and Principles in Engineering.

CO3 : Understanding the fundamentals of Life Cycle assessment.

CO4 : Understanding the fundamentals of Life Cycle cost and environmental Economics.

CO5 : Applying the sustainable engineering design process to engineering systems.

Renewable Energy Sources

Contact Hours/ Week	:	3(L) + 0(T) + 0(P)	Credits	:	3.0
Total Lecture Hours	:	40	CIE Marks	:	50
Total Tutorial Hours	:	00	SEE Marks	:	50
Total Practical Hours	:	00	Exam Hours	:	3
Course Type	:	Theory	Course Code	:	ETC08

Course Objectives : This course will enable students :

- To understand energy scenario, energy sources and their utilization.
- To explore society's present needs and future energy demands.
- To Study the principles of renewable energy conversion systems.
- To exposed to energy conservation methods.

UNIT - I

INTRODUCTION **08 Hrs**

Principles of renewable energy; energy and sustainable development, fundamentals and social implications. worldwide renewable energy availability, renewable energy availability in India, brief descriptions on solar energy, wind energy, tidal energy, wave energy, ocean thermal energy, biomass energy, geothermal energy, oil shale. Introduction to Internet of energy (IOE).

UNIT - II

SOLAR ENERGY **08 Hrs**

Fundamentals; Solar Radiation; Estimation of solar radiation on horizontal and inclined surfaces; Solar radiation Measurements- Pyrheliometers, Pyrometer, Sunshine Recorder. Solar Thermal systems: Flat plate collector; Solar distillation; Solar pond electric power plant.

SOLAR ELECTRIC POWER GENERATION

Principle of Solar cell, Photovoltaic system for electric power generation, advantages, Disadvantages and applications of solar photovoltaic system.

UNIT - III

WIND ENERGY **08 Hrs**

Properties of wind, availability of wind energy in India, wind velocity and power from wind; major problems associated with wind power, Basic components of wind energy conversion system (WECS); Classification of WECS- Horizontal

axis- single, double and muliblade system. Vertical axis - Savonius and darrieus types.

BIOMASS ENERGY

Introduction; Photosynthesis Process; Biofuels; Biomass Resources; Biomass conversion technologies - fixed dome; Urban waste to energy conversion; Biomass gasification (Downdraft)

UNIT - IV

TIDAL POWER **08 Hrs**

Tides and waves as energy suppliers and their mechanics; fundamental characteristics of tidal power, harnessing tidal energy, advantages and limitations.

OCEAN THERMAL ENERGY CONVERSION

Principle of working, OTEC power stations in the world, problems associated with OTEC.

UNIT - V

GREEN ENERGY **08 Hrs**

Introduction, Fuel cells: Classification of fuel cells – H2; Operating principles, Zero energy Concepts. Benefits of hydrogen energy, hydrogen production technologies (electrolysis method only), hydrogen energy storage, applications of hydrogen energy, problem associated with hydrogen energy.

TEXT BOOKS :

1	G D Rai	Nonconventional Energy sources, Khanna Publication, Fourth Edition
2	S. Rao and Dr. B.B. Parulekar	Energy Technology, Khanna Publication. Solar Energy, Subhas P Sukhatme, Tata McGraw Hill, 2nd Edition,1996.

REFERENCE BOOKS :

1	A. W. Culp Jr	Principles of Energy Conversion, McGraw Hill, 1996
2	Shobh Nath Singh	Non-Convention Energy Resources, Shobh Nath Singh, Pearson, 2018

WEB LINKS AND VIDEO LECTURES (e-RESOURCES) :

1	E-book URL: https://www.pdfdrive.com/non-conventional-energy-sources-e10086374.html
2	E-book URL: https://www.pdfdrive.com/non-conventional-energy-systems-nptel- d17376903.html
3	E-book URL: https://www.pdfdrive.com/renewable-energy-sources-and-their-applications- e33423592.html
4	E-book URL: https://www.pdfdrive.com/lecture-notes-on-renewable-energy-sources- e34339149.html
5	https://onlinecourses.nptel.ac.in/noc18_ge09/preview
ACTIVITY BASED LEARNING (SUGGESTED ACTIVITIES IN CLASS) / PRACTICAL BASED LEARNING	
1	Poster presentation on the theme of renewable energy sources
2	Industry Visit

Course Outcomes :

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

CO1 : Describe the environmental aspects of renewable energy resources. In Comparison with various conventional energy systems, their prospects and limitations.

CO2 : Describe the use of solar energy and the various components used in the energy production with respect to applications like-heating, cooling, desalination, power generation

CO3 : Understand the conversion principles of wind and tidal energy.

CO4 : Understand the concept of biomass energy resources and green energy.

CO5 : Acquire the basic knowledge of ocean thermal energy conversion and hydrogen energy.

Introduction to Internet of Things (IoT)

Contact Hours/ Week	:	3(L) + 0(T) + 0(P)	Credits	:	3.0
Total Lecture Hours	:	40	CIE Marks	:	50
Total Tutorial Hours	:	00	SEE Marks	:	50
Total Practical Hours	:	00	Exam Hours	:	3
Course Type	:	Theory	Course Code	:	ETC11

Course Objectives : This course will enable students to:

- Understand about the fundamentals of Internet of Things and its building blocks along with their characteristics.
- Understand the recent application domains of IoT in everyday life.
- Gain insights about the current trends of associated IoT technologies and IoT analytics.

UNIT - I

BASICS OF NETWORKING **8 Hrs**

Introduction, Network Types, Layered network models

EMERGENCE OF IoT

Introduction, Evolution of IoT, Enabling IoT & the Complex Interdependence ofTechnologies, IoT Networking Components.

Text book 1: Chapter 1 - 1.1 to 1.3, Chapter 4 - 4.1 to 4.4

UNIT - II

IoT SENSING AND ACTUATION **8 Hrs**

Introduction, Sensors, Sensor Characteristics, Sensorial Deviations, Sensing Types, Sensing Considerations, Actuators, Actuator Types, Actuator Characteristics.

Text book 1: Chapter 5 - 5.1 to 5.9

UNIT - III

IoT PROCESSING TOPOLOGIES AND TYPES **8 Hrs**

Data Format, Importance of Processing in IoT, Processing Topologies, IoT Device Design and Selection Considerations, Processing Offloading.

Text book 1: Chapter 6 - 6.1 to 6.5

UNIT - IV

ASSOCIATED IOT TECHNOLOGIES **8 Hrs**

Cloud Computing: Introduction, Virtualization, Cloud Models, Service-Level Agreement in Cloud Computing, Cloud Implementation, Sensor-Cloud: Sensors-as-a-Service.

IoT Case Studies

Agricultural IoT – Introduction and Case Studies

Text book 1: Chapter 10 - 10.1 to 10.6, Chapter 12 - 12.1, 12.2

UNIT - V

IoT CASE STUDIES AND FUTURE TRENDS **7 Hrs**

Vehicular IoT – Introduction

Healthcare IoT – Introduction

IoT Analytics – Introduction

Text book 1: Chapter 13 - 13.1, Chapter 14 - 14.1, 14.2, Chapter 17 - 17.1

TEXT BOOKS :

1	Sudip Misra, Anandarup Mukherjee, Arijit Roy	Introduction to IoT, Cambridge University Press 2021
2	S. Misra, C. Roy, and A. Mukherjee	Introduction to Industrial Internet of Things and Industry 4.0. CRC Press, 2020
3	Vijay Madisetti and Arshdeep Bahga	Internet of Things (A Hands-on-Approach), VPT, 1st Edition, 2014.
4	Francis daCosta	Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", Apress Publications, 1st Edition, 2013.

Course Outcomes :

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

CO1 : Describe the evolution of IoT, IoT networking components and addressing strategies in IoT.

CO2 : Classify various sensing devices and actuator types.

CO3 : Demonstrate the processing in IoT.

CO4 : Explain Associated IoT Technologies.

CO5 : Illustrate architecture of IoT Applications

Introduction to Cyber Security

Contact Hours/ Week	:	3(L) + 0(T) + 0(P)	Credits	:	3.0
Total Lecture Hours	:	40	CIE Marks	:	50
Total Tutorial Hours	:	00	SEE Marks	:	50
Total Practical Hours	:	00	Exam Hours	:	3
Course Type	:	Theory	Course Code	:	ETC12

Course Objectives : This course will enable students :

- To familiarize cybercrime terminologies and perspectives
- To understand Cyber Offenses and Botnets
- To gain knowledge on tools and methods used in cybercrimes
- To understand phishing and computer forensics

UNIT - I

INTRODUCTION TO CYBERCRIME **8 Hours**

CYBERCRIME

Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals? Classifications of Cybercrimes, An Indian Perspective, Hacking and Indian Laws, Global Perspectives**.**

Text book1 : Chapter 1 (1.1 to 1.5, 1.7 - 1.9)

UNIT - II

CYBER OFFENSES **8 Hours**

HOW CRIMINALS PLAN THEM

Introduction, How criminals plan the attacks, Social Engineering, Cyber Stalking, Cybercaafe & cybercrimes.

BOTNETS

The fuel for cybercrime, Attack Vector.

Text book 1 : Chapter 2 (2.1 to 2.7)

UNIT - III

TOOLS AND METHODS USED IN CYBERCRIME **8 Hours**

Introduction, Proxy Servers, Anonymizers, Phishing, Password Cracking, Key Loggers and Spyways, Virus and Worms, Trozen Horses and Backdoors, Steganography, DoS and DDOS Attackes, Attacks on Wireless networks.

Text book 1 : Chapter 4 (4.1 to 4.9, 4.12)

UNIT - IV

PHISHING AND IDENTITY THEFT **8 Hours**

Introduction, methods of phishing, phishing, phising techniques, spear phishing, types of phishing scams, phishing toolkits and spy phishing, counter measures, Identity Theft.

Text book 1 : Chapter 5 (5.1. to 5.3)

UNIT - V

UNDERSTANDING COMPUTER FORENSICS **8 Hours**

Introduction, Historical Background of Cyber forensics, Digital Forensics Science, Need for Computer Forensics, Cyber Forensics and Digital Evidence, Digital Forensic Life cycle, Chain of Custody Concepts, network forensics.

Text book 1 : Chapter 7 (7.1. to 7.5, 7.7 to 7.9)

TEXT BOOKS :

1	Sunit Belapure and Nina Godbole	"Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives", Wiley India Pvt Ltd, ISBN: 978-81- 265-21791, 2011, First Edition (Reprinted 2018)

WEB LINKS AND VIDEO LECTURES (e-RESOURCES) :

1	https://www.youtube.com/watch?v=yC_hFm0BX28&list=PLxApjaSnQGi6Jm7LLSxvmNQjS_rt9swsu
2	https://www.youtube.com/watch?v=nzZkKoREEGo&list=PL9ooVrP1hQOGPQVeapGsJCktzIO4DtI4_
3	https://www.youtube.com/watch?v=6wi5DI6du-4&list=PL_uaeekrhGzJlB8XQB xU3zhDwT95xlk

Course Outcomes :

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

CO1 : Explain the cybercrime terminologies.

CO2 : Describe Cyber offenses and Botnets.

CO3 : Illustrate Tools and Methods used on Cybercrime.

CO4 : Explain Phishing and Identity Theft.

CO5 : Justify the need of Computer Forensics.

Communicative English

Contact Hours/ Week	:	1(L) + 0(T) + 0(P)	Credits	:	1.0
Total Lecture Hours	:	15	CIE Marks	:	50
Total Tutorial Hours	:	00	SEE Marks	:	50
Total Practical Hours	:	00	Exam Hours	:	1.30
Course Type	:	Theory	Course Code	:	CC01

Course Objectives : This course will enable students :

- To know about Fundamentals of Communicative English and Communication Skills in general.
- To train to identify the nuances of phonetics, intonation and enhance pronunciation skills for better Communication skills.
- To impart Basic English grammar and essentials of important language skills.
- To enhance with English vocabulary and language proficiency for better communication skills.
- To learn about Techniques of Information Transfer through presentation.

LANGUAGE LAB

To augment LSRW, grammar and Vocabulary skills (Listening, Speaking, Reading, Writing and Grammar, Vocabulary) through tests, activities, exercises etc., comprehensive web-based learning and assessment systems can be referred as per the AICTE / VTU guidelines.

UNIT - I

INTRODUCTION TO COMMUNICATIVE ENGLISH **3 Hrs**

Communicative English, Fundamentals of Communicative English, Process of Communication, Barriers to Effective Communicative English, Different styles and levels in Communicative English. Interpersonal and Intrapersonal Communication Skills.

UNIT - II

INTRODUCTION TO PHONETICS **3 Hrs**

Phonetic Transcription, English Pronunciation, Pronunciation Guidelines to consonants and vowels, Sounds Mispronounced, Silent and Non silent Letters, Syllables and Structure. Word Accent, Stress Shift and Intonation, Spelling Rules and Words often Mis-spelt. Common Errors in Pronunciation.

UNIT - III

BASIC ENGLISH COMMUNICATIVE GRAMMAR AND VOCABULARY PART - I **3 Hrs**

GRAMMAR

Basic English Grammar and Parts of Speech, Articles and Preposition. Question Tags, One Word Substitutes, Strong and Weak forms of words, Introduction to Vocabulary, All Types of Vocabulary – Exercises on it.

UNIT - IV

BASIC ENGLISH COMMUNICATIVE GRAMMAR AND VOCABULARY PART - II **3 Hrs**

WORDS FORMATION

Prefixes and Suffixes, Contractions and Abbreviations. Word Pairs (Minimal Pairs) – Exercises, Tense and Types of tenses, The Sequence of Tenses (Rules in use of Tenses) and Exercises on it.

UNIT - V

COMMUNICATION SKILLS FOR EMPLOYMENT **3 Hrs**

INFORMATION TRANSFER

Oral Presentation and its Practice. Difference between Extempore/Public Speaking, Communication Guidelines. Mother Tongue Influence (MTI), Various Techniques for Neutralization of Mother Tongue Influence. Reading and Listening Comprehensions – Exercises.

TEXT BOOKS :

1	Communication Skills by Sanjay Kumar & Pushp Lata, Oxford University Press India Pvt Ltd - 2019.
2	A Textbook of English Language Communication Skills, (ISBN-978-81-955465-2-7), Published by Infinite Learning Solutions, Bengaluru - 2022.

REFERENCE BOOKS :

1	Technical Communication by Gajendra Singh Chauhan and Et al, (ISBN-978-93-5350-050-4), Cengage learning India Pvt Limited [Latest Revised Edition] - 2019.
2	English for Engineers by N.P. Sudharshana and C. Savitha, Cambridge University Press – 2018.

3	English Language Communication Skills – Lab Manual cum Workbook, Cengage learning India Pvt Limited [Latest Revised Edition] (ISBN-978-93-86668-45-5), 2019.
4	A Course in Technical English – D Praveen Sam, K N Shoba, Cambridge University Press – 2020.
5	Practical English Usage by Michael Swan, Oxford University Press – 2016.

Course Outcomes :

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

CO1 : Understand and apply the Fundamentals of Communication Skills in their communication skills.

CO2 : Identify the nuances of phonetics, intonation and enhance pronunciation skills.

CO3 : Impart Basic English grammar and essentials of language skills as per present requirement.

CO4 : Understand and use all types of English vocabulary and language proficiency.

CO5 : Adopt the Techniques of Information Transfer through presentation.

Professional Writing Skills in English

Contact Hours/ Week	:	1(L) + 0(T) + 0(P)	Credits	:	1.0
Total Lecture Hours	:	15	CIE Marks	:	50
Total Tutorial Hours	:	00	SEE Marks	:	50
Total Practical Hours	:	00	Exam Hours	:	1.30
Course Type	:	Theory	Course Code	:	CC02

Course Objectives : This course will enable students :

- To identify the Common Errors in Writing and Speaking of English.
- To achieve better Technical writing and Presentation skills for employment.
- To read Technical proposals properly and make them to write good technical reports.
- To Acquire Employment and Workplace communication skills.
- To learn about Techniques of Information Transfer through presentation in different level.

LANGUAGE LAB

To augment LSRW, grammar and Vocabulary skills (Listening, Speaking, Reading, Writing and Grammar, Vocabulary) through tests, activities, exercises etc., comprehensive web-based learning and assessment systems can be referred as per the AICTE / VTU guidelines.

UNIT - I

IDENTIFYING COMMON ERRORS IN WRITING AND SPEAKING ENGLISH **3 Hrs**

Common errors identification in parts of speech, Use of verbs and phrasal verbs, Auxiliary verbs and their forms, Subject Verb Agreement (Concord Rules), Common errors in Subject-Verb agreement, Sequence of Tenses and errors identification in Tenses. Words Confused/Misused.

UNIT - II

NATURE AND STYLE OF SENSIBLE WRITING **3 Hrs**

Organizing Principles of Paragraphs in Documents, Writing Introduction and Conclusion, Importance of Proper Punctuation, Precise writing and Techniques in Essay writing, Sentence arrangements and Corrections activities. Misplaced modifiers, Contractions, Collocations, Word Order, Errors due to the Confusion of words.

UNIT - III

TECHNICAL READING AND WRITING PRACTICES **3 Hrs**

Technical writing process, Introduction to Technical Reports writing, Significance of Reports, Types of Reports. Introduction to Technical Proposals Writing, Types of Technical Proposals, Characteristics of Technical Proposals. Scientific Writing Process. Grammar – Voices and Reported Speech, Spotting Error & Sentence Improvement, Cloze Test and Theme Detection Exercises.

UNIT - IV

PROFESSIONAL COMMUNICATION FOR EMPLOYMENT **3 Hrs**

Listening Comprehension, Types of Listening, Listening Barriers, Improving Listening Skills. Reading Comprehension, Tips for effective reading. Job Applications, Types of official/ employment/business Letters, Resume vs. Bio Data, Profile, CV. Writing effective resume for employment, Emails, Blog Writing and Memos.

UNIT - V

PROFESSIONAL COMMUNICATION AT WORKPLACE **3 Hrs**

Group Discussion and Professional Interviews, Characteristics and Strategies of a GD and PI's, Intra and Interpersonal Communication Skills at workplace, Non-Verbal Communication Skills and its importance in GD and Interview. Presentation skills and Formal Presentations by Students, Strategies of Presentation Skills.

TEXT BOOKS :

1	**"Professional Writing Skills in English"** published by Fillip Learning – Education (ILS), Bangalore – 2022.
2	**"Functional English"** (As per AICTE 2018 Model Curriculum) (ISBN-978-93-5350-047-4) Cengage learning India Pvt Limited [Latest Edition 2019]

REFERENCE BOOKS :

1	**English for Engineers** by N.P. Sudharshana and C. Savitha, Cambridge University Press – 2018.
2	**Technical Communication** by Gajendra Singh Chauhan and Et al, (ISBN-978-93-5350-050-4), Cengage learning India Pvt. Limited [Latest Revised Edition] - 2019.

3	**Technical Communication** – Principles and Practice, Third Edition by Meenakshi Raman and Sangeetha Sharma, Oxford University Press 2017.
4	**High School English Grammar & Composition** by Wren and Martin, S Chandh & Company Ltd – 2015.
5	**Effective Technical Communication** – Second Edition by M Ashraf Rizvi, McGraw Hill Education (India) Private

Course Outcomes :

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

CO1 : Understand and identify the Common Errors in Writing and Speaking.

CO2 : Achieve better technical writing and presentation skills.

CO3 : Read technical proposals properly and make them to write good technical reports.

CO4 : Acquire Employment and Workplace communication skills.

CO5 : Learn about Techniques of Information Transfer through presentation in different level.

ಬಳಕೆ ಕನ್ನಡ Balake Kannada (Kannada for Usage)

Contact Hours/ Week	:	1(L) + 0(T) + 0(P)	Credits	:	1.0
Total Lecture Hours	:	15	CIE Marks	:	50
Total Tutorial Hours	:	00	SEE Marks	:	50
Total Practical Hours	:	00	Exam Hours	:	1.30
Course Type	:	Theory	Course Code	:	CC03

Course Objectives : This course will enable students :

- To create the awareness regarding the necessity of learning local language for comfortable and healthy life.
- To enable learners to Listen and understand the Kannada language properly.
- To speak, read and write Kannada language as per requirement.
- To train the learners for correct and polite conservation. To know about Karnataka state and its language, literature and General information about this state.

Unit - I

1. Introduction, Necessity of learning a local language, Methods to learn the Kannada language. **03 Hrs**
2. Easy learning of a Kannada Language: A few tips, Hints for correct and polite conservation, Listening and Speaking Activities, Key to Transcription.
3. ವೈಯಕ್ತಿಕ, ಸ್ವಾಮ್ಯಸೂಚಕ/ಸಂಬಂಧಿತ ಸರ್ವನಾಮಗಳು ಮತ್ತು ಪ್ರಶ್ನಾರ್ಥಕ ಪದಗಳು - Personal Pronouns, Possessive Forms, Interrogative words.

Unit - II

1. ನಾಮಪದಗಳ ಸಂಬಂಧಾರ್ಥಕ ರೂಪಗಳು, ಸಂದೇಹಾಸ್ಪದ ಪ್ರಶ್ನೆಗಳು ಮತ್ತು ಸಂಬಂಧವಾಚಕ ನಾಮಪದಗಳು - Possessive forms of nouns, doubtive question and Relative nouns. **03 Hrs**
2. ಗುಣ, ಪರಿಮಾಣ ಮತ್ತು ವರ್ಣ ಬಣ್ಣ ವಿಶೇಷಣಗಳು, ಸಂಖ್ಯಾವಾಚಕಗಳು - Qualitative, Quantitative and Colour Adjectives, Numerals.
3. ಕಾರಕ ರೂಪಗಳು ಮತ್ತು ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯಗಳು - ಸಪ್ತಮಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯ - (ಆ, ಅದು, ಅವು, ಅಲ್ಲಿ) - Predictive Forms, Locative Case.

Unit - III

1. ಚತುರ್ಥಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯದ ಬಳಕೆ ಮತ್ತು ಸಂಖ್ಯಾವಾಚಕಗಳು - Dative cases and Numerals. **03 Hrs**
2. ಸಂಖ್ಯಾಗುಣವಾಚಕಗಳು ಮತ್ತು ಬಹುವಚನ ನಾಮರೂಪಗಳು - Ordinal Numerals and Plural markers.
3. ನ್ಯೂನ/ ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾಪದಗಳು ಮತ್ತು ವರ್ಣ ಗುಣವಾಚಕಗಳು - Defective / Negative verbs and Colour Adjectives.

Unit - IV

1. ಅಪ್ಪಣೆ/ಒಪ್ಪಿಗೆ, ನಿರ್ದೇಶನ, ಪ್ರೋತ್ಸಾಹ ಮತ್ತು ಒತ್ತಾಯ ಅರ್ಥರೂಪ ಪದಗಳು ಮತ್ತು ವಾಕ್ಯಗಳು Permission, Commands, Encouraging and Urgin words (Imperative words and sentences) **03 Hrs**
2. ಸಾಮಾನ್ಯ ಸಂಭಾಷಣೆಗಳಲ್ಲಿ ದ್ವಿತೀಯ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯಗಳು ಮತ್ತು ಸಂಭವನೀಯ ಪ್ರಕಾರಗಳು Accusative cases and Potential Forms used in General Communication.
3. "ಇರು ಮತ್ತು ಇರಲ್ಲ" ಸಹಾಯಕ ಕ್ರಿಯಾಪದಗಳು, ಸಂಭಾವ್ಯಸೂಚಕ ಮತ್ತು ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾಪದಗಳು Helping verbs '*iru* and *iralla*'. Corresponding Future and Negation verbs.
4. ಹೋಲಿಕೆ (ತರತಮ), ಸಂಬಂಧ ಸೂಚಕ, ವಸ್ತುಸೂಚಕ ಪ್ರತ್ಯೆಯಗಳು ಮತ್ತು ನಿಷೇಧಾರ್ಥಕ ಪದಗಳ ಬಳಕೆ Comparative, Relationship, Identification and Negation words.

Unit - V

1. ಕಾಲ ಮತ್ತು ಸಮಯದ ಹಾಗೂ ಕ್ರಿಯಾಪದಗಳ ವಿವಿಧ ಪ್ರಕಾರಗಳು - Different types of Tense, Time and Verbs. **03 Hrs**
2. -ದ್, -ತ್, -ತು, -ಇತು, -ಆಗಿ, -ಅಲ್ಲ, -ಗ್, -ಕ್, ಇದೆ ಕ್ರಿಯಾ ಪ್ರತ್ಯಯಗಳೊಂದಿಗೆ ಭೂತ, ಭವಿಷ್ಯತ್ ಮತ್ತು ವರ್ತಮಾನ ಕಾಲ ವಾಕ್ಯ ರಚನೆ - Formation of Past, Future and Present Tense Sentences with Verb Forms.
3. ಸಂಭಾಷಣೆಯಲ್ಲಿ ದಿನೋಪಯೋಗಿ ಕನ್ನಡ ಪದಗಳು - Kannada Vocabulary List. Kannada Words in Conversation.

TEXT BOOKS :

1	**ಬಳಕೆ ಕನ್ನಡ** - ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ ಪ್ರಕಟಣೆ : ಪ್ರಸಾರಾಂಗ, ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ. **ಸೂಚನೆ :** ಹೆಚ್ಚಿನ ಮಾಹಿತಿ ಮತ್ತು ವಿವರಣೆಗಳಿಗೆ ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ (9900832331) ಇವರನ್ನು ಸಂಪರ್ಕಿಸಿ. ಮಾದರಿ ಪ್ರಶ್ನೆಪತ್ರಿಕೆ, ಕೋರ್ಸ್ ಆಯ್ಕೆ ಮಾಹಿತಿ, ಅಧ್ಯಯನ ಸಾಮಗ್ರಿ ಮತ್ತು ಬಹು ಆಯ್ಕೆ ಮಾದರಿಯ ಪ್ರಶ್ನೆಗಳ ಕೈಪಿಡಿಗಾಗಿ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವೆಬ್‌ಸೈಟ್ ನೋಡುವುದು.

Course Outcomes :

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

- **CO1 :** Familiarize the necessity of learning of local language for comfortable life.
- **CO2 :** Speak, read and write Kannada language as per requirement.
- **CO3 :** Communicate (converse) in Kannada language in their daily life with Kannada speakers.
- **CO4 :** Listen and understand the Kannada language properly.
- **CO5 :** Speak in polite conservation.

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ Samskruthika Kannada

Contact Hours/ Week	:	1(L) + 0(T) + 0(P)	Credits	:	1.0
Total Lecture Hours	:	15	CIE Marks	:	50
Total Tutorial Hours	:	00	SEE Marks	:	50
Total Practical Hours	:	00	Exam Hours	:	1.30
Course Type	:	Theory	Course Code	:	CC04

Course Objectives : This course will enable students to:

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಪಠ್ಯ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು:

- ವೃತ್ತಿಪರ ಪದವಿ ವಿದ್ಯಾರ್ಥಿಗಳಾಗಿರುವುದರಿಂದ ಕನ್ನಡ ಭಾಷೆ, ಸಾಹಿತ್ಯ ಮತ್ತು ಕನ್ನಡದ ಸಂಸ್ಕೃತಿಯ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.
- ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಪ್ರಧಾನ ಭಾಗವಾದ ಆಧುನಿಕ ಪೂರ್ವ ಮತ್ತು ಆಧುನಿಕ ಕಾವ್ಯಗಳನ್ನು ಸಾಂಕೇತಿಕವಾಗಿ ಪರಿಚಯಿಸುವುದು.
- ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯ ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ಅರಿವು ಹಾಗೂ ಆಸಕ್ತಿಯನ್ನು ಮೂಡಿಸುವುದು.
- ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯವನ್ನು ಹಾಗೂ ಅವರುಗಳು ಸಾಧಿಸಿದ ವಿಷಯಗಳನ್ನು ಪರಿಚಯಿಸುವುದು.
- ಸಾಂಸ್ಕೃತಿಕ, ಜನಪದ ಹಾಗೂ ಪ್ರವಾಸ ಕಥನಗಳ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.

ಘಟಕ - 1

ಕನ್ನಡ ಸಂಸ್ಕೃತಿ ಮತ್ತು ಭಾಷೆ ಕುರಿತಾದ ಲೇಖನಗಳು 03 ಗಂಟೆಗಳು

1. ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ – ಹಂ.ಪ. ನಾಗರಾಜಯ್ಯ
2. ಕರ್ನಾಟಕದ ಏಕೀಕರಣ – ಒಂದು ಅಪೂರ್ವ ಚರಿತ್ರೆ – ಜಿ. ವೆಂಕಟಸುಬ್ಬಯ್ಯ
3. ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕನ್ನಡ – ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ ಮತ್ತು ಪ್ರೊ. ವಿ. ಕೇಶವಮೂರ್ತಿ

ಘಟಕ - 2

ಆಧುನಿಕ ಪೂರ್ವದ ಕಾವ್ಯ ಭಾಗ 03 ಗಂಟೆಗಳು

1. ವಚನಗಳು – ಬಸವಣ್ಣ, ಅಕ್ಕಮಹಾದೇವಿ, ಅಲ್ಲಮಪ್ರಭು, ಆಯ್ದಕ್ಕಿ ಮಾರಯ್ಯ, ಜೇಡರ ದಾಸಿಮಯ್ಯ, ಆಯ್ದಕ್ಕಿ ಲಕ್ಕಮ್ಮ
2. ಕೀರ್ತನೆಗಳು: ಅದರಿಂದೇನು ಫಲ ಇದರಿಂದೇನು ಫಲ – ಪುರಂದರದಾಸರು ತಲ್ಲಣಿಸದಿರು ಕಂಡ್ಯ ತಾಳು ಮನವೇ – ಕನಕದಾಸರು
3. ತತ್ವಪದಗಳು : ಸಾವಿರ ಕೊಡಗಳ ಸುಟ್ಟು – ಶಿಶುನಾಳ ಶರೀಫ

ಘಟಕ - 3

ಆಧುನಿಕ ಕಾವ್ಯ ಭಾಗ **03 ಗಂಟೆಗಳು**

1. ಡಿವಿಜಿ ರವರ ಮಂಕುತಿಮ್ಮನ ಕಗ್ಗದಿಂದ ಆಯ್ದ ಕೆಲವು ಭಾಗಗಳು
2. ಕುರುಡು ಕಾಂಚಾಣ: ದ.ರಾ. ಬೇಂದ್ರೆ
3. ಹೊಸಬಾಳಿನ ಗೀತೆ : ಕುವೆಂಪು

ಘಟಕ - 4

ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯ **03 ಗಂಟೆಗಳು**

1. ಡಾ. ಸರ್ ಎಂ. ವಿಶ್ವೇಶ್ವರಯ್ಯ: ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹ್ಯ – ಎ.ಎನ್. ಮೂರ್ತಿರಾವ್
2. ಕರಕುಶಲ ಕಲೆಗಳು ಮತ್ತು ಪರಂಪರೆಯ ವಿಜ್ಞಾನ – ಕರೀಗೌಡ ಬೀಚನಹಳ್ಳಿ

ಘಟಕ – 5

ಸಾಂಸ್ಕೃತಿಕ, ಜನಪದ ಕಥೆ ಮತ್ತು ಪ್ರವಾಸ ಕಥನ **03 ಗಂಟೆಗಳು**

1. ಯುಗಾದಿ : ವಸುಧೇಂದ್ರ
2. ಮೆಗಾನೆ ಎಂಬ ಗಿರಿಜನ ಪರ್ವತ : ಹಿ.ಚಿ. ಬೋರಲಿಂಗಯ್ಯ

TEXT BOOKS :

1	**ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ** – ಡಾ. ಹಿ.ಚಿ. ಬೋರಲಿಂಗಯ್ಯ ಮತ್ತು ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ ಪ್ರಕಟಣೆ: ಪ್ರಸಾರಾಂಗ, ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ. **ಸೂಚನೆ :** ಹೆಚ್ಚಿನ ಮಾಹಿತಿ ಮತ್ತು ವಿವರಣೆಗಳಿಗೆ ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ (9900832331) ಇವರನ್ನು ಸಂಪರ್ಕಿಸಿ. ಮಾದರಿ ಪ್ರಶ್ನೆಪತ್ರಿಕೆ, ಕೋರ್ಸ್ ಆಯ್ಕೆ ಮಾಹಿತಿ, ಅಧ್ಯಯನ ಸಾಮಗ್ರಿ ಮತ್ತು ಬಹು ಆಯ್ಕೆ ಮಾದರಿಯ ಪ್ರಶ್ನೆಗಳ ಕೈಪಿಡಿಗಾಗಿ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವೆಬ್‌ಸೈಟ್ ನೋಡುವುದು.

Course Outcomes :

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

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಪಠ್ಯ ಕಲಿಕೆಯ ನಂತರ ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ:

- **CO1 :** ಕನ್ನಡ ಭಾಷೆ, ಸಾಹಿತ್ಯ ಮತ್ತು ಕನ್ನಡದ ಸಂಸ್ಕೃತಿಯ ಕುರಿತು ಅರಿವು ಮೂಡಿರುತ್ತದೆ.
- **CO2 :** ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಪ್ರಧಾನ ಭಾಗವಾದ ಆಧುನಿಕ ಪೂರ್ವ ಮತ್ತು ಆಧುನಿಕ ಕಾವ್ಯಗಳನ್ನು ಸಾಂಕೇತಿಕವಾಗಿ ಕಲಿತು ಹೆಚ್ಚಿನ ಓದಿಗೆ ಮತ್ತು ಜ್ಞಾನಕ್ಕೆ ಸ್ಫೂರ್ತಿ ಮೂಡುತ್ತದೆ.
- **CO3 :** ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯ ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ಅರಿವು ಹಾಗೂ ಆಸಕ್ತಿ ಹೆಚ್ಚಾಗುತ್ತದೆ.
- **CO4 :** ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯವನ್ನು ಹಾಗೂ ಅವರುಗಳು ಸಾಧಿಸಿದ ವಿಷಯಗಳನ್ನು ತಿಳಿದುಕೊಂಡು ನಾಡಿನ ಇನ್ನಿತರ ವ್ಯಕ್ತಿಗಳ ಬಗ್ಗೆ ತಿಳಿದುಕೊಳ್ಳುವ ಕೌತುಕತೆ ಹೆಚ್ಚಾಗುತ್ತದೆ.
- **CO5 :** ಸಾಂಸ್ಕೃತಿಕ, ಜನಪದ ಹಾಗೂ ಪ್ರವಾಸ ಕಥನಗಳ ಪರಿಚಯವಾಗುತ್ತದೆ.

Indian Constitution

Contact Hours/ Week	:	1(L) + 0(T) + 0(P)	Credits	:	1.0
Total Lecture Hours	:	15	CIE Marks	:	50
Total Tutorial Hours	:	00	SEE Marks	:	50
Total Practical Hours	:	00	Exam Hours	:	1.30
Course Type	:	Theory	Course Code	:	CC05

Course Objectives : This course will enable students :

- To know about the basic structure of Indian Constitution.
- To know the Fundamental Rights (FR's), DPSP's and Fundamental Duties (FD's) of our constitution.
- To know about our Union Government, political structure & codes, procedures.
- To know the State Executive & Elections system of India.
- To learn the Amendments and Emergency Provisions, other important provisions given by the constitution.

Unit - I

INDIAN CONSTITUTION **3 Hrs**

Necessity of the Constitution, Societies before and after the Constitution adoption. Introduction to the Indian constitution, Making of the Constitution, Role of the Constituent Assembly.

Unit - II

SALIENT FEATURES OF INDIAN CONSTITUTION **3 Hrs**

Preamble of Indian Constitution & Key concepts of the Preamble. Fundamental Rights (FR's) and its Restriction and limitations in different Complex Situations. Building.

Unit - III

Directive Principles of State Policy (DPSP's) and its present relevance in Indian society. Fundamental Duties and its Scope and significance in Nation, Union Executive: Parliamentary System, Union Executive – President, Prime Minister, Union Cabinet. **3 Hrs**

Unit - IV

PARLIAMENT **3 Hrs**

LS & RS, Parliamentary Committees, Important Parliamentary Terminologies. Judicial System of India, Supreme Court of India and other Courts, Judicial Reviews and Judicial Activism.

Unit - V

State Executive and Governor, CM, State Cabinet, Legislature - VS & VP, Election Commission, Elections & Electoral Process. Amendment to Constitution, and Important Constitutional Amendments till today. Emergency Provisions. **3 Hrs**

TEXT BOOKS :

1	**"Constitution of India"** (for Competitive Exams) - Published by Naidhruva Edutech Learning Solutions, Bengaluru - 2022.
2	**"Introduction to the Constitution of India",** (Students Edition.) by Durga Das Basu (DD Basu) : Prentice Hall, 2008

REFERENCE BOOKS :

1	**"Constitution of India, Professional Ethics and Human Rights"** by Shubham Singles, Charles E. Haries, and et al: published by Cengage Learning India, Latest Edition - 2019.
2	**"The Constitution of India"** by Merunandan K B : published by Merugu Publication, Second Edition, Bengaluru.
3	"**Samvidhana Odu"** - for Students & Youths by Justice H N Nagamohan Dhas, Sahayana, kerekon.
4	M. Govindarajan, S. Natarajan, V.S. Senthilkumar, **"Engineering Ethics"**, Prentice Hall, 2004.

Course Outcomes :

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

CO1 : Analyse the basic structure of Indian Constitution.

CO2 : Remember their Fundamental Rights, DPSP's and Fundamental Duties (FD's) of our constitution.

CO3 : Know about our Union Government, political structure & codes, procedures.

CO4 : Understand our State Executive & Elections system of India.

CO5 : Remember the Amendments and Emergency Provisions, other important provisions given by the constitution.

Innovation & Design Thinking

Contact Hours/ Week	:	1(L) + 0(T) + 0(P)	Credits	:	1.0
Total Lecture Hours	:	15	CIE Marks	:	50
Total Tutorial Hours	:	00	SEE Marks	:	50
Total Practical Hours	:	00	Exam Hours	:	1.30
Course Type	:	Theory	Course Code	:	CC06

Course Category : Foundation

To know about the basic structure of Indian Constitution.

Preamble : This course will enable students to:

This course provides an introduction to the basic concepts and techniques of engineering and reverses engineering, the process of design, analytical thinking and ideas, basics and development of engineering drawing, application of engineering drawing with computer aide.

Course Objectives :

- To explain the concept of design thinking for product and service development
- To explain the fundamental concept of innovation and design thinking.
- To discuss the methods of implementing design thinking in the real world.

Teaching-Learning Process (General Instructions :

- These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.
- Lecturer method (L) does not mean only the traditional lecture method, but a different type of teaching method may be adopted to develop the outcomes.
- Show Video/animation films to explain concepts.
- Encourage collaborative (Group Learning) Learning in the class.
- Ask at least three HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking.
- Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develops thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
- Topics will be introduced in multiple representations.
- Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
- Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

UNIT - I

PROCESS OF DESIGN : **03 Hrs**

UNDERSTANDING DESIGN THINKING

Meaning of Design Thinking, Definition of Design Thinking, Origins of Design Thinking, Design Thinker in the organizations, Features of Design Thinking, Principles of Design Thinking, Stages of Design Thinking, Benefits of Design Thinking, Theories and Practices of Design Thinking, Practices of Design Thinking, Team based Design Thinking.

Teaching- Learning Process : Introduction about the design thinking: Chalk and Talk method Theory and practice through presentation MVP and Prototyping through live examples and videos.

CASE STUDY: Embrace Infant Warmer

UNIT - II

TOOLS FOR DESIGN THINKING **03 Hrs**

Visualization, Journey mapping, Value chain analysis, The mind map, Rapid Concept development, Assumption testing, Prototype, Co- creation, Learning Launches, Story telling.

Teaching-Learning Process - Explanation through live examples and video.

CASE STUDY: GE Health Care-Adventure Series

UNIT - III

DESIGN THINKING FOR BUSINESS PROCESS MODELING **03 Hrs**

Business Process Modelling (BPM), Advantage of Business Process Modelling, Design Thinking in Business Process Modelling, Agile in Virtual Collaboration, Scenario Based Prototyping.

Teaching-Learning Process - Explanation through live examples and videos.

CASE STUDY: Bank of America-Keep the Change

UNIT - IV

DESIGN THINKING FOR STRATEGIC INNOVATIONS **03 Hrs**

Strategic Management, Innovation Management, types of innovation , Strategic Innovation, Features of Strategic Innovation, Scope of Strategic Innovation, Design Thinking and Strategic Innovation, Practices of Integrating Design Thinking in Strategic Innovation.

Teaching-Learning Process - Explanation through live examples and videos.

CASE STUDY: American Express

UNIT - V

DESIGN THINKING WORKSHOP **03 Hrs**

Design Thinking Work shop Empathize, Design, Ideate, Prototype and Test.

Teaching-Learning Process - Workshop on Design Thinking from the expert

Presentation by the students on the success of design Live project on design thinking in a group of 4 students.

TEXT BOOKS :

1	John. R. Karsnitz, Stephen O'Brien and John P. Hutchinson	"Engineering Design",Cengage learning (International edition) Second Edition, 2013.
2	Roger Martin	"The Design of Business: Why Design Thinking is the Next Competitive Advantage", Harvard Business Press , 2009
3	Hasso Plattner, Christoph Meinel and Larry Leifer (eds)	"Design Thinking: Understand – Improve – Apply", Springer, 2011
4	Idris Mootee	"Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School", John Wiley & Sons 2013.

REFERENCE BOOKS :

1	Yousef Haik and Tamer M. Shahin	"Engineering Design Process", Cengage Learning, Second Edition, 2011.
2	Jeanne Liedtka, Andrew King, Kevin Bennett	Solving Problems with Design Thinking - Ten Stories of What Works (Columbia Business School Publishing) Hardcover – 20 Sep 2013

WEB LINKS AND VIDEO LECTURES (e-RESOURCES) :

1	www.tutor2u.net/business/presentations/. /productlifecycle/default.html
2	https://docs.oracle.com/cd/E11108_02/otn/pdf/. /E11087_01.pdf
3	www.bizfilings.com › Home › Marketing › Product Developmen
4	https://www.mindtools.com/brainstm.html
5	https://www.quicksprout.com/. /how-to-reverse-engineer-your-competit
6	www.vertabelo.com/blog/documentation/reverse-engineering
7	https://support.microsoft.com/en-us/kb/273814

8	https://support.google.com/docs/answer/179740?hl=en
9	https://www.youtube.com/watch?v=2mjSDIBaUlM thevirtualinstructor.com/ foreshortening.html
10	https://dschool.stanford.edu/.../designresources/.../ModeGuideBOOTCAMP2010L.pdf
11	https://dschool.stanford.edu/use-our-methods/ 6. https://www.interaction-
12	design.org/literature/article/5-stages-in-the-design-thinking-process
13	http://www.creativityatwork.com/design-thinking-strategy-for-innovation/ 49
14	https://www.nngroup.com/articles/design-thinking/
15	https://designthinkingforeducators.com/design-thinking/ 10. www.designthinkingformobility.org/wp content/.../10/NapkinPitch_Worksheet.pdf

ACTIVITY BASED LEARNING (SUGGESTED ACTIVITIES IN CLASS) / PRACTICAL BASED LEARNING :

1	http://dschool.stanford.edu/dgift/
2	https://onlinecourses.nptel.ac.in/noc19_mg60/preview

Course Outcomes :

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

CO1 : Appreciate various design thinking process.

CO2 : Analyze different tools used in Design thinking.

CO3 : Identify the significance of Design thinking for Business Process Modeling.

CO4 : Identify the significance of Design thinking for Design Thinking for strategic innovations

Scientific Foundations of Health

Contact Hours/ Week	:	1(L) + 0(T) + 0(P)	Credits	:	1.0
Total Lecture Hours	:	15	CIE Marks	:	50
Total Tutorial Hours	:	00	SEE Marks	:	50
Total Practical Hours	:	00	Exam Hours	:	1.30
Course Type	:	Theory	Course Code	:	CC07

Course Objectives : This course will enable students :

- To know about health and wellness (and its beliefs) & its balance for positive mind set.
- To build the healthy lifestyles for good health for their better future.
- To create a healthy and caring relationships to meet the requirements of good/social/positive life.
- To learn about avoiding risks and harmful habits in their campus and outside the campus for their bright future.
- To prevent and fight against harmful diseases for good health through positive mind set.

UNIT - I

GOOD HEALTH & IT'S BALANCE FOR POSITIVE MIND SET **3 Hrs**

Health - Importance of Health, Influencing factors of Health, Health beliefs, Advantages of good health, Health and Behaviour, Health & Society, Health & family, Health & Personality, Psychological disorders-Methods to improve good psychological health, Changing health habits for good health.

UNIT - II

BUILDING OF HEALTHY LIFESTYLES FOR BETTER FUTURE **3 Hrs**

Developing healthy diet for good health, Food & health, Nutritional guidelines for good health, Obesity & overweight disorders and its management, Eating disorders, Fitness components for health, Wellness and physical function, How to avoid exercise injuries.

UNIT - III

CREATION OF HEALTHY AND CARING RELATIONSHIPS **3 Hrs**

Building communication skills, Friends and friendship - Education, the value of relationship and communication skills, Relationships for Better or worsening of life, understanding of basic instincts of life (more than a biology), changing health behaviours through social engineering.

UNIT - IV

AVOIDING RISKS AND HARMFUL HABITS **3 Hrs**

Characteristics of health compromising behaviours, Recognizing and avoiding of addictions, How addiction develops, Types of addictions, influencing factors of addictions, Differences between addictive people and non-addictive people & their behaviours. Effects of addictions Such as..., how to recovery from addictions.

UNIT - V

PREVENTING & FIGHTING AGAINST DISEASES FOR GOOD HEALTH **3 Hrs**

How to protect from different types of infections, How to reduce risks for good health, Reducing risks & coping with chronic conditions, Management of chronic illness for Quality of life, Health & Wellness of youth : a challenge for upcoming future, Measuring of health & wealth status.

TEXT BOOKS :

1	**"Scientific Foundations of Health"** – Study Material Prepared by Dr. L Thimmesha, Published in VTU University Website.
2	**"Scientific Foundations of Health"**, (ISBN-978-81-955465-6-5) published by Infinite Learning Solutions, Bangalore - 2022.
2	**Health Psychology - A Textbook**, Fourth Edition by Jane Ogden McGraw Hill Education (India) Private Limited - Open University Press.

REFERENCE BOOKS :

1	**Health Psychology** (Second edition) by Charles Abraham, Mark Conner, Fiona Jones and Daryl O'Connor – Published by Routledge 711 Third Avenue, New York, NY 10017.
2	**Health Psychology** (Ninth Edition) by Shelley E. Taylor - University of California, Los Angeles, McGraw Hill Education (India) Private Limited - Open University Press.
3	SWAYAM / NPTL / MOOCS / We blinks / Internet sources / YouTube videos and other materials / notes.
4	**Scientific Foundations of Health (Health & Wellness)** - General Books published for university and colleges references by popular authors and published by the reputed publisher.

Course Outcomes :

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

CO1 : Understand and analyse about Health and wellness (and its Beliefs) and its balance for positive mind set.

CO2 : Develop the healthy lifestyles for good health for their better future.

CO3 : Build a Healthy and caring relationships to meet the requirements of good/social/positive life.

CO4 : Learn about Avoiding risks and harmful habits in their campus and outside the campus for their bright future.

CO5 : Prevent and fight against harmful diseases for good health through positive mind set.

INDUCTION PROGRAM (3 WEEKS)

Purpose of the *Induction Program* is to help new students to adjust and feel comfortable in the new environment, inculcate in them the ethos and culture of the institution, help them build bonds with other students and faculty members, and expose them to a sense of larger purpose and self-exploration.

The term *induction* is generally used to describe the whole process whereby the incumbents adjust to or acclimatize to their new roles and environment. In other words, it is a well planned event to educate the new entrants about the environment in a particular institution, and connect them with the people in it.

Induction Program engages with the new students as soon as they come into the institution; regular classes start only after that. At the start of the induction, the incumbents learn about the institutional policies, processes, practices, culture and values, and their mentor groups are formed. Then the different activities start, including those which are daily.

List of activities:

- Physical Activity
- Creative Arts and Culture
- Mentoring & Universal Human Values
- Familiarization with College, Dept./Branch
- Literary Activity
- Proficiency Modules
- Lectures & Workshops by Eminent People
- Visits in Local Area
- Extra-Curricular Activities in College
- Feedback and Report on the Program

The time during the Induction Program is also used to rectify some critical lacunas, for example, English background, for those students who have deficiency in it. These are included under Proficiency Modules.

There will be a 3-week long induction program for the UG students entering the institution, right at the start. Normal classes start only after the induction program is over. Its purpose is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.

AICTE ACTIVITY POINTS

Apart from technical knowledge and skills to be successful as professionals, students should have excellent soft skills, leadership qualities and team spirit. They should have entrepreneurial capabilities and societal commitment. In order to match these multifarious requirements, AICTE has created a unique mechanism of awarding Activity Points over and above the academic grades.

Following suggestive activities as Long Term Goals may be carried out by students in teams:

- Prepare and implement plan to create local job opportunities.
- Prepare and implement plan to improve education quality in village.
- Prepare an actionable DPR for doubling the village Income.
- Developing Sustainable Water Management System.
- Prepare and improve a plan to improve health parameters of villagers.
- Developing and implementing of Low-Cost Sanitation facilities.
- Prepare and implement plan to promote Local Tourism through Innovative Approaches.
- Implement/Develop Technology solutions which will improve quality of life.
- Prepare and implement solution for energy conservation.
- Prepare and implement plan to develop skills of village youth and provide employment.
- Develop localized techniques for reduction in construction Cost.
- Prepare and implement plan of sustainable growth of village.
- Setting of Information imparting club for women leading to contribution in social and economic issues.
- Developing and managing efficient garbage disposable system.
- Contribution to any national level initiative of Government of India. For example Digital India / Skill India / Swachh Bharat Internship etc.

A student has to earn 100 points (75 points for lateral entry students).

The activities can be spread over entire duration of the programme and it will be reflected in the student's 8th semester Grade Card. It shall not be considered for computation of SGPA/CGPA and for vertical progression. The

total duration of the activities for entire programme is 400 hours for regular students and 300 hours for lateral entry students.

AICTE Activity Points Implementation and Monitoring Committee has been constituted under the Chairmanship of Principal and NSS Coordinator as convener, and Dean Academic, Dean Student Welfare, Chief Warden, NCC Coordinator and Two Senior Professors as members. This Committee shall arrange for logistics and material support wherever necessary and review the progress at the end of each Semester.

Procedure:

1. Students can take-up listed activities individually or in a group.
2. Proctors shall monitor the progress of students' work.
3. They can work on daily basis/ weekends/ or in one shot, continuously for 300 hours to earn 100 points. The schedule is at the convenience of group of students.
4. For every **FOUR** hours of work students will get **ONE** Activity Point.
5. Students shall submit a report and photographs related to activities carried out to the proctor
6. Students shall maintain a “Activity Logbook”
7. Students shall register to "Activity Points" during VIII Semester
8. The work done by students will be reviewed by Department Seminar Evaluation Committee during VIII Semester.
9. Break-up of CIE marks for activity points:

Evaluation by the Proctor	20 marks
Evaluation by DSEC	
(i) Report	30 marks
(ii) Presentation	30 marks
(iii) Outcome	20 marks
Total	**100 marks**

10. No SEE for Activity Points.
11. Students will be awarded either NP or PP grade based on their performance.
12. Students will be awarded degree only on earning P grade in the Activity Points.

PROGRAM OUTCOMES

Engineering Graduates will be able to:

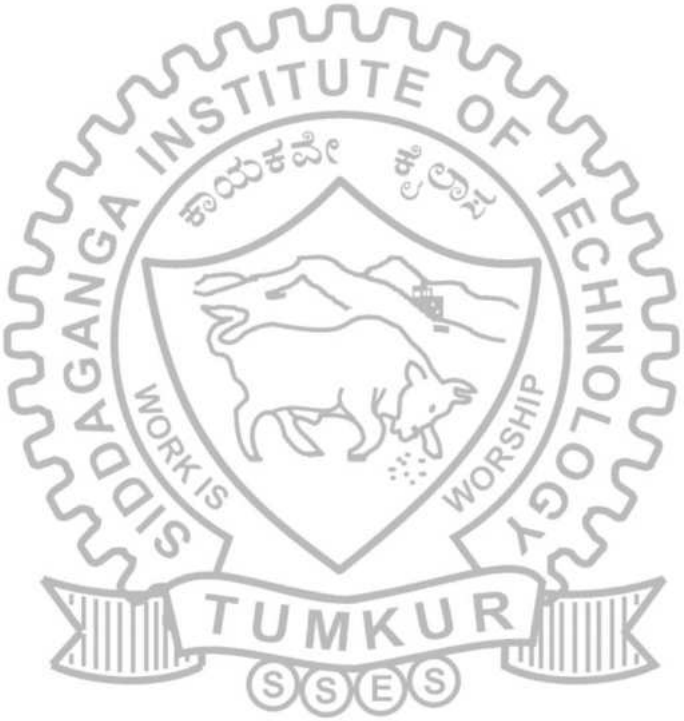
1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching 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.


SIDDAGANGA INSTITUTE OF TECHNOLOGY
WORK IS WORSHIP
TUMKUR
SSES

Our Motto
"WORK IS WORSHIP"

VISION

To develop young minds in a learning environment of high academic ambience by synergizing spiritual values and technological competence.

MISSION

To continuously strive for the total development of students by educating them in state-of-the-art technologies and helping them imbibe professional ethics and societal commitment, so that they emerge as competent professionals to meet the global challenges.

QUALITY POLICY

Siddaganga Institute of Technology is committed to:

- Impart quality education by establishing effective learning-teaching-learning processes to produce competent engineers with high professional ethics and societal responsibility.
- Create congenial environment and provide state-of-the-art infrastructure.
- Continually improve the effectiveness of the quality management system.
- Satisfy all applicable requirements.

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