B.M.S. COLLEGE OF ENGINEERING, BENGALURU-19
Autonomous Institute, Affiliated to VTU

BACHELOR OF ENGINEERING

SCHEME & SYLLABUS

I & II SEMESTERS

2022-2023

B.M.S. COLLEGE OF ENGINEERING, BENGALURU-19
Autonomous Institute, Affiliated to VTU

VISION

PROMOTING PROSPERITY OF MANKIND BY AUGMENTINGHUMAN RESOURCE CAPITAL THROUGH QUALITY TECHNICAL EDUCATION &TRAINING

MISSION

ACCOMPLISH EXCELLENCE IN THE FIELD OF TECHNICAL EDUCATION THROUGH EDUCATION, RESEARCH ANDSERVICE NEEDS OF SOCIETY

B.M.S. COLLEGE OF ENGINEERING, BENGALURU-19
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FIRST YEAR SYLLABUS BOOK
With effect from the A.Y.2022-2023

CONTENTS

5.23	22CY1BSCME/22CY2BSCME - Applied Chemistry for Mechanical Stream	
5.24	22CY1BSCEE/22CY2BSCEE - Applied Chemistry for Electrical Stream	
5.25	22ME1ESCED/22ME2ESCED - Computer Aided Engineering Drawing	
5.26	22CV1ESGBT/22CV2ESGBT - Green Buildings	
5.27	22ME1ETISE/22ME2ETISE - Introduction to Sustainable Engineering	
5.28	22EE1ESRES/22EE2ESRES - Renewable Energy Sources	
5.29	22CV1ESWMT/22CV2ESWMT - Waste Management	
5.30	22ME1AEIDT/22MEAEIDT - Innovation and Design Thinking	
5.31	22MA1AESFH/22MA2AESFH - Scientific Foundations for Health	
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5.33	22MA2BSMME - Mathematical foundation for Mechanical Engineering Stream– 2	
5.34	22MA2BSMCV - Mathematical foundation for Civil Engineering – 2	
5.35	22MA2BSMCS - Mathematical foundation for Computer Science Stream– 2	
5.36	22MA2BSMES - Mathematical foundation for Electrical Stream– 2	
5.37	22MA2AEPWE - Professional Writing Skills in English	
5.38	22MA1HSBAK/22MA2HSBAK - Balake Kannada	
5.39	22MA1HSSAK/22MA2HSSAK - Samskrutika Kannada	
5.40	22MA1HSCIP/22MA2HSCIP - Constitution of India & Professional Ethics	

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Scheme & Syllabus for UG Programme – I & II Semesters
ABBREVATIONS

AY	Academic Year
AAT	Alternative Assessment Tools
BOE	Board of Examiners
BOS	Board of Studies
CBCS	Choice Based Credit System
CGPA	Cumulative Grade Point Averages
CIE	Continuous Internal Evaluation
HS	Humanity and Social Science Courses
L-T-P-S	Lecture-Tutorial- Practical-Self study
NFTE	Not Fit for Technical Education
SEE	Semester End Examination
SGPA	Semester Grade Point Average
BS	Basic Science
ESC	Engineering Science
PLC	Programming Language
ETC	Emerging Technology
SDC	Skill Development Course
AEC	Ability Enhancement
NC	No Credit

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Scheme of Instruction for First Semester B.E.

2022-2023 (PHYSICS CYCLE)

	Sl. No.	Course Type	COURSE CODE	Course Title	L	T	P	Total credits
1	1	ASC1	22MA1BSMCV	Mathematical foundation for Civil Engineering – 1	2	1	1	4
2			22MA1BSMCS	Mathematical foundation for Computer Science Stream– 1				
3			22MA1BSMES	Mathematical foundation for Electrical Stream– 1				
4	2	ASC2	22PH1BSPCV	Applied Physics for Civil Engg.	3	0	2	4
5			22PH1BSPEE	Applied Physics for Electrical Stream				
6			22PH2BSPCS	Applied Physics for Computer Science Stream				
7	3	ESC	22EC1ESBEC	Basic Electronics	3	0	0	3
8			22EE1ESEEE	Elements of Electrical Engg.				
9			22CV1ESENM	Engineering Mechanics				
10			22CS1ESPOP	Principles of programming in C				
11	4	ESC1	22CV1ESICV	Introduction to Civil Engineering	3	0	0	3
12			22ME1ESIME	Introduction to Mechanical Engineering				
13			22CS1ESICP	Introduction to C Programming				
14			22EC1ESIEL	Introduction to Electronics Engineering				
15			22EE1ESIEE	Introduction to Electrical Engineering				
16	5	PLC	22CS1ESPYP	Introduction to PYTHON Programing	2	0	2	3
17			22CS1ESWEB	Introduction to WEB Programing				
18	6	HSMC	22MA1HSBAK	Balake Kannada	1	0	0	1
19			22MA1HSSAK	Samskrutika Kannada				
20	7	AEC2	22ME1AEIDT	Innovation and Design Thinking	1	0	0	1
21	8	AEC1	22MA1AECEN	Communicative English	1	0	0	1
Total								**20**

L-Lecture (1 credit=1 contact hr.); **T**-Tutorial (1 credit=2 contact hrs.); **P**-Practical (1 credit=2 contact hrs.);	
ASC1 - Applied Science Course	PLC - Programming Language Course
ASC2 - Applied Science Course	HSMC--> Humanities
ESC - Engineering Science Course	SDC- Skill Development Course
ESC1 - Engineering Science Course-1	AEC- Ability Enhancement

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Scheme of Instruction for First Semester B.E.

2022-2023 (CHEMISTRY CYCLE)

	Sl. No.	Course Type	COURSE CODE	Course Title	L	T	P	Total credits
1	1	ASC1	22MA1BSMCS	Mathematical foundation for Computer Science Stream– 1	2	1	1	4
2			22MA1BSMME	Mathematical foundation for Mechanical Engineering Stream– 1				
3			22MA1BSMES	Mathematical foundation for Electrical Stream– 1				
4	2	ASC2	22CY1BSCCS	Applied Chemistry for CSE Stream	3	0	2	4
5			22CY1BSCME	Applied Chemistry for Mechanical Stream				
6			22CY1BSCEE	Applied Chemistry for Electrical Stream				
7	3	ESC	22ME1ESCED	Computer Aided Engineering Drawing	1	0	4	3
8	4	ESC1	22CV1ESICV	Introduction to Civil Engineering	3	0	0	3
9			22ME1ESIME	Introduction to Mechanical Engineering				
10			22CS1ESICP	Introduction to C Programming				
11			22EC1ESIEL	Introduction to Electronics Engineering				
12			22EE1ESIEE	Introduction to Electrical Engineering				
13	5	ETC	22CV1ESGBT	Green Buildings	3	0	0	3
14			22ME1ETISE	Introduction to Sustainable Engineering				
15			22EE1ESRES	Renewable Energy Sources				
16			22CV1ESWMT	Waste Management				
17	6	HSMC	22MA1HSCIP	Constitution of India & Professional Ethics	1	0	0	1
18	7	SDC	22MA1AESFH	Scientific Foundations for Health	1	0	0	1
19	8	AEC1	22MA1AECEN	Communicative English	1	0	0	1
	Total							**20**

L-Lecture (1 credit=1 contact hr.); **T**-Tutorial (1 credit=2 contact hrs.); **P**-Practical (1 credit=2 contact hrs.);	
ASC1 - Applied Science Course	ETC - Emerging Technology Course
ASC2 - Applied Science Course	HSMC--> Humanities
ESC - Engineering Science Course	SDC- Skill Development Course
ESC1 - Engineering Science Course-1	AEC- Ability Enhancement

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Scheme of Instruction for Second Semester B.E.

2022-2023 (PHYSICS CYCLE)

	Sl. No.	Course Type	COURSE CODE	Course Title	L	T	P	Total credits
1	1	ASC1	22MA2BSMME	Mathematical foundation for Mechanical Engineering Stream– 2	2	1	1	4
2			22MA2BSMCS	Mathematical foundation for Computer Science Stream– 2				
3			22MA2BSMES	Mathematical foundation for Electrical Stream– 2				
4	2	ASC2	22PH2BSPME	Applied Physics for Mechanical Engg. Stream	3	0	2	4
5			22PH2BSPEE	Applied Physics for Electrical Stream				
6			22PH2BSPCS	Applied Physics for Computer Science Stream				
7		ESC-2	22EC2ESBEC	Basic Electronics	3	0	3	3
8			22ME2ESEME	Elements of Mechanical Engineering				
9			22CS2ESPOP	Principles of programming in C				
10	4	ESC2-II	22EE2ESIEE	Introduction to Electrical Engg.	3	0	0	3
11			22CV2ESICV	Introduction to Civil Engineering				
12			22EC2ESIEL	Introduction to Elecronics Engg				
13			22CS2ESICP	Introduction to C Programing				
14			22ME2ESIME	Introduction to Mechanical Engg.				
15	5	PLC	22CS2ESPYP	Introduction to PYTHON Programing	2	0	2	3
16			22CS2ESWEB	Introduction to WEB Programing				
17	6	HSMC	22MA2HSBAK	Balake Kannada	1	0	0	1
18			22MA2HSSAK	Samskrutika Kannada	1	0	0	1
19	7	AEC2	22ME2AEIDT	Innovation and Design Thinking	1	0	0	1
20	8	AEC2	22MA2AEPWE	Professional Writing Skills in English	1	0	0	1
Total								**20**

L-Lecture (1 credit=1 contact hr.); **T**-Tutorial (1 credit=2 contact hrs.); **P**-Practical (1 credit=2 contact hrs.);	
ASC1 - Applied Science Course	PLC - Programming Language Course
ASC2 - Applied Science Course	HSMC--> Humanities
ESC2 - Engineering Science Course	SDC- Skill Development Course
ESC2-II - Engineering Science Course-2	AEC- Ability Enhancement

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Scheme of Instruction for Second Semester B.E.

2022-2023(CHEMISTRY CYCLE)

	Sl. No.	Course Type	COURSE CODE	Course Title	L	T	P	Total credits
1	1	ASC1	22MA2BSMCS	Mathematical foundation for Computer Science Stream– 2	2	1	1	4
2			22MA2BSMCV	Mathematical foundation for Civil Engineering – 2				
3			22MA2BSMES	Mathematical foundation for Electrical Stream– 2				
4	2	ASC2	22CY2BSCCS	Applied Chemistry for CSE Stream	3	0	2	4
5			22CY2BSCCV	Applied Chemistry for Civil Stream				
6			22CY2BSCEE	Applied Chemistry for Electrical Stream				
7	3	ESC2	22ME2ESCED	Computer Aided Engineering Drawing	1	0	4	3
8	4	ESC2-II	22CV2ESICV	Introduction to Civil Engineering	3	0	0	3
9			22ME2ESIME	Introduction to Mechanical Engineering				
10			22CS2ESICP	Introduction to C Programming				
11			22EC2ESIEL	Introduction to Electronics Engineering				
12			22EE2ESIEE	Introduction to Electrical Engineering				
13	5	ETC	22CV2ESGBT	Green Buildings	3	0	0	3
14			22ME2ETISE	Introduction to Sustainable Engineering				
15			22EE2ESRES	Renewable Energy Sources				
16			22CV2ESWMT	Waste Management				
17	6	HSMC	22MA2HSCIP	Constitution of India & Professional Ethics	1	0	0	1
18	7	SDC	22MA2AESFH	Scientific Foundations for Health	1	0	0	1
19	8	AEC2	22MA2AEPWE	Professional Writing Skills in English	1	0	0	1
Total								**20**

L-Lecture (1 credit=1 contact hr.); **T**-Tutorial (1 credit=2 contact hrs.); **P**-Practical (1 credit=2 contact hrs.);	
ASC1 - Applied Science Course	ETC - Emerging Technology Course
ASC2 - Applied Science Course	HSMC--> Humanities
ESC2 - Engineering Science Course	SDC- Skill Development Course
ESC2-II - Engineering Science Course-1	AEC- Ability Enhancement

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Course Title	Mathematical Foundation for Civil Engineering – 1	Course Code	22MA1BSMCV
Credits	04	L – T – P	2-1-1

Course Objectives:

The objectives of the course are to facilitate the learners to

- **Appreciate** the importance of Calculus and Matrix theory in Civil Engineering.
- **Gain the knowledge** of Calculus and Matrix theory concepts to implement them in their core domain.
- Improve their **mathematical thinking** and **acquire skills** required for sustained lifelong learning.

Teaching-Learning Process (General Instructions)

These are sample strategies which teachers can use to accelerate the attainment of the various course outcomes.

- Lecture method (L) does not mean only traditional method, but different type of teaching methods may be adopted to develop the outcomes.
- Show Video/animation films to explain functioning of various concepts.
- Encourage collaborative (Group Learning) learning in the class.
- Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
- Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
- Topics will be introduced in a multiple representation 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 to improve the students' understanding.

UNIT - 1	**[08 hours]**

Calculus of One Variable:

Introduction to polar coordinates, polar curves, angle between the radius vector and tangent, angle between two curves. Pedal equations. Curvature and Radius of curvature – Cartesian, Polar forms.

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

(RBT Levels: L1, L2 and L3)

Teaching-Learning Process	Chalk and talk method / Power Point Presentation

UNIT - 2	**[08 hours]**

Multivariable Calculus

Partial differentiation, total derivative - differentiation of composite functions, Jacobian, Taylor's and Maclaurin's series expansion for two variables (statement only) – problems.

Applications: Errors and approximations, Maxima and minima for a function of two variables.

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

(RBT Levels: L1, L2 and L3)

Teaching-Learning Process	Chalk and talk method / Power Point Presentation

UNIT - 3	**[08 hours]**
Ordinary Differential Equations of First Order Introduction to first order ordinary differential equations. Bernoulli's differential equations. Exact and reducible to exact differential equations- 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**: Mixing problem, Orthogonal trajectories. **Self-Study:** Nonlinear differential equations - Introduction to general and singular solutions, solvable for p, for x and y. Clairaut's equations. **(RBT Levels: L1, L2 and L3)**	
Teaching-Learning Process	Chalk and talk method / Power Point Presentation
UNIT - 4	**[08 hours]**
Ordinary Differential Equations of Higher Order Higher-order linear ordinary differential equations with constant coefficients - Inverse differential operator, method of variation of parameters, Cauchy's and Legendre's homogeneous differential equations. **Applications:** Oscillations of a spring-mass system. **Self-Study:** Formulation and solution of Cantilever beam. Finding the solution by the method of undetermined coefficients. **(RBT Levels: L1, L2 and L3)**	
Teaching-Learning Process	Chalk and talk method / Power Point Presentation
UNIT - 5	**[08 hours]**
Matrices and System of equations Elementary row transformation of a matrix, Rank of a matrix. Consistency and Solution of system of linear equations - Gauss-elimination method, approximate solution by Gauss-Seidel method. Eigenvalues and eigenvectors, Rayleigh's power method to find the dominant Eigenvalue and Eigenvector. **Applications:** Balancing chemical equations, traffic flow. **Self-Study:** Solution of a system of linear equations by Gauss-Jacobi iterative method. Inverse of a square matrix by Cayley- Hamilton theorem. **(RBT Levels: L1, L2 and L3)**	
Teaching-Learning Process	Chalk and talk method / Power Point Presentation

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List of Lab Programs

Weekly: 1 Session (2 hours) **Batch strength :15 students**

Number of Labs: 12 (10 Sessions+2 Lab Assessments)

1. Introduction to Python: Installation of packages and Modules, Variables, Lists, Tuples, Strings and Dictionaries.
2. Control statements and Looping statements, Introduction to Numpy, Sympy and Matplotlib.
3. 2D plots for Cartesian and polar curves.
4. Finding angle between polar curves, curvature and radius of curvature of a given curve.
5. Finding partial derivatives and Jacobian of multivariable functions.
6. Applications to Maxima and Minima of two variables.
7. Solving the first and second order differential equations with initial/boundary conditions and visualising their solutions.
8. Solution of a differential equation of oscillations of a spring/deflection of a beam with different loads.
9. Solving the system of linear equations using Gauss-Elimination and Gauss-Seidel Method.
10. Compute eigenvalues and eigenvectors and find the largest and smallest eigenvalue by Rayleigh power method.

Suggested software: Python

Course outcomes (Course Skills Set)

After successfully completing the course, the student will be able to understand the topics:

Course Code	CO	COURSE OUTCOME (CO)	PO	Strength
22MA1BSMCV	**CO 1**	Apply the concepts of Calculus and Matrix theory in solving problems.	1	3
	CO 2	Relate the importance of Calculus and Matrix theory concepts to Civil engineering.	1	1
	CO 3	Demonstrate the understanding of Calculus and Matrix theory concepts through programming skills using modern tool - Python.	1,5,10	2

Assessment Details (both CIE and SEE)

Component	Type of assessment	Max. Marks	Total	Reduced Marks	Total	Min. Marks required for eligibility	Total Marks
CIE – Theory	Quiz/AAT	10		50	25	10	50
	Test 1	40	90				
	Test 2	40					
	Test 3	40					
CIE – Lab	Record & Performance	100	120	10	25	10	
	Lab Test	15		15			
CIE				50		**20**	
SEE	End Exam	100		50		35	50
Grand Total Marks						**40**	**100**

Two best scores out of the three tests will be considered for CIE.
CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy
as per the outcome defined for the course.

Semester End Examination:

- Each unit consists of one full question.
- Five full questions to be answered.
- To set one question each from Units 1, 3, 5 and two questions each from Unit 2 and Unit 4.

Suggested Learning Resources:

Text Books

1. **B. S. Grewal**: "Higher Engineering Mathematics", Khanna publishers, 44th Ed., 2021.
2. **E. Kreyszig**: "Advanced Engineering Mathematics", John Wiley & Sons, 10th Ed., 2018.
3. **D. C. Lay:** "Linear Algebra and its Applications", Pearson Publishers, 4th Ed., 2018.
4. **C.R. Severance**: "Python for Everybody: Exploring Data Using Python 3", 1st edition, University of Michigan, 2016.
5. **J. Kiusalaas** : "Numerical Methods in Engineering with Python 3", Cambridge university press, 2013.

Reference Books

1. **V. Ramana:** "Higher Engineering Mathematics", McGraw-Hill Education, 11th Ed., 2017
2. **S. Pal and S. C. Bhunia**: "Engineering Mathematics", Oxford University Press, 3rd Ed., 2016.
3. **N. P. Bali and M. Goyal**: "A textbook of Engineering Mathematics", Laxmi Publications, 10th Ed., 2022.
4. **C. R. Wylie, L. C. Barrett:** "Advanced Engineering Mathematics", McGraw – Hill Book Co., New York, 6th Ed., 2017.
5. **C. B. Gupta, S. R. Sing and M. Kumar:** "Engineering Mathematic for Semester I and II", Mc-Graw Hill Education (India) Pvt. Ltd, 2015.
6. **H. K. Dass and Er. R. Verma:** "Higher Engineering Mathematics", S. Chand Publication, 3rd Ed., 2014.
7. **J. Stewart: "**Calculus", Cengage Publications, 7th Ed., 2019.
8. **G. Williams:** "Linear Algebra with applications", Jones Bartlett Publishers Inc., 6th Ed., 2017.
9. **M Lutz,** "Programming Python", O'Reilly Media, 4th edition, 2010.
10. **C. Jackson,** "Learning to Program using Python", Packt Publishing, 2nd edition, 2018.

Web links and Video Lectures (e-Resources):

1. Calculus of one and multivariable: https://nptel.ac.in/courses/111104092
2. Differential Equations: https://www.classcentral.com/course/differential-equations-engineers-13258 and https://nptel.ac.in/courses/111106100
3. Matrices and System of Equations:https://www.classcentral.com/course/matrix-algebra-engineers-11986 and https://nptel.ac.in/courses/111106051
4. Python:https://spokentutorial.org/tutorialsearch/?search_foss=Python%203.4.3&search_language=English&page=1

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Course Title	Mathematical foundation for Computer Science stream -1	Course Code	22MA1BSMCS
Credits	4	L – T – P	2-1-1

Course Objectives: The objectives of the course are to facilitate the learners to

- **Appreciate** the importance of Calculus, Congruences and Matrix theory in computer and allied engineering science.
- **Gain the knowledge** of Calculus, Congruences and Matrix theory concepts to implement them in their core domain.
- Improve their **mathematical thinking** and **acquire skills** required for sustained lifelong learning.

Teaching-Learning Process (General Instructions)

These are sample strategies, which teachers can use to accelerate the attainment of the various course outcomes.

- Lecture method (L) does not mean only traditional method, but different type of teaching methods may be adopted to develop the outcomes.
- Show Video/animation films to explain functioning of various concepts.
- Encourage collaborative (Group Learning) Learning in the class.
- Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
- Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
- Topics will be introduced in a multiple representation 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 to improve the students' understanding.

UNIT - 1	**[08 hours]**

Calculus of One Variable:

Introduction to polar coordinates, polar curves, angle between the radius vector and tangent, angle between two curves. Pedal equations.

Curvature and Radius of curvature - Cartesian, Parametric, Polar and Pedal forms.

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

(RBT Levels: L1, L2 and L3)

Teaching-Learning Process	Chalk and talk method / Power Point Presentation

UNIT - 2	**[08 hours]**

Multivariable Calculus

Partial differentiation, total derivative - differentiation of composite functions, Jacobian, Taylor's and Maclaurin's series expansion for two variables (statement only) – problems.

Applications: Maxima and minima for a function of two variables, Gradient descent method.

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

(RBT Levels: L1, L2 and L3)

Teaching-Learning Process	Chalk and talk method / Power Point Presentation

UNIT - 3	**[08 hours]**
Ordinary Differential Equations (ODEs) of First Order Introduction to first order ordinary differential equations. Bernoulli's differential equations. Exact and reducible to exact differential equations- 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**: Growth and decay, Orthogonal trajectories. **Self-Study:** Nonlinear differential equations - Introduction to general and singular solutions, solvable for p, for x and y. Clairaut's equations. **(RBT Levels: L1, L2 and L3)**	
Teaching-Learning Process	Chalk and talk method / Power Point Presentation
UNIT - 4	**[08 hours]**
Congruences and its applications Introduction to Congruences, Linear Congruences, The Chinese Remainder theorem, Solving Polynomials, Linear Diophantine Equation, Euler's Theorem, Wilson Theorem and Fermat's little theorem. **Application:** RSA algorithm. **Self-Study:** Divisibility, GCD, Properties of Prime Numbers, Fundamental theorem of Arithmetic. **(RBT Levels: L1, L2 and L3)**	
Teaching-Learning Process	Chalk and talk method / Power Point Presentation
UNIT - 5	**[08 hours]**
Matrices and System of equations Elementary row transformation of a matrix, Rank of a matrix. Consistency and Solution of system of linear equations - Gauss-elimination method, approximate solution by Gauss-Seidel method. Eigenvalues and eigenvectors, Rayleigh's power method to find the dominant Eigenvalue and Eigenvector. **Applications:** Traffic flow. **Self-Study:** Solution of a system of linear equations by Gauss-Jacobi iterative method. Inverse of a square matrix by Cayley- Hamilton theorem. **(RBT Levels: L1, L2 and L3).**	
Teaching-Learning Process	Chalk and talk method / Power Point Presentation

List of Lab Programs

Weekly: 1 Session (2 hours) **Batch Strength : 15 students**

Number of Labs: 12 (10 Sessions+2 Lab Assessments)

1. Introduction to Python: Installation of packages and Modules, Variables, Lists, Tuples, Strings and Dictionaries.
2. Control statements and Looping statements, Introduction to Numpy, Sympy and Matplotlib.
3. 2D plots for Cartesian and polar curves.
4. Finding angle between polar curves, curvature and radius of curvature of a given curve.
5. Finding partial derivatives and Jacobian of multivariable functions.

6. Applications to Maxima and Minima of two variables.
7. Solving the first order differential equations with initial conditions and visualising their solutions.
8. Finding GCD using Euclid's Algorithm and solving linear Congruence.
9. Solving the system of linear equations using Gauss-Elimination and Gauss-Seidel Method.
10. Compute eigenvalues and eigenvectors and find the largest and smallest eigenvalue by Rayleigh power method.

Course outcomes (Course Skills Set)

After successfully completing the course, the student will be able to understand the topics:

Course Code	CO	COURSE OUTCOME (CO)	PO	Strength
22MA1BSMCS	CO 1	Apply the concepts of Calculus, Congruences and Matrix theory in solving problems.	1	3
	CO 2	Relate the importance of Calculus, Congruences and Matrix theory in computer science stream.	1	1
	CO 3	Demonstrate the understanding of Calculus, Congruences and Matrix theory through programming skills using modern tool - Python.	1,5,10	2

Assessment Details (both CIE and SEE)

Component	Type of assessment	Max. Marks	Total	Reduced Marks	Total	Min. Marks required for eligibility	Total Marks
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	Test 1	40					
	Test 2	40					
	Test 3	40					
CIE – Lab	Record & Performance	100	120	10	25	10	
	Lab Test	15		15			
CIE				50		**20**	
SEE	End Exam	100		50		35	50
Grand Total Marks						**40**	**100**

Two best scores out of the three tests will be considered for CIE.

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

- Each unit consists of one full question.
- Five full questions to be answered.
- To set one question each from Units 1, 3, 5 and two questions each from Unit 2 and Unit 4.

Suggested Learning Resources:

Text Books

1. **B. S. Grewal**: "Higher Engineering Mathematics", Khanna publishers, 44th Ed., 2021.
2. **E. Kreyszig**: "Advanced Engineering Mathematics", John Wiley & Sons, 10th Ed., 2018.
3. **D. C Lay:** "Linear Algebra and its Applications", Pearson Publishers, 4th Ed., 2018.
4. **T. Koshy:** "Elementary number theory with applications", Elsevier Science, 2nd Ed., 2007.
5. **C.R. Severance**: "Python for Everybody: Exploring Data Using Python 3", 1st edition, University of Michigan, 2016.
6. **J. Kiusalaas** : "Numerical Methods in Engineering with Python 3", Cambridge university press, 2013.

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3. **N. P. Bali and M. Goyal**: "A textbook of Engineering Mathematics" Laxmi Publications, 10th Ed., 2022.
4. **C. R. Wylie, L. C. Barrett:** "Advanced Engineering Mathematics" McGraw – Hill Book Co., Newyork, 6th Ed., 2017.
5. **C. B. Gupta, S. R. Sing S. R. and M. Kumar:** "Engineering Mathematic for Semester I and II", Mc-Graw Hill Education(India) Pvt. Ltd 2015.
6. **H. K. Dass and Er. Rajnish Verma:** "Higher Engineering Mathematics" S. Chand Publication, 3rd Ed., 2014.
7. **J. Stewart: "**Calculus" Cengage Publications, 7th Ed., 2019.
8. **G. Williams:** "Linear Algebra with applications", Jones Bartlett Publishers Inc., 6th Ed., 2017.
9. **W. Stallings:** "Cryptography and Network Security" Pearson Prentice Hall, 6th Ed., 2013.
10. **M Lutz,** "Programming Python", O'Reilly Media, 4th edition, 2010.
11. **C. Jackson,** "Learning to Program using Python", Packt Publishing, 2nd edition, 2018.

Web links and Video Lectures (e-Resources):

1. Calculus of one and multivariable: https://nptel.ac.in/courses/111104092
2. Differential Equations: https://www.classcentral.com/course/differential-equations-engineers-13258
3. Congruences and its applications: https://www.classcentral.com/course/youtube-math-455-number-theory-90833/classroomand https://nptel.ac.in/courses/111101137
4. Matrices and System of Equations: https://www.classcentral.com/course/matrix-algebra-engineers-11986 and https://nptel.ac.in/courses/111106051
5. Python:https://spokentutorial.org/tutorialsearch/?search_foss=Python%203.4.3&search_language=English&page=1

B.M.S. COLLEGE OF ENGINEERING, BENGALURU-19
Autonomous Institute, Affiliated to VTU

Course Title	Mathematical foundation for Electrical stream - 1	Course Code	22MA1BSMES
Credits	4	L – T – P	2 – 1 – 1

Course objectives:
The objectives of the course are to facilitate the learners to

- **Appreciate** the importance of calculus and matrix theory in allied engineering science
- **Gain the knowledge** of calculus and matrix theory concepts to implement them in their core domain
- Improve their **mathematical thinking** and **acquire skills** required for sustained lifelong learning

Teaching-Learning Process (General Instructions)
These are sample strategies, which teachers can use to accelerate the attainment of the various course outcomes.

- Lecture method(L) does not mean only traditional method, but different type of teaching methods may be adopted to develop the outcomes.
- Show Video/animation films to explain functioning of various concepts.
- Encourage collaborative (Group Learning) Learning in the class.
- Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
- Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
- Topics will be introduced in a multiple representation 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 to improve the students' understanding.

UNIT -1	**[08 hours]**

Calculus of One Variable
Introduction to polar coordinates, polar curves, angle between the radius vector and tangent, angle between two curves. Pedal equations.
Curvature and Radius of curvature - Cartesian, Parametric, Polar forms.
Self-study: Center and circle of curvature, evolutes and involutes.
(RBT Levels: L1, L2 and L3)

Teaching-Learning Process	Chalk and talk method / Power Point Presentation

UNIT - 2	**[08 hours]**

Multivariable Calculus
Partial differentiation, total derivative - differentiation of composite functions, Jacobian, Taylor's and Maclaurin's series expansion for two variables (statement only) – problems.
Applications: Errors and approximations, Maxima and minima for a function of two variables.
Self-study: Euler's theorem and problems. Method of Lagrange's undetermined multipliers with a single constraint.
(RBT Levels: L1, L2 and L3)

Teaching-Learning Process	Chalk and talk method / Power Point Presentation

UNIT- 3	**[08 hours]**
Ordinary Differential Equations of First Order Introduction to first order ordinary differential equations. Bernoulli's differential equations. Exact and reducible to exact differential equations- 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:** L-R circuits. Orthogonal trajectories. **Self-Study:** Nonlinear differential equations- Introduction to general and singular solutions, solvable for p, for x and y. Clairaut's equations. **(RBT Levels: L1, L2 and L3)**	
Teaching-Learning Process	Chalk and talk method / Power Point Presentation
UNIT - 4	**[08 hours]**
Ordinary Differential Equations of Higher Order Higher-order linear ordinary differential equations with constant coefficients - Inverse differential operator, method of variation of parameters, Cauchy's and Legendre's homogeneous differential equations. Problems. **Application:** LRC series circuit. **Self-Study**: Finding the solution by the method of undetermined coefficients. **(RBT Levels: L1, L2 and L3)**	
Teaching-Learning Process	Chalk and talk method / Power Point Presentation
UNIT - 5	**[08 hours]**
Matrices and System of equations Elementary row transformation of a matrix, Rank of a matrix. Consistency and Solution of system of linear equations: Gauss-elimination method, approximate solution by Gauss-Seidel method. Eigenvalues and Eigenvectors, Rayleigh's power method to find the dominant Eigenvalue and Eigenvector. Problems **Applications of Linear Algebra:** Mesh current, traffic flow. **Self-Study:** Solution of a system of equations by Gauss-Jacobi iterative method. Inverse of a square matrix by Cayley- Hamilton theorem. **(RBT Levels: L1, L2 and L3)**	
Teaching-Learning Process	Chalk and talk method / Power Point Presentation

List of Lab Programs

Weekly: 1 Session (2 hours) **Batch strength :15 students**

Number of Labs: 12 (10 Sessions+2 Lab Assessments)

1. Introduction to Python: Installation of packages and Modules, Variables, Lists, Tuples, Strings and Dictionaries.
2. Control statements and Looping statements, Introduction to Numpy, Sympy and Matplotlib.
3. 2D plots for Cartesian and polar curves.
4. Finding angle between polar curves, curvature and radius of curvature of a given curve.
5. Finding partial derivatives and Jacobian of multivariable functions.

6. Applications to Maxima and Minima of two variables.
7. Solving the first and second order differential equations with initial/boundary conditions and visualising their solutions.
8. Solving the differential equations of electrical circuits – RC, LR and LCR.
9. Solving the system of linear equations using Gauss-Elimination and Gauss-Seidel Method.
10. Compute eigenvalues and eigenvectors and find the largest and smallest eigenvalue by Rayleigh power method.

Suggested software: Python

Course outcomes (Course Skills Set)

After successfully completing the course, the student will be able to understand the topics:

Course Code	CO	COURSE OUTCOME (CO)	PO	Strength
22MA1BSMES	CO 1	Apply the concepts of Calculus and Matrix theory in solving problems.	1	3
	CO 2	Relate the importance of Calculus and Matrix theory concepts to Electrical engineering stream.	1	1
	CO 3	Demonstrate the understanding of Calculus and Matrix theory concepts through programming skills using modern tool - Python.	1,5,10	2

Assessment Details (both CIE and SEE)

Component	Type of assessment	Max. Marks	Total	Reduced Marks	Total	Min. Marks required for eligibility	Total Marks
CIE – Theory	Quiz/AAT	10	90	50	25	10	50
	Test 1	40					
	Test 2	40					
	Test 3	40					
CIE – Lab	Record & Performance	100	120	10	25	10	
	Lab Test	15		15			
CIE				50		**20**	
SEE	End Exam	100		50		35	50
Grand Total Marks						**40**	**100**

Two best scores out of the three tests will be considered for CIE.

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

- Each unit consists of one full question.
- Five full questions to be answered.
- To set one question each from Units 1, 3, 5 and two questions each from Unit 2 and Unit 4

Suggested Learning Resources:

Text Books

1. **B. S. Grewal**: "Higher Engineering Mathematics", Khanna publishers, 44th Ed., 2021.
2. **E. Kreyszig**: "Advanced Engineering Mathematics", John Wiley & Sons, 10th Ed., 2018.
3. **D. C. Lay:** "Linear Algebra and its Applications", Pearson Publishers, 4th Ed., 2018.
4. **C.R. Severance**: "Python for Everybody: Exploring Data Using Python 3", 1st edition, University of Michigan, 2016.
5. **J. Kiusalaas** : "Numerical Methods in Engineering with Python 3", Cambridge university press, 2013.

Reference Books

1. **V. Ramana:** "Higher Engineering Mathematics" McGraw-Hill Education, 11th Ed., 2017
2. **Srimanta Pal & Subodh C. Bhunia**: "Engineering Mathematics" Oxford University Press, 3rd Ed., 2016.
3. **N.P Bali and Manish Goyal**: "A textbook of Engineering Mathematics" Laxmi Publications, 10th Ed., 2022.
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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.
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8. **David C Lay:** "Linear Algebra and its Applications", Pearson Publishers, 4th Ed., 2018.
9. **Gareth Williams:** "Linear Algebra with applications", Jones Bartlett Publishers Inc., 6th Ed., 2017.
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2. Differential Equations: https://www.classcentral.com/course/differential-equations-engineers-13258 and https://nptel.ac.in/courses/111106100
3. Matrices and System of Equations:https://www.classcentral.com/course/matrix-algebra-engineers-11986 and https://nptel.ac.in/courses/111106051
4. Python:https://spokentutorial.org/tutorialsearch/?search_foss=Python%203.4.3&search_language=English&page=1

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B.M.S. COLLEGE OF ENGINEERING, BENGALURU-19
Autonomous Institute, Affiliated to VTU

Course Title	Mathematical foundation for Mechanical Engineering stream- 1	Course Code	22MA1BSMME
Credits	4	L – T – P	2-1-1

Course Objectives:

The objectives of the course are to facilitate the learners to

- **Appreciate** the importance of Calculus and matrix theory in Mechanical Engineering Stream.
- **Gain the knowledge** of Calculus and Matrix theory concepts to implement them in their core domain.
- Improve their **mathematical thinking** and **acquire skills** required for sustained lifelong learning.

Teaching-Learning Process (General Instructions)
These are sample strategies, which teachers can use to accelerate the attainment of the various course outcomes.

- Lecture method(L) does not mean only traditional method, but different type of teaching methods may be adopted to develop the outcomes.
- Show Video/animation films to explain functioning of various concepts.
- Encourage collaborative (Group Learning) Learning in the class.
- Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
- Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
- Topics will be introduced in a multiple representation 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 to improve the students' understanding.

UNIT - 1	**[08 hours]**

Calculus of One Variable:
Introduction to polar coordinates, polar curves, angle between the radius vector and tangent, angle between two curves.
Pedal equations. Curvature and Radius of curvature - Cartesian, Parametric, Polar and Pedal forms.
Problems.

Self-study: Center and circle of curvature, evolutes and involutes.
(RBT Levels: L1, L2 and L3)

Teaching-Learning Process	Chalk and talk method / Power Point Presentation

UNIT - 2	**[08 hours]**
Multivariable Calculus Partial differentiation, total derivative - differentiation of composite functions, Jacobian, Taylor's and Maclaurin's series expansion for two variables (statement only) – problems. **Applications:** Errors and approximations, Maxima and minima for a function of two variables. **Self-study:** Euler's theorem and problems. Method of Lagrange's undetermined multipliers with single constraint. **(RBT Levels: L1, L2 and L3)**	
Teaching-Learning Process	Chalk and talk method / Power Point Presentation
UNIT - 3	**[08 hours]**
Ordinary Differential Equations of First Order Introduction to first order ordinary differential equations. Bernoulli's differential equations. Exact and reducible to exact differential equations- 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**: Mixing problem, Orthogonal trajectories. **Self-Study:** Nonlinear differential equations - Introduction to general and singular solutions, solvable for p, for x and y. Clairaut's equations. **(RBT Levels: L1, L2 and L3)**	
Teaching-Learning Process	Chalk and talk method / Power Point Presentation
UNIT- 4	**[08 hours]**
Ordinary Differential Equations of Higher Order Higher-order linear ordinary differential equations with constant coefficients - Inverse differential operator, method of variation of parameters, Cauchy's and Legendre's homogeneous differential equations. **Applications:** Oscillations of a spring-mass system. **Self-Study:** Finding the solution by the method of undetermined coefficients. **(RBT Levels: L1, L2 and L3)**	
Teaching-Learning Process	Chalk and talk method / Power Point Presentation
UNIT - 5	**[08 hours]**
Matrices and System of equations Elementary row transformation of a matrix, Rank of a matrix. Consistency and Solution of system of linear equations - Gauss-elimination method, approximate solution by Gauss-Seidel method. Eigenvalues and eigenvectors, Rayleigh's power method to find the dominant Eigenvalue and Eigenvector. **Applications:** Balancing chemical equations, traffic flow. **Self-Study:** Solution of a system of linear equations by Gauss-Jacobi iterative method. Inverse of a square matrix by Cayley- Hamilton theorem. **(RBT Levels: L1, L2 and L3)**	
Teaching-Learning Process	Chalk and talk method / Power Point Presentation

B.M.S. COLLEGE OF ENGINEERING, BENGALURU-19
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List of Lab Programs

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3. 2D plots for Cartesian and polar curves.
4. Finding angle between polar curves, curvature and radius of curvature of a given curve.
5. Finding partial derivatives and Jacobian of multivariable functions.
6. Applications to Maxima and Minima of two variables.
7. Solving the first and second order differential equations with initial/boundary conditions and visualising their solutions.
8. Solution of a differential equation of oscillations of a spring - mass system with different loads.
9. Solving the system of linear equations using Gauss-Elimination and Gauss-Seidel Method.
10. Compute eigenvalues and eigenvectors and find the largest and smallest eigenvalue by Rayleigh power method.

Suggested software : Python

Course outcomes (Course Skills Set)

After successfully completing the course, the student will be able to understand the topics:

Course Code	CO	COURSE OUTCOME (CO)	PO	Strength
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Assessment Details (both CIE and SEE)

Component	Type of assessment	Max. Marks	Total	Reduced Marks	Total	Min. Marks required for eligibility	Total Marks
CIE – Theory	Quiz/AAT	10		50	25	10	50
	Test 1	40	90				
	Test 2	40					
	Test 3	40					
CIE – Lab	Record & Performance	100	120	10	25	10	
	Lab Test	15		15			
CIE				50		**20**	
SEE	End Exam	100		50		35	50
Grand Total Marks						**40**	**100**

Two best scores out of the three tests will be considered for CIE.
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12. **J. Stewart: "**Calculus", Cengage Publications, 7th Ed., 2019.
13. **G. Williams:** "Linear Algebra with applications", Jones Bartlett Publishers Inc., 6th Ed., 2017.
14. **M Lutz,** "Programming Python", O'Reilly Media, 4th edition, 2010.
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2. Differential Equations: https://www.classcentral.com/course/differential-equations-engineers-13258 and https://nptel.ac.in/courses/111106100
3. Matrices and System of Equations: https://www.classcentral.com/course/matrix-algebra-engineers-11986 and https://nptel.ac.in/courses/111106051
4. Python:https://spokentutorial.org/tutorialsearch/?search_foss=Python%203.4.3&search_language=English&page=1

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B.M.S. COLLEGE OF ENGINEERING, BENGALURU-19
Autonomous Institute, Affiliated to VTU

Course Title: **APPLIED PHYSICS for CIVIL CLUSTER**	L-T-P: 3-0-2
Course Code: **22PH1BSPCV /22PH2BSPCV**	Hours/Week: 05
Credits: 04	Theory : 40 Hours, Practicals : 24 Hours

Course objectives:

- To understand the essentials of LASERs and optical fibers for engineering applications
- To understand the types of oscillation and applications
- To understand the material characterization techniques
- To understand the elastic properties of materials
- To understand the natural hazards and its safety measures

Teaching-Learning Process:

Suggested strategies that teachers may use to effectively achieve the course outcomes:

1. Chalk and Talk
2. Blended Mode of Learning
3. Simulations, Interactive Simulations and Animations
4. NPTEL and Other Videos for theory topics
5. Flipped Class
6. Smart Class Room
7. Lab Experiment Videos

MODULE – 1 LASERS AND OPTICAL FIBERS [8 HOURS]

LASERs: Introduction, characteristics of LASERs, interaction of radiation with matter, expression for energy density of a system under thermal equilibrium in terms of Einstein's coefficients, conditions for LASER action using Einstein's coefficients, basic requisites of a LASER system, construction and working of semiconductor diode LASER. Applications of LASERs: LASER Range Finder, LIDAR – Detection of pollutants in the atmosphere. Problems.

Optical Fibers: Introduction, principle of propagation in optical fibers. Angle of acceptance, expression for numerical aperture and condition for propagation. Number of modes: V-number. Classification of optical fibers. Attenuation - causes of attenuation, Applications of optical fibers: fiber optic displacement sensor and fiber optic temperature sensor. Problems.

Practical Topics:

1. Wavelength of LASER source
2. Divergence of LASER beam
3. Numerical aperture of an optical fiber

Self-study: Basics of LASERs and optical fibers

MODULE – 2 OSCILLATIONS AND RESONANCE [8 HOURS]

Theory of free vibrations: Periodic motion, simple harmonic motion, equation of a simple harmonic oscillator, expressions for period and frequency, energy considerations-total energy, conversion of energy from kinetic to potential energy in SHM.

Theory of damped vibrations: Resistive forces, equation of motion-expression for decaying amplitude, three cases of damping. Logarithmic decrement, relaxation time and quality factor.

Theory of forced vibrations: Equation of motion-expression for amplitude, three cases of forcing, expression for maximum amplitude.

Resonance: Phenomenon of resonance. Example of resonance: LCR circuit. Problems.

Practical Topics:

1. LCR circuits
2. Spring constant

Self-study: Basics of Simple Harmonic Motion

MODULE – 3 MATERIAL CHARACTERIZATION AND INSTRUMENTATION TECHNIQUES [8 HOURS]

Introduction, crystal systems, planes in a crystal. Miller indices – expression for interplanar spacing in terms of Miller indices. Relation between lattice constant and bulk density. Co-ordination number. Relation between atomic radius and lattice constant. Atomic packing factor. Problems.

Bragg's law, X-ray diffractometer, powder diffraction methods of structure determination, crystallite size determination by Scherrer equation. Principle, construction, working and applications of X-ray photoelectron spectroscopy (XPS). Problems.

Practical Topics: X-ray film analysis

Self-study: Basics of crystal systems

MODULE-4 ELASTICITY [8 HOURS]

Stress, strain and their types. Hooke's law. Stress-strain diagram. Young's Modulus(Y), bulk modulus (K) and rigidity modulus (n). Poisson's ratio (σ). Equivalence of shear to compression and extension. Equivalence of shearing stress to a compressive stress and a tensile stress. Work done per unit volume in a strain. Relation between Y, K, n and σ. Torsion of a cylinder - expression for twisting couple per unit twist.

Beams: Bending moment – expression for bending moment.

Cantilever- Cantilever loaded at free end. Problems.

Practical Topics:

1. Young's modulus by single cantilever
2. Rigidity modulus of a given wire by Torsional pendulum

Self-study: Basics of elasticity

MODULE – 5 NATURAL HAZARDS AND SAFETY [8 HOURS]
Introduction, Earthquake - general characteristics, Physics of earthquake, Richter scale of measurement and earthquake resistant measures. Tsunami - causes for tsunami, characteristics, adverse effects, risk reduction measures, engineering structures to withstand tsunami. Landslide - causes such as excess rainfall, geological structure change, human excavation etc. Types of landslide, adverse effects, and engineering solution for landslides. Forest Fires and detection using remote sensing. Fire hazards and fire protection, fire-proofing materials, fire safety regulations and firefighting equipment - Prevention and safety measures. Problems.
Self-study: Richter scale

Laboratory component: Any **ten** experiments have to be completed from the following list of experiments

No.	Name of the experiment
1	Wavelength of LASER by diffraction
2	Divergence angle of a LASER
3	Numerical aperture of an optical fiber
4	Series LCR circuits
5	Parallel LCR circuits
6	X-ray film analysis
7	Spring constant
8	Young's modulus by single cantilever
9	Rigidity modulus by Torsional pendulum
10	Resistivity by Four Probe method
11	GNU step interactive simulations
12	Study of motion using spread sheet
13	PHET Interactive Simulations (https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype)

Reference Books:

1. A Text book of Engineering Physics- M.N. Avadhanulu and P.G. Kshirsagar, 10th revised Ed, S. Chand. & Company Ltd, New Delhi.
2. An Introduction to Lasers theory and applications by M.N.Avadhanulu and P.S.Hemne revised Edition 2012 . S. Chand and company Ltd -New Delhi.
3. Engineering Physics-Gaur and Gupta-Dhanpat Rai Publications-2017.
4. Vibrations and Waves (MIT introductory Physics Series), A P French, CBS, 2003 Edition
5. Timoshenko, S. and Goodier J.N. "Theory of Elasticity", 2nd Edition, McGraw Hill Book Co, 2001.
6. Sadhu Singh, "Theory of Elasticity", Khanna Publishers, 1997.
7. Fundamentals of Fibre Optics in Telecommunication & Sensor Systems, B.P. Pal, New Age International Publishers.

8. Lasers and Non-Linear Optics – B.B. Laud, 3rd Ed, New Age International Publishers 2011.
9. LASERS Principles, Types and Applications by K.R. Nambiar-New Age International Publishers.
10. Solid State Physics - S O Pillai, 8th Ed- New Age International Publishers-2018.
11. Characterization of Materials- Mitra P. K. Prentice Hall India Learning Private Limited.
12. An Introduction to Disaster Management, Natural Disaster & Man-Made Hazards, S. Vaidyanathan, IKON Books.
13. Natural Hazards, Edward Bryant, Cambridge University Press, 2nd Edition.
14. Natural hazards, Earthquakes, Volcanoes, and landslides by Ramesh P Singh, and Darius Bartlett, CRC Press, Taylor and Francis group.
15. Principles of Fire Safety Engineering Understanding Fire & Fire Protection, Akhil Kumar Das, PHI Learning, II Edition.
16. Disaster Management, R. Subramanian, S. Chand Publishing, 2018.

Web links and Video Lectures (e-Resources):

1. **Simple Harmonic motion:** https://www.youtube.com/watch?v=k2FvSzWeVxQ
2. **Stress-strain curves:** https://web.mit.edu/course/3/3.11/www/modules/ss.pdf
3. **Stress curves:** https://www.youtube.com/watch?v=f08Y39UiC-o
4. **Laser:** https://www.britannica.com/technology/laser
5. **Laser:** https://nptel.ac.in/courses/115/102/115102124/
6. **Numerical aperture of fiber:** https://bop-iitk.vlabs.ac.in/exp/numerical-aperture-measurement
7. **Virtual lab:** https://www.vlab.co.in/participating-institute-amrita-vishwa-vidyapeetham
8. **Material characterization:** https://onlinecourses.nptel.ac.in/noc20_mm14/preview

1. Activity-Based Learning /Practical-Based Learning

1. http://nptel.ac.in
2. https://swayam.gov.in
3. https://virtuallabs.merlot.org/vl_physics.html
4. https://phet.colorado.edu
5. https://www.myphysicslab.com

2. **Course outcomes:** On completion of the course, the student will have the ability to:

CO1	**Understand** and **Apply** the principle of laser and optical fiber, concept of vibrations, crystal structure, various material characterization techniques, elastic properties of materials, natural hazards and its safety measures to obtain the desired parameter.
CO2	Use appropriate **Tools** to develop the concept of physics, perform as a **member of team** to build a model and make an oral presentation
CO3	**Conduct**, **analyze** and **interpret** the data and results from applied physics experiments.

COs and POs Mapping

COs	POs											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	**3**	**2**										
CO2					**1**				**1**	**1**		
CO3				**3**								

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped, Level 0- Not Mapped

Scheme of Evaluation:

Component	**Type of assessment**	**Max. Marks**	**Reduced to**	**Total**	**Total Marks**
CIE – Theory	AAT	10	5	50	50
	Test 1	40	10		
	Test 2	40	10		
CIE-Lab		50	25		
SEE	End Exam	100	50		50
Grand Total Marks					100

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B.M.S. COLLEGE OF ENGINEERING, BENGALURU-19
Autonomous Institute, Affiliated to VTU

Course Title: **APPLIED PHYSICS for ELECTRICAL CLUSTER**	L-T-P: 3-0-2
Course Code: **22PH1BSPEE /22PH2BSPEE**	Hours/Week: 05
Credits: 04	Theory : 40 Hours, Practical : 24 Hours

Course objectives:

- To understand the principles of quantum mechanics
- To understand the essentials of LASERs and optical fibers for engineering applications
- To understand the electrical and dielectric properties of materials
- To understand the concepts of semiconductors and devices
- To understand the magnetic and superconducting properties of materials

Teaching-Learning Process:

Suggested strategies that teachers may use to effectively achieve the course outcomes:

1. Chalk and Talk
2. Blended Mode of Learning
3. Simulations, Interactive Simulations and Animations
4. NPTEL and Other Videos for theory topics
5. Smart Class Room
6. Flipped Class
7. Lab Experiment Videos

MODULE – 1 QUANTUM MECHANICS [8 HOURS]

Introduction, de-Broglie hypothesis, derivation by analogy. Definition of phase velocity and group velocity. Relation between group velocity and phase velocity, relation between group velocity and particle velocity, relation between group velocity, phase velocity and velocity of light. Problems.

Heisenberg's uncertainty principle- statement and physical significance. Application of uncertainty principle - non-existence of electron in the nucleus. Wave function-properties and physical significance. Probability density and normalization of wave function. Setting up of one-dimensional time independent Schrödinger's wave equation. Application of Schrodinger's wave equation: Particle in a one-dimensional potential well of infinite height and finite width (particle in a box) - Eigen functions, probability density and Eigen values for the first two states. Problems.

Practical Topics: Wavelength of different transparent LEDs/Planck's constant

Self-study: de-Broglie hypothesis

MODULE – 2 LASERS AND OPTICAL FIBERS [8 HOURS]

LASERs: Introduction, characteristics of LASERs, interaction of radiation with matter, expression for energy density of a system under thermal equilibrium in terms of Einstein's coefficients, conditions for LASER action using Einstein's coefficients, basic requisites of a LASER system, construction and working of He-Ne LASER. Applications of LASERs: bar code scanner and LASER printer. Problems.

Optical Fibers: Introduction, principle of propagation in optical fibers. Angle of acceptance, expression for numerical aperture and condition for propagation. Number of modes: V-number. Classification of optical fibers. Attenuation - causes of attenuation. Application of optical fibers: Block diagram and discussion of point-point optical communication, advantages and disadvantages. Problems.

Practical Topics:

1. Wavelength of LASER source
2. Divergence of LASER beam
3. Numerical aperture of an optical fiber

Self-study: Basics of LASERs and optical fibers

MODULE – 3 ELECTRICAL PROPERTIES OF MATERIALS [8 HOURS]

Electrical Properties: Review of classical free electron theory, limitations of classical free electron theory. Postulates of quantum free electron theory, Fermi energy, Fermi velocity, Fermi temperature. Fermi factor and its dependence on energy and temperature. Electrical conductivity (qualitative expression using effective mass and Fermi velocity). Merits of quantum free electron theory. Problems.

Dielectric Materials: Introduction, polarization, expression for polarization, types of polarization, expression for electronic polarizability. Expression for internal field in one dimensional liquids and solids, Lorentz field. Clausius–Mossotti relation. Applications of dielectric materials. Problems.

Practical Topics:

1. Fermi energy of copper
2. Dielectric constant

Self-study: Classical free electron theory and basics of dielectrics

MODULE – 4 SEMICONDUCTORS AND DEVICES [8 HOURS]

Semiconductors: Introduction, expression for concentration of electrons in conduction band, expression for hole-concentration in valance band (qualitative). Expression for intrinsic carrier concentration, expression for Fermi level in intrinsic semiconductors, Fermi level in semiconductors, expression for conductivity of semiconductors. Hall effect, expressions for Hall voltage and Hall coefficient. Problems.

Devices: Photodiode and power responsivity, construction and working of semiconducting diode LASER, four probe method to determine resistivity. Problems.

Practical Topics:

1. Energy band gap of a semiconductor by four probes method
2. V-I characteristics of a photodiode

Self-study: Basics of Semiconductors

MODULE – 5 MAGNETIC AND SUPERCONDUCTING PROPERTIES OF MATERIALS [8 HOURS]

Magnetic Properties of Materials: Classification of magnetic materials. Ferromagnetic materials – Weiss's domain theory. Hysteresis in ferromagnetic materials. Explanation of

hysteresis using domain theory. Soft and hard magnetic materials – characteristic features and applications. Ferrites – features and applications. Problems. **Superconductivity:** Introduction to Superconductors, Temperature dependence of resistivity, Meissner effect, critical current, types of superconductors, temperature dependence of critical field, BCS theory (Qualitative), high temperature superconductivity. Application of superconductors: MAGLEV vehicle. Problems.
Practical Topics: B-H curve **Self-study:** Basics of magnetism and superconductivity

Laboratory component: **Any** ten **experiments have to be completed from the following list of experiments**

No.	Name of the experiment
1	Wavelength of LEDs/Planck's constant
2	Wavelength of LASER by diffraction
3	Divergence angle of a LASER
4	Numerical aperture of an optical fiber
5	Fermi energy of copper
6	Dielectric constant of a material by charging and discharging of a capacitor
7	Energy gap of a semiconductor using four probe method
8	-I characteristics of a photodiode
9	Frequency response of series and parallel LCR circuits
10	B-H curve
11	Black box
12	Attenuation coefficient of OFC
13	GNU step interactive simulations
14	Study of motion using spread sheet
15	PHET Interactive Simulations (https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype)

Reference Books:

1. A Text book of Engineering Physics - M.N. Avadhanulu and P.G. Kshirsagar, 10th revised Ed, S. Chand. & Company Ltd, New Delhi.
2. An Introduction to Lasers theory and applications by M.N. Avadhanulu and P.S. Hemne revised Edition 2012. S. Chand and company Ltd - New Delhi.
3. Engineering Physics - Gaur and Gupta - Dhanpat Rai Publications-2017.
4. Concepts of Modern Physics - Arthur Beiser: 6th Ed; Tata McGraw Hill Edu Pvt Ltd- New Delhi 2006.
5. Fundamentals of Fibre Optics in Telecommunication & Sensor Systems, B.P. Pal, New Age International Publishers.

6. Lasers and Non Linear Optics – B.B. Laud, 3rd Ed, New Age International Publishers 2011.
7. LASERS Principles, Types and Applications by K.R. Nambiar - New Age International Publishers.
8. Solid State Physics - S O Pillai, 8th Ed - New Age International Publishers-2018.

Web links and Video Lectures (e-Resources):

1. **Laser:** https://www.britannica.com/technology/laser
2. **Laser:** https://nptel.ac.in/courses/115/102/115102124/
3. **Quantum mechanics:** https://nptel.ac.in/courses/115/104/115104096/
4. **Physics:** http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html
5. **Numerical aperture of fiber:** https://bop-iitk.vlabs.ac.in/exp/numerical-aperture-measurement
6. **Superconductivity:** https://archive.nptel.ac.in/courses/115/103/115103108/

Activity-Based Learning /Practical-Based Learning:

1. http://nptel.ac.in
2. https://swayam.gov.in
3. https://www.vlab.co.in/participating-institute-amrita-vishwa-vidyapeetham
4. https://vlab.amrita.edu/index.php?sub=1&brch=189&sim=343&cnt=1
5. https://virtuallabs.merlot.org/vl_physics.html
6. https://phet.colorado.edu
7. https://www.myphysicslab.com

Course outcomes: On completion of the course, the student will have the ability to:

CO1	**Understand** and **Apply** the principles of quantum mechanics, transport phenomena in metals, dielectrics and semiconductor materials, superconducting and magnetic properties of solids, construction and working principle of laser and optical fiber to obtain desired parameter.
CO2	Use appropriate **Tools** to develop the concept of physics, perform as a **member of team** to build a model and make an oral presentation.
CO3	**Conduct**, **analyze** and **interpret** the data and results from applied physics experiments.

COs and POs Mapping

COs	**POs**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	**3**	**2**										
CO2					**1**				**1**	**1**		
CO3				**3**								

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped, Level 0- Not Mapped

Scheme of Evaluation:

Component	Type of assessment	Max. Marks	Reduced to	Total	Total Marks
CIE – Theory	AAT	10	5	50	50
	Test 1	40	10		
	Test 2	40	10		
CIE-Lab		50	25		
SEE	End Exam	100	50		50
Grand Total Marks					100

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B.M.S. COLLEGE OF ENGINEERING, BENGALURU-19
Autonomous Institute, Affiliated to VTU

Course Title: **APPLIED PHYSICS for COMPUTER SCIENCE CLUSTER**	L-T-P: 3-0-2
Course Code: **22PH1BSPCS /22PH2BSPCS**	Hours/Week: 05
Credits: 04	Theory : 40 Hours, Practical : 24 Hours

Course objectives:

- To understand the essentials of LASERs and optical fibers for engineering applications
- To understand the principles of quantum mechanics
- To understand the electrical and dielectric properties of materials
- To understand the concepts of semiconductor and superconductivity
- To understand the principles of quantum computing

Teaching-Learning Process:

Suggested strategies that teachers may use to effectively achieve the course outcomes:

1. Chalk and Talk
2. Blended Mode of Learning
3. Simulations, Interactive Simulations and Animations
4. NPTEL and Other Videos for theory topics
5. Smart Class Room
6. Flipped Class
7. Lab Experiment Videos

MODULE – 1 LASERS AND OPTICAL FIBERS [8 HOURS]

LASERs: Introduction, characteristics of LASERs, interaction of radiation with matter, expression for energy density of a system under thermal equilibrium in terms of Einstein's coefficients, conditions for LASER action using Einstein's coefficients, basic requisites of a LASER system, construction and working of semiconductor diode LASER. Applications of LASERs: Bar Code Scanner and LASER Printer. Problems.

Optical Fibers: Introduction, principle of propagation in optical fibers. Angle of acceptance, expression for numerical aperture and condition for propagation. Number of modes: V-number. Classification of optical fibers. Attenuation-causes of attenuation. Applications of optical fibers: Block diagram and discussion of point-point optical communication, advantages and disadvantages. Problems.

Practical Topics:

1. Wavelength of LASER source
2. Divergence of LASER beam
3. Numerical aperture of an optical fiber

Self-study: Basics of LASERs and optical fibers

MODULE – 2	**QUANTUM MECHANICS**	**[8 HOURS]**

Introduction, de-Broglie hypothesis – derivation by analogy. Definition of phase velocity and group velocity. Relation between group velocity and phase velocity, relation between group velocity and particle velocity, relation between group velocity, phase velocity and velocity of light. Problems.

Heisenberg's uncertainty principle- statement and physical significance. Application of uncertainty principle – non-existence of electron in the nucleus. Wave function-properties and physical significance. Probability density and normalization of wave function. Setting up of one-dimensional time independent Schrödinger's wave equation. Application of Schrodinger's wave equation: Particle in a one-dimensional potential well of infinite height and finite width (particle in a box) - Eigen functions, probability density and Eigen values for the first two states. Problems.

Practical Topics: Wavelength of different transparent LEDs/Planck's constant

Self-study: de-Broglie hypothesis

MODULE – 3	**ELECTRICAL PROPERTIES OF MATERIALS**	**[8 HOURS]**

Electrical Properties: Review of classical free electron theory, limitations of classical free electron theory. Postulates of quantum free electron theory, Fermi energy, Fermi velocity, Fermi temperature. Fermi factor and its dependence on energy and temperature. Electrical conductivity (qualitative expression using effective mass and Fermi velocity). Merits of quantum free electron theory. Problems.

Dielectric Materials: Introduction, polarization, expression for polarization, types of polarization, expression for electronic polarizability. Expression for internal field in one dimensional liquids and solids, Lorentz field. Clausius–Mossotti relation. Applications of dielectric materials. Problems.

Practical Topics:

1. Fermi energy of copper
2. Dielectric constant

Self-study: Classical free electron theory and basics of dielectrics

MODULE – 4	**SEMICONDUCTORS AND SUPERCONDUCTIVITY**	**[8 HOURS]**

Semiconductors: Introduction, expression for concentration of electrons in conduction band, expression for hole-concentration in valance band (qualitative). Expression for intrinsic carrier concentration, expression for Fermi level in intrinsic semiconductors, Fermi level in semiconductors, expression for conductivity of semiconductors. Hall effect, expressions for Hall voltage and Hall coefficient. Problems.

Superconductivity: Introduction to superconductors, temperature dependence of resistivity, Meissner effect, critical current, types of superconductors, temperature dependence of critical field, BCS theory (Qualitative), high temperature superconductivity. Application of superconductors: MAGLEV vehicle. Problems.

Practical Topics: Energy band gap of a semiconductor by four probe method

Self-study: Basics of semiconductors and superconductivity

MODULE – 5	**QUANTUM COMPUTING**	**[8 HOURS]**

Principles of Quantum Information & Quantum Computing: Introduction to quantum computing, Moore's law & its end. Single particle quantum interference, classical and quantum information comparison. Differences between classical and quantum computing, quantum superposition.

Concept of Qubit and its properties.

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: 2x2 Matrices and their multiplication (Inner Product), Probability, Orthogonality.

Quantum Gates: Single Qubit Gates: Quantum Not Gate, Pauli Z Gate, Hadamard Gate, Phase Gate (or S Gate), T Gate.

Multiple Qubit Gates: Controlled gate - CNOT Gate, (Discussion for 4 different input states). Representation of Swap gate, Controlled - Z gate, Toffoli gate. Problems.

Self-Study: Moore's law

Laboratory component: Any **ten** experiments have to be completed from the following list of experiments

No.	**Name of the experiment**
1	Wavelength of LASER by diffraction
2	Divergence angle of a LASER
3	Numerical aperture of an optical fiber
4	Wavelength of LEDs/Planck's constant
5	Fermi energy of copper
6	Dielectric constant of a material by charging and discharging of a capacitor
7	Energy gap of a semiconductor using four probe method
8	-I characteristics of a photodiode
9	Frequency response of series and parallel LCR circuits
10	Black box
11	Attenuation coefficient of OFC
12	GNU step interactive simulations
13	Study of motion using spread sheet
14	PHET Interactive Simulations (https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype)

Reference Books:

1. Solid State Physics, S O Pillai, New Age International Private Limited, 8th Edition, 2018.
2. Engineering Physics by Gupta and Gour, Dhanpat Rai Publications, 2016 (Reprint).
3. Concepts of Modern Physics, ArthurBeiser, McGraw-Hill, 6th Edition, 2009.
4. Lasers and Non-Linear Optics, B B Loud, New age international, 2011 edition.
5. A textbook of Engineering Physics by M. N. Avadhanulu, P. G. Kshirsagar and T. V. S. Arun Murthy, Eleventh edition, S Chand and Company Ltd. New Delhi-110055.
6. Quantum Computation and Quantum Information, Michael A. Nielsen & Isaac L. Chuang, Cambridge Universities Press, 2010 Edition.
7. Quantum Computing, Vishal Sahani, McGraw Hill Education, 2007 Edition.
8. Quantum Computation and Logic: How Quantum Computers Have Inspired Logical Investigations, Maria Luisa Dalla Chiara, Roberto Giuntini, Roberto Leporini, Giuseppe Sergioli, Trendsin Logic, Volume 48, Springer.
9. Introduction to Superconductivity, Michael Tinkham, McGraww Hill, INC, II Edition.

Web links and Video Lectures (e-Resources):

1. **LASER:** https://www.youtube.com/watch?v=WgzynezPiyc
2. **Superconductivity:** https://www.youtube.com/watch?v=MT5Xl5ppn48
3. **Optical Fiber:** https://www.youtube.com/watch?v=N_kA8EpCUQo
4. **Quantum Mechanics:** https://www.youtube.com/watch?v=p7bzE1E5PMY&t=136s
5. **Quantum Computing:** https://www.youtube.com/watch?v=jHoEjvuPoB8
6. **NPTEL Supercoductivity:** https://archive.nptel.ac.in/courses/115/103/115103108/
7. **NPTEL Quantum Computing:** https://archive.nptel.ac.in/courses/115/101/115101092
8. **Virtual LAB:** https://www.vlab.co.in/participating-institute-amrita-vishwa-vidyapeetham
9. **Virtual LAB:** https://vlab.amrita.edu/index.php?sub=1&brch=189&sim=343&cnt=1

Activity-Based Learning/Practical-Based Learning:

1. http://nptel.ac.in
2. https://swayam.gov.in
3. https://virtuallabs.merlot.org/vl_physics.html
4. https://phet.colorado.edu
5. https://www.myphysicslab.com

Course outcomes: On completion of the course, the student will have the ability to:

CO1	**Understand** and **Apply** the principles of quantum mechanics, quantum computing, transport phenomena in metals, properties of dielectric, semiconducting and superconducting materials, construction and working principle of laser and optical fibers to obtain the desired parameter.
CO2	Use appropriate **Tools** to develop the concept of physics, perform as a **member of team** to build a model and make an oral presentation.
CO3	**Conduct**, **analyze** and **interpret** the data and results from applied physics experiments.

COs and POs Mapping

COs	POs											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	**3**	**2**										
CO2					**1**				**1**	**1**		
CO3				**3**								

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped, Level 0- Not Mapped

Scheme of Evaluation:

Component	**Type of assessment**	**Max. Marks**	**Reduced to**	**Total**	**Total Marks**
CIE – Theory	AAT	10	5	50	50
	Test 1	40	10		
	Test 2	40	10		
CIE-Lab		50	25		
SEE	End Exam	100	50		50
Grand Total Marks					100

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B.M.S. COLLEGE OF ENGINEERING, BENGALURU-19
Autonomous Institute, Affiliated to VTU

Course Title: **APPLIED PHYSICS for MECHANICAL CLUSTER**	L-T-P: 3-0-2
Course Code: **22PH1BSPME /22PH2BSPME**	Hours/Week: 05
Credits: 04	Theory : 40 Hours, Practical : 24 Hours

Course objectives:

- To understand the essentials of LASERs and optical fibers for engineering applications
- To understand the types of oscillation and applications
- To understand the electrical and thermal properties of materials
- To understand the elastic properties of materials
- To understand the material characterization techniques

Teaching-Learning Process:

Suggested strategies that teachers may use to effectively achieve the course outcomes:

1. Chalk and Talk
2. Blended Mode of Learning
3. Simulations, Interactive Simulations and Animations
4. NPTEL and Other Videos for theory topics
5. Smart Class Room
6. Flipped Class
7. Lab Experiment Videos

MODULE – 1 LASERS AND OPTICAL FIBERS [8 HOURS]

LASERs: Introduction, characteristics of LASERs, interaction of radiation with matter, expression for energy density of a system under thermal equilibrium in terms of Einstein's coefficients, conditions for LASER action using Einstein's coefficients, basic requisites of a LASER system, construction and working of semiconductor diode LASER. Applications of LASERs in industry: LASER cutting, welding and drilling. Problems.

Optical Fibers: Introduction, principle of propagation in optical fibers. Angle of acceptance, expression for numerical aperture and condition for propagation. Number of modes: V-number. Classification of optical fibers. Attenuation - causes of attenuation. Applications of optical fibers: fiber optic displacement sensor and fiber optic temperature sensor. Problems.

Practical Topics:

1. Wavelength of LASER source
2. Divergence of LASER beam
3. Numerical aperture of an optical fiber

Self-study: Basics of LASERs and optical fibers

MODULE – 2 OSCILLATIONS AND RESONANCE [8 HOURS]

Theory of free vibrations: Periodic motion, simple harmonic motion, equation of a simple harmonic oscillator, expressions for period and frequency, energy considerations-total energy, conversion of energy from kinetic to potential energy in SHM.

Theory of damped vibrations: Resistive forces, equation of motion-expression for decaying amplitude, three cases of damping. Logarithmic decrement, relaxation time and quality factor.

Theory of forced vibrations: Equation of motion-expression for amplitude, three cases of forcing, expression for maximum amplitude.

Resonance: Phenomenon of resonance. Example of resonance: LCR circuit. Problems.

Practical Topics:

1. LCR circuits
2. Spring constant

Self-study: Basics of Simple Harmonic Motion

MODULE – 3 ELECTRICAL AND THERMAL PROPERTIES OF MATERIALS [8 HOURS]

Electrical Properties: Review of classical free electron theory, limitations of classical free electron theory. Postulates of quantum free electron theory, Fermi energy, Fermi velocity, Fermi temperature. Fermi factor and its dependence on energy and temperature. Electrical conductivity (qualitative expression using effective mass and Fermi velocity). Merits of quantum free electron theory. Problems.

Thermal Properties: Thermal conductivity, expression for thermal conductivity of a conductor using classical free electron theory. Wiedemann–Franz law, calculation of Lorentz number using classical and quantum assumptions. Theory and determination of thermal conductivity using Forbe's and Lee–Charlton's methods. Problems.

Practical Topics:

1. Fermi energy of Copper
2. Thermal conductivity of a poor conductor by Lee–Charlton's method
3. Thermal conductivity of a good conductor by Forbe's method

Self-study: Classical free electron theory and basics of thermodynamics

MODULE-4 ELASTICITY [8 HOURS]

Elasticity – Stress, strain and their types. Hooke's law. Stress-strain diagram. Young's Modulus (Y), bulk modulus (K) and rigidity modulus (n). Poisson's ratio (σ). Equivalence of shear to compression and extension. Equivalence of shearing stress to a compressive stress and a tensile stress. Work done per unit volume in a strain. Relation between Y, K, n and σ. Torsion of a cylinder - Expression for twisting couple per unit twist. Torsional pendulum.

Beams: Bending moment – expression for bending moment.

Cantilever- Cantilever loaded at free end. Problems

Practical Topics:

1. Young's modulus by single cantilever
2. Rigidity modulus of a given wire by Torsional pendulum

Self-study: Basics of elasticity

MODULE – 5 MATERIAL CHARACTERIZATION AND INSTRUMENTATION TECHNIQUES [8 HOURS]
Introduction, crystal systems, planes in a crystal. Miller indices – Expression for interplanar spacing in terms of Miller indices. Relation between lattice constant and bulk density. Co-ordination number. Relation between atomic radius and lattice constant. Atomic packing factor. Problems. Bragg's law, Bragg's diffractometer, powder diffraction methods of structure determination, crystallite size determination by Scherrer equation. Principle, construction, working and applications of X-ray Photoelectron Spectroscopy (XPS). Problems.
Practical Topics: X-ray film analysis **Self-study:** Basics of crystal systems

Laboratory component: Any **ten** experiments have to be completed from the following list of experiments

No.	Name of the experiment
1	Wavelength of LASER by diffraction
2	Divergence angle of a LASER
3	Numerical aperture of an optical fiber
4	Series LCR circuits
5	Parallel LCR circuits
6	Fermi energy of copper
7	Thermal conductivity of a good conductor by Forbe's method
8	Thermal conductivity of a poor conductor by Lee Charlton's method
9	Spring constant
10	Young's modulus by single cantilever
11	Rigidity modulus by Torsional pendulum
12	X-ray film analysis
13	GNU step interactive simulations
14	Study of motion using spread sheet
15	PHET Interactive Simulations (https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype)

Reference Books:

1. Vibrations and Waves (MIT introductory Physics Series), A P French, CBS, 2003 Edition.
2. Timoshenko, S. and Goodier J.N. "Theory of Elasticity", 2nd Edition, McGraw Hill Book Co, 2001.
3. Sadhu Singh, "Theory of Elasticity", Khanna Publishers, 1997.
4. Mechanical Properties of Engineered Materials by Wole Soboyejo, CRC Press; 1st edition, 2002.
5. Heat and Thermodynamics (I-Edition) – D. S. Mathur - S. Chand & Company Ltd., New-Delhi, 1991.
6. Characterization of Materials - Mitra P. K. Prentice Hall India Learning Private Limited.
7. A Text book of Engineering Physics - M. N. Avadhanulu and P. G. Kshirsagar, 10th revised Ed, S. Chand. & Company Ltd, New Delhi.
8. Engineering Physics - Gaur and Gupta - Dhanpat Rai Publications - 2017.
9. Fundamentals of Fibre Optics in Telecommunication & Sensor Systems, B.P. Pal, New Age International Publishers.
10. Lasers and Non Linear Optics – B. B. Laud, 3rd Ed, New Age International Publishers 2011.
11. Solid State Physics - S O Pillai, 8th Ed- New Age International Publishers - 2018.

Web links and Video Lectures (e-Resources):

1. **Simple Harmonic motion:** https://www.youtube.com/watch?v=k2FvSzWeVxQ
2. **Stress-strain curves:** https://web.mit.edu/course/3/3.11/www/modules/ss.pdf
3. **Stress curves:** https://www.youtube.com/watch?v=f08Y39UiC-o
4. **Laser:** https://www.britannica.com/technology/laser
5. **Laser:** https://nptel.ac.in/courses/115/102/115102124/
6. **Numerical aperture of fiber:** https://bop-iitk.vlabs.ac.in/exp/numerical-aperture-measurement
7. **Virtual lab:** https://www.vlab.co.in/participating-institute-amrita-vishwa-vidyapeetham
8. **Material characterization:** https://onlinecourses.nptel.ac.in/noc20_mm14/preview

1. Activity-Based Learning /Practical-Based Learning:

1. http://nptel.ac.in
2. https://swayam.gov.in
3. https://virtuallabs.merlot.org/vl_physics.html
4. https://phet.colorado.edu
5. https://www.myphysicslab.com

Course outcomes: On completion of the course, the student will have the ability to:

CO1	**Understand** and **Apply** the principle of laser and optical fiber, concept of vibrations, electrical and thermal transport phenomena in metals, crystal structure, various material characterization techniques and elastic properties of materials to obtain the desired parameter.
CO2	Use appropriate **Tools** to develop the concept of physics, perform as a **member of team** to build a model and make an oral presentation.
CO3	**Conduct**, **analyze** and **interpret** the data and results from applied physics experiments.

COs and POs Mapping

COs	POs											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
CO1	**3**	**2**										
CO2					**1**				**1**	**1**		
CO3				**3**								

Level 3- Highly Mapped, Level 2- Moderately Mapped, Level 1- Low Mapped, Level 0- Not Mapped

Scheme of Evaluation:

Component	**Type of assessment**	**Max. Marks**	**Reduced to**	**Total**	**Total Marks**
CIE – Theory	AAT	10	5	50	50
	Test 1	40	10		
	Test 2	40	10		
CIE-Lab		50	25		
SEE	End Exam	100	50		50
Grand Total Marks					100

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B.M.S. COLLEGE OF ENGINEERING, BENGALURU-19
Autonomous Institute, Affiliated to VTU

Course Title	**Basic Electronics** (For ECE and Allied Branches)	**Course Code**	**22EC1ESBEC/22EC2ESBEC**
Credits	**03**	**L – T – P (Credits)**	**3-0-0**

Course Objectives:

The objectives of the course are to facilitate the learners to

- **Gain fundamental knowledge** in the field of Electronics and Communication Engineering.
- **Equip** students with a basic foundation in electronic engineering fundamentals required for comprehending the operation and application of electronic circuits, logic design and communication systems.
- **Simulate** the electronic circuits using modern Engineering tools

UNIT - 1	**[08 hours]**

Semiconductor Diode & Applications:

Diode: Working principle Characteristics, Parameters and Specifications, Shockley's Equation.
Half-Wave and Bridge Rectifier: Working principle and parameters Ripple Factor and Efficiency Derivations, Peak Inverse Voltage, Shunt Capacitor Filter,
Zener Diode, Zener Diode as a Voltage Regulator, Regulated Power Supply.

(RBT Levels: L1, L2, L3 and L4)

Teaching-Learning Process	Chalk and talk method / Power Point Presentation

UNIT - 2	**[08 hours]**

Bipolar Junction Transistors:

Introduction, BJT Voltages & Currents, BJT Amplification, Common Base Characteristics, Common Emitter Characteristics, Common Collector Characteristics, BJT Biasing: Introduction, DC Load line and Bias point, Transistor as a Switch,
Feedback: Feedback Principle, Types of feedback: Positive and Negative Feedback, Advantages of negative feedback.

(RBT Levels: L1, L2, L3 and L4)

Teaching-Learning Process	Chalk and talk method / Power Point Presentation

UNIT - 3	**[08 hours]**
Operational Amplifiers: Introduction, The Operational Amplifier, Block Diagram Representation of Typical Op-Amp, Schematic Symbol, Op-Amp parameters - Gain, input resistance, Output resistance, CMRR, Slew rate, Bandwidth, input offset voltage, input bias Current and Input Offset Current, The Ideal Op-Amp, Equivalent Circuit of Op-Amp, Open Loop Op-Amp configurations, Differential Amplifier, Inverting & Non Inverting Amplifier **Op-Amp Applications:** Inverting configuration: Summing, scaling, averaging circuit, subtractor, Voltage Follower, Integrator and Differentiator **Oscillators:** Principle of Oscillations, RC Phase Shift Oscillator, Hartley and Colpitts Oscillator, Crystal Oscillator. **(RBT Levels: L1, L2, L3 and L4)**	
Teaching-Learning Process	Chalk and talk method / Power Point Presentation
UNIT - 4	**[08 hours]**
Boolean Algebra and Logic Circuits: Binary numbers, Number Base Conversion, octal & Hex Decimal Numbers, Complements (1's and 2's complement), 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 **Applications:** Combinational logic: Introduction, Design procedure, Adders- Half adder, Full adder **Sequential logic:** Introduction, flip-flops- SR, D, T and JK flip-flops **(RBT Levels: L1, L2, L3 and L4)**	
Teaching-Learning Process	Chalk and talk method / Power Point Presentation
UNIT - 5	**[08 hours]**
Communication: Modern communication system scheme, Information source, and input transducer, Transmitter, Channel or Medium –Wired and Wireless, Noise, Receiver, Multiplexing, Types of communication systems. Types of modulation-AM, FM **Applications:** Introduction to Cellular Communication, Computer Communication Networks. **(RBT Levels: L1, L2 and L3)**	
Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

Course outcomes (Course Skills Set)

After successfully completing the course, the student will be able to understand the topics:

Course Code	CO	COURSE OUTCOME (CO)	PO	Strength
22EC1ESBEC	CO 1	Apply the basic principles of Electronics to solve Analog and Digital circuits.	1	3
	CO 2	Analyse the characteristics/performance parameters of Electronic Circuits.	2	1
	CO 3	Design basic Electronic Circuits for given Specifications.	3	1
	CO 4	Simulate the performance of electronic circuits using modern Engineering tools	5	1

Assessment Details (both CIE and SEE)

Component	Type of assessment	Max. Marks	Total	Reduced Marks	Total	Min. Marks required for eligibility	Total Marks
CIE – Theory	AAT (simulation)	10	10	10	10	20	50
	Test 1	40	80	20	40		
	Test 2	40		20			
	Test 3	40		20			
CIE				50		**20**	
SEE	End Exam	100		50		35	50
Grand Total Marks						**40**	**100**

Two best scores out of the three tests will be considered for CIE.
CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

- Each unit consists of one full question.
- Five full questions to be answered.
- To set one question each from Units 2, 4, 5 and two questions each from Unit 1 and Unit 3.

Suggested Learning Resources:

Text Books

1. Basic Electronics- Devices, circuits and IT fundamentals- By Santiram Kal- PHI, 2012
2. Op-amps and Linear Integrated Circuits, Ramakanth A Gayakwad, Pearson Education, 4th Edition
3. Digital Logic and Computer Design, M. Morris Mano, PHI Learning, 2008 ISBN-978-81-203-0417-8.

Reference Books

1. **Electronic Devices and Circuits,** David A Bell, 5th Edition, Oxford, 2016
2. S L Kakani and Priyanka Punglia, **'Communication Systems'**, New Age International Publisher,
2017. https://elib4u.ipublishcentral.com/pdfreader/communication-systems

Web links and Video Lectures (e-Resources):

1. https://www.elsevier.com/books/basic-electronics/holbrook/978-0-08-006865-7
2. http://www.worldcat.org/title/basic-electronics/oclc/681543319
3. http://nptel.ac.in/courses/117103063/
4. https://swayam.gov.in/course/3595-basic-electronics
5. https://www.mooc-list.com/course/introduction-electronics-coursera

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B.M.S. COLLEGE OF ENGINEERING, BENGALURU-19
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Course Title	Elements of Electrical Engineering	Course Code	22EE1ESEEE/ 22EE2ESEEE
Credits	03	L – T – P (Credits)	2-0-1

Course Objectives:

The objectives of the course are to facilitate the learners to

- To explain the laws used in the analysis of DC circuits
- To explain the construction and operation of transformers, and DC motors.
- To explain the behaviour of circuit elements in single-phase circuits.
- To explain the generation of three-phase power and operation of three-phase circuits.
- To explain the construction and operation of transformers, DC generators and motors, Induction motors, and synchronous generators.
- To explain electricity billing, equipment and personal safety measures.

UNIT - 1	**[08 hours]**

DC Circuits: Ohm's Law and its limitations. KCL & KVL, series, parallel, series-parallel circuits, Power and energy, Numerical problems (Numerical problems on KCL and KVL can be solved using Branch current method).

DC motors: Construction and principle of operation, back emf, torque equation, types of dc motors, characteristics of DC motors (shunt and series motors only) and applications, Simple Numerical.

Teaching-Learning Process	Chalk and talk method / Power Point Presentation
	DC Motors: Cut -out demo/actual machine models, video for working of machine, Chalk and talk.

UNIT - 2	**[08 hours]**

AC Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor.

AC Circuits: 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, Simple Numerical.

Teaching-Learning Process	Chalk and talk method / Power Point Presentation

UNIT - 3	**[08 hours]**

Three-phase AC circuits: Necessity and advantage of 3-phase system. Generation of 3-phase power. Definition of phase sequence. Relationship between line and phase values of balanced star and delta connections. Power in balanced 3-phase circuits. Simple Numerical.

Teaching-Learning Process	Three-phase circuits: (i) For a generation of 3-phase voltages, video/animation are used. (ii) Numerical problems can be solved with the chalk and talk method. (iii) Practical Topics: Relation between the line and phase parameter in 3-phase connection both star and delta connections.

<table>
<tr><td colspan="2"><u>UNIT - 4</u></td><td>[08 hours]</td></tr>
<tr><td colspan="3">Single Phase Transformers: Construction and principle of operation, emf equation, losses, variation in losses with respect to load, efficiency, condition for maximum efficiency, illustrative examples.
Three-phase induction Motors: Concept of rotating magnetic field, Principle of operation, constructional features of motor, types - squirrel cage and wound rotor, slip and problems on the slip, significance of slip, applications.</td></tr>
<tr><td rowspan="2">Teaching-Learning Process</td><td colspan="2">Transformer topic: Cut-out demo /actual machine models and chalk and talk method of teaching, YouTube videos.</td></tr>
<tr><td colspan="2">DC Motors: Cut -out demo/actual machine models, video for working of machine, Chalk and talk.</td></tr>
<tr><td colspan="2"><u>UNIT - 5</u></td><td>[08 hours]</td></tr>
<tr><td colspan="3">Electricity Bill: 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.
Equipment Safety measures: Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits.
Personal safety measures: Electric Shock, Earthing and its types, Safety Precautions to avoid shock, and Residual Current Circuit Breaker (RCCB) and Earth Leakage Circuit Breaker (ELCB).
Introduction to Electric Vehicles: Overview and block diagram approach to Electric Vehicles.</td></tr>
<tr><td rowspan="2">Teaching-Learning Process</td><td colspan="2">Chalk and talk, Demonstration of functioning of MCB and Fuse.</td></tr>
<tr><td colspan="2">Self-study topic: Safety precautions to avoid shock.</td></tr>
</table>

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LIST OF EXPERIMENTS	
S. No.	**Aim of the Experiment**
1	Verification of KCL and KVL for DC circuits.
2	Measurement of Current, Power, and Power Factor of Lighting Loads.
3	Measurement of Current, Power, and Power Factor of Heater Load.
4	Measurement of Resistance and Inductance of a Choke coil using three voltmeter method.
5	Measurement of Resistance and Inductance of a Choke coil using A-V-W method.
6	Determination of Phase and Line quantities in three-phase star connected load.
7	Determination of Phase and Line quantities in three-phase delta connected load.
8	Determination of efficiency of a single-phase transformer by direct load test.
9	Speed Vs Torque characteristics of shunt Motor
10	Speed Vs Torque characteristics of series Motor

Course outcomes (Course Skills Set)

After successfully completing the course, the student will be able to understand the topics:

Course Code	CO	COURSE OUTCOME (CO)	PO	Strength
22EE1ESEEE	**CO1**	Understand the fundamental concepts of DC, AC circuits, electrical machines and electric vehicles	1	1
	CO2	Apply the basic electrical laws to solve circuits.	1	2
	CO3	Analyse the behaviour of electric circuits, electrical machines and.	2	3
	CO4	Explain the concepts of electric power transmission and distribution, electricity billing, circuit protective devices and personal safety measures.	6	2
	CO5	Conduct the experiments and study the performance of electrical machines, AC and DC circuits	9	1
	CO6	Ability to engage in individual/team work to make effective technical presentation on electrical concepts and communicate effectively to the audience	10	1

Assessment Details (both CIE and SEE)

Component	Type of assessment	Max. Marks	Total	Reduced Marks	Total	Min. Marks required for eligibility	Total Marks
CIE – Theory	Quiz/AAT	20	20	25	25	10	50
	Test 1	40	80 (Best 2 of 3 tests)				
	Test 2	40					
	Test 3	40					
CIE – Lab	Record	10	25	10	25	10	
	Lab Test – Write up, Conduction, Results, Viva	15		15			
CIE				50		**20**	
SEE	End Exam	100		50		35	50
Grand Total Marks						**40**	**100**

Two best scores out of the three tests will be considered for CIE.
CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

- Each unit consists of one full question.
- Five full questions to be answered.
- To set one question each from Units 2, 3, 5 and two questions each from Unit 1 and Unit 4.

Suggested Learning Resources:

Text Books

1. Basic Electrical Engineering by D C Kulshreshtha, Tata McGraw Hill, First Edition 2019.
2. A text book of Electrical Technology by B.L. Theraja, S Chand and Company, reprint edition 2014.
3. Basic Electrical Engineering by B Venkatesh, Madhura S, Divya. S and Chaitanya L, InSc Publishers, 2021

Reference Books

1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Tata McGraw Hill 4th edition, 2019.
2. Principles of Electrical Engineering & Electronics by V. K. Mehta, Rohit Mehta, S. Chand and Company Publications, 2nd edition, 2015.
3. Fundamentals of Electrical Engineering by Rajendra Prasad, PHI, 3rd edition, 2014.

Web links and Video Lectures (e-Resources):

1. www.nptel.ac.in
2. http://nptel.ac.in/courses/108105053/
3. http://nptel.ac.in/courses/108108076/

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B.M.S. COLLEGE OF ENGINEERING, BENGALURU-19
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Course Title	**Engineering Mechanics**		
Course Code	22CV1ESENM/22CV2ESENM	**CIE Marks**	50
Course Type	THEORY	**SEE Marks**	50
		Total Marks	100
Credits	03	**Exam Hours**	03

Course objectives

- To develop students' ability to analyze the problems involving forces, moments with their applications.
- To analyse the member forces in trusses.
- 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.

Course outcomes

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

CO1: Apply the concepts of statics for the analysis of coplanar force systems.
CO2: Apply the principles of static equilibrium for solving problems involving friction.
CO3: Locate centroid and evaluate second moment of area of plane composite and built-up areas.
CO4: Apply the concepts of dynamics to solve problems related to kinematics and kinetics of particles.

MODULE 1

Resultant of coplanar force system: Basic dimensions and units, Idealisations, Classification of force system, principle of transmissibility of a force, composition of forces, resolution of a force, Free body diagrams, moment, Principle of moments, couple, Resultant of coplanar concurrent force system, Resultant of coplanar non-concurrent force system, Numerical examples

MODULE 2

Equilibrium of coplanar force system: Equilibrium of coplanar concurrent force system, Lami's theorem, Equilibrium of coplanar parallel force system, types of beams, types of loadings, types of supports, Equilibrium of coplanar non-concurrent force system, support reactions of statically determinate beams subjected to various types of loads, Numerical examples. Analysis of Trusses: Introduction, Classification of trusses, analysis of plane perfect trusses by the method of joints and method of sections, Numerical examples.

MODULE 3

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

MODULE 4

Centroid of Plane areas: Introduction, Locating the centroid of rectangle, triangle, circle, semicircle, quadrant and sector of a circle using method of integration, 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, moment of inertia of composite areas and simple built up sections,, Numerical examples.

MODULE 5

Kinematics: 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.

Continuous Internal Evaluation (CIE): Total 50 marks

- Test total of 40 Marks - Best 2 out of 3 (40 marks reduced to 20 in each test)
- Alternate Assessment Tools/ Quiz- 10 marks

Semester End Examination(SEE):

- The question paper shall be set for 100 marks. The medium of the question paper shall be English/Kannada). The duration of SEE is 03 hours.
- The question paper will have 7 questions. Two questions each from module 1 and 5. One question each from module 2, 3 & 4. Each question is set for 20 marks. The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for 100 marks and marks scored out of 100 shall be proportionally reduced to 50 marks.
- Each of the main question shall have sub questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module.

Suggested Learning Resources:

Text Books

1. Bansal R. K., Rakesh Ranjan Beohar and Ahmad Ali Khan, Basic Civil Engineering and Engineering Mechanics, 2015, Laxmi Publications.
2. Kolhapure B K, Elements of Civil Engineering and Engineering Mechanics, 2014, EBPB

Reference Books:

1. Beer F.P. and Johnson 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

CO-PO Mapping

CO	Description	PO	Strength
CO1	Apply the concepts of statics for the analysis of coplanar force systems.	PO1, PO2	3
CO2	Apply the principles of static equilibrium for solving problems involving friction.	PO1, PO2	2
CO3	Locate centroid and evaluate second moment of area of plane composite and built-up areas.	PO1, PO2	3
CO4	Apply the concepts of dynamics to solve problems related to kinematics and kinetics of particles.	PO1, PO2	2

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B.M.S. COLLEGE OF ENGINEERING, BENGALURU-19
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Course Title	Principles of Programming in C	Course Code	22CS1ESPOP/22CS2ESPOP
Credits	03	L – T – P (Credits)	2-0-1

Course Objectives

The objectives of the course are to facilitate the learners to:

- **Gain the knowledge** of the basic principles of Problem solving.
- **Learn** how to use C programming language to specify data and operations on data.
- **Understand and explore** systematic techniques and approaches for constructing C programs.

UNIT - 1	[05 hours]

Introduction to C

Basic Organization of a Computer, Types of Programming Languages, Program Design Tools, Introduction to C, Structure of C program, Writing the first C Program, Compiling and Executing C Programs, C Tokens, Basic Data Types in C, Operators in C, Evaluating Expressions, Type Conversion and Typecasting, Example Programs.

(RBT Levels: L1, L2 and L3)

Teaching-Learning Process	Chalk and talk method / Power Point Presentation

UNIT - 2	[05 hours]

Decision Control and Looping Statements

Introduction to Decision Control Statements, Conditional Branching Statements (if, if-else, if-else-if, switch), Iterative Statements (while, do-while, for), Nested Loops, Break and Continue Statements, Example Programs.

(RBT Levels: L1, L2 and L3)

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

UNIT - 3	[05 hours]

Functions: Introduction, Using Functions, Components of Functions (Function Declaration, Function Definition, Function Call), Passing Parameters to Functions, Example Programs.

Arrays: Introduction, Declaration of Arrays, Accessing the elements of an Array, Storing values in Arrays, Operations on Arrays (Insertion, Deletion, Searching), Two-Dimensional Arrays, Transpose of a Matrix, Example Programs.

(RBT Levels: L1, L2 and L3)

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

UNIT - 4	[05 hours]

Strings: Introduction, Operations on Strings (Length of a String, Converting Lowercase to Uppercase and Vice Versa, String Concatenation, String Comparison), Example Programs.

Structures: Introduction, Arrays of Structures, Nested Structures, Example Programs.

(RBT Levels: L1, L2 and L3)

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation
UNIT - 5	**[05 hours]**

Pointers: Introduction to Pointers, Declaring Pointer Variables, Pointer Expressions and Pointer Arithmetic, Passing Arguments to Functions using Pointers, Example Programs.
Files: Introduction to Files, Using Files in C, Read Data from Files, Writing Data to Files, Example Programs.
(RBT Levels: L1, L2 and L3)

Teaching-Learning Process	Chalk and talk method / PowerPoint Presentation

List of Lab Programs

Weekly: 1 Session (2 hours) **Batch Strength: 15 Students**
Number of Labs: 12 (10 Sessions + 2 Lab Assessments)
Suggested Software: Code Blocks (Open Source)

Part A

1. Implement a C program to find the distance between two points.
2. Illustrate conditional branching statements to find the smallest of three numbers.
3. Develop a C program to find all possible roots of a quadratic equation.
4. Develop a C program to print the sum of even numbers from M to N.
5. Develop a C program to sum the series 1+1/2+1/3+ …. 1/N.
6. Develop a C program to compute the GCD of two numbers.

Part B

1. Develop a C program to search a Book ID from an organized bookshelf that has N number of books using appropriate searching technique.
2. Develop a C program to find the Transpose of a Matrix.
3. Write functions to implement String operations such as concatenation and String length without using built-in functions.
4. Parameter Passing techniques: Call by Value and Call by reference (**Virtual Lab link:** https://cse02-iiith.vlabs.ac.in/exp/pointers/)
5. Structures (**Virtual Lab link:** https://cse02-iiith.vlabs.ac.in/exp/structures/)
6. Demonstrate how to read data from the keyboard, write it to a file called BMSCE, again read the same data from the BMSCE file, and display it on the screen/console.

Additional Programs

1. Develop a C program to convert Fahrenheit to Celsius.
2. A company decides to give a bonus to its employees on Diwali. A 5% bonus on salary is given to the Male workers and a 10% bonus on salary to the female workers. Write a program to enter the salary and gender of the employee if the salary of the employee is less than Rs.10,000 then the employee gets an extra 2% bonus on salary. Write a C program to calculate the bonus that has to be given to the employee and display the salary the employee will get.
3. Develop a C Program to display the following by reading the number of rows as input.

1
121
12321
1234321

4. Develop a C program to find the factorial of a number using functions.
5. Develop a C Program to read a matrix and print the diagonal elements.
6. Develop a program using pointers to compute the sum, mean and standard deviation
7. of all elements stored in an array of N real numbers.
8. Develop a C Program to Count the Number of Vowels, Consonants, digits, and special
9. characters in a string.
10. Implement structures to read, write and compute the average salary of the employees, and list the employees earning a salary above and below the average salary for a department of N employees. (Consider Employee DOB as a nested structure).

Course Outcomes

After successfully completing the course, the students will be able to:

Course Code		COURSE OUTCOMES (COs)	POs	Strength
22CS1ESPOP	**CO1**	Understand the basic concepts of computer programming, including variables, data types, and dynamics of memory and write, Compile and debug programs in the C programming language using proper syntax and conventions.	1,2	2
	CO2	Design simple programs involving decision structures, loops, functions, arrays, structures, pointers and files.	1,2,3	3

Assessment Details

Component	Type of assessment	Max. Marks	Total	Reduced Marks	Total	Min. Marks required for eligibility	Total Marks
CIE – Theory	AAT	20	20	5	25	10	50
	Test 1	40	120	20			
	Test 2	40					
	Test 3	40					
CIE – Lab	Lab Test1 (10)	20	20	20	25	10	
	Lab Test2 (10)						
	Record & Performance	5	5	5			
CIE				50		**20**	
SEE		100		50		35	50
Grand Total Marks						**40**	**100**

Two best scores out of the three tests will be considered for CIE.
CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination

- Each unit consists of one full question.
- Five full questions to be answered.
- To set one question each from Units 1, 4, 5 and two questions each from Unit 2 and Unit 3.

Suggested Learning Resources

Text Book

1. **Reema Thareja**, "Computer Fundamentals and Programming in C", 2nd Edition, Oxford Higher Education, 2016.

Reference Books

1. **E. Balaguruswamy**, "Programming in ANSI C", 7th Edition, McGraw-Hill Education, 2018.
2. **J. R. Hanly and E. B. Koffman**, "Problem Solving and Program Design in C", 7th Edition, Pearson Education, 2013.

Web links and Video Lectures (e-Resources)

1. **Introduction to Programming in C** [https://onlinecourses.nptel.ac.in/noc23_cs02/preview]
2. **C for Everyone: Programming Fundamentals** [https://www.coursera.org/learn/c-for-everyone]
3. **Computer Programming Virtual Lab** [https://cse02-iiith.vlabs.ac.in/exp/pointers/]
4. **C Programming: The ultimate way to learn the fundamentals of the C language** [https://www.pdfdrive.com/c-programming-the-ultimate-way-to-learn-the-fundamentals-of-the-c-language-e187584209.html]
5. **C Programming: The Complete Reference** [https://viden.io/knowledge/programming-in-c-language/attachment/28313/c-the-complete-reference-herbert-schildt-4th-edition-pdf/preview]

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B.M.S. COLLEGE OF ENGINEERING, BENGALURU-19
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Course Title: ELEMENTS OF MECHANICAL ENGINEERING	**Course Code**: 22ME1ESEME/ 22ME2ESEME	**Credits**: 03
L:T:P: 2:0:1 (credits)	**Contact Hours**:40	**Hours/Week**: 04

Course Learning Objectives

CLO 1: To impart the knowledge of fundamental principles of Mechanical Engineering as applied in the domains of machining, thermal, automotive and futuristic technologies.
CLO 2: To provide the knowledge on various mechanical systems and processes (energy, metal joining, IC engines etc.)
CLO 3: To explain the mathematical concepts and relationships concerning different mechanical systems.
CLO 4: To teach skills with regards to fabrication techniques and experimental analysis in various domains of Mechanical Engineering.

Module 1 [5 hours]
Introduction to Mechanical Engineering (Overview only): Role of Mechanical Engineering in Industries and Society- Emerging Trends and Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors and contribution to GDP (*Not for CIE/SEE*). **Steam Formation and Application:** Formation of steam and thermodynamic properties of steam (no numerical problems), Applications of steam in industries. **Energy Sources and Power Plants:** Classification of energy sources, Construction and working of Hydel power plant, Solar power plant (Helio-thermal process, flat and parabolic collectors), Wind power plant.
Module 2[5 hours]
Hydraulic turbines and pumps: Classification of Hydraulic turbines, Principle and Operation of Pelton Wheel and Francis Turbine,-Introduction to working of single stage Centrifugal Pump. **Metal Joining Processes:** Soldering, Brazing and Welding**:** Classification, definitions and principles of operation. Procedure followed in soldering, brazing and welding. Brief description of arc welding. **Heat Transfer Applications:** Modes of Heat Transfer: Definition, Governing laws, Principle of heat transfer in Automobile Radiators, Cooling of Electrical and Electronic Devices (Active, Passive and Hybrid Cooling.)
Module 3 [5 hours]
Fundamentals of IC Engines: Classification of Internal Combustion Engines, Working of 4-Stroke (petrol and diesel) engines, Applications of IC Engines, Numericals on Power and Mechanical efficiency calculations.

Insight into future mobility technology: Introduction to Electric and Hybrid Vehicles, Components of Electric and Hybrid Vehicles (block diagram only). Advantages and disadvantages of EVs and Hybrid vehicles.

Refrigeration: Principle of refrigeration, Refrigeration effect, Ton of Refrigeration, COP, Refrigerants and their desirable properties. Principles and Operation of Vapor Compression and Vapor absorption refrigeration (with block diagrams). Applications of Refrigeration.

Module 4 [5 hours]

Power Transmission – Belt Drives:
Principle, working and application of flat and V-belt drives. Flat belt drives (Open and crossed), Simple numericals on flat belt drives involving velocity ratios (with effect of belt thickness and slip).

Power Transmission – Gear Drives:
Classification of gear drives, Gear Trains and their application: simple and compound Gear Trains, Simple numericals on Gear trains involving velocity ratios.

Introduction to Robotics:
Robot anatomy, Joints & links, common robot configurations. Applications of Robotics.

Module 5 [5 hours]

Fundamentals of Machine Tools and Operations: (*Machine tool sketches are not included for CIE/SEE*)

Working Principle of Lathe, Milling and Drilling machine tools.

Lathe Operations: Turning, Facing, Taper Turning and Knurling.

Introduction to Modern Manufacturing Tools and Techniques:
CNC: Introduction, components of CNC, advantages and applications of CNC.
Additive Manufacturing: Introduction, classification, steps involved.

Introduction to Mechatronics: Concept of open-loop and closed-loop control systems, Examples of Mechatronic systems.

Laboratory Components:

Experiments

1. One model preparation using arc welding.
2. Preparation of a sheet metal model.
3. One model preparation using soldering.
4. One model preparation involving bench-drilling & tapping.
5. One lathe model involving facing, turning and knurling.
6. Performance study of Pelton wheel turbine.
7. Performance study of 4 stroke petrol engine.
8. Determination of thermal conductivity of a copper rod.

Demonstration

1. Different gear trains.
2. CNC/WJM lab
3. 3D Printing

Teaching- Learning Process:

1.Power Point presentation,
2. Chalk and talk are used for problem solving (in-general).
3. Students are encouraged to practice only line diagrams for exams.
4.Video demonstration or simulations
5.Laboratory demonstrations and practical experiments

Text Books:

1. Elements of Mechanical Engineering, K R GopalaKrishna, Subhash Publications, 2019.
2. Elements of Mechanical Engineering, V. K. Manglik, PHI Learning, 2019

Additional References:

1. Textbook of Elements of Mechanical Engineering, S. Trymbaka Murthy, Medtech, 2019.
2. Elements of Mechanical Engineering, Kestoor Praveen, Suggi Publishing, 2019
3. Thermal Management in Electronic Equipment, HCL Technologies, 2010
4. Fundamentals of Robotics: Analysis and Control, Robert J. Schilling, Pearson Education (US).

Web-links:

1. https://www.tlv.com/global/TI/steam-theory/principal-applications-for-steam.html
2. https://www.forbesmarshall.com/Knowledge/SteamPedia/About-Steam/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)
5. Mechanisms and mechanical devices 4e.pdf (e-book- Mechanical Linkages)

Continuous Internal Evaluation (CIE):

Theory: 25 Marks (to be assessed by theory faculty)
Test - Best 2 out of 3 (40 marks reduced to 25 marks)

Lab: 25 Marks (to be assessed by lab faculty)

- Lab models + Record + Test --> 15 marks
- Experiential learning --> 10 Marks

Experiential learning of the lab should be within the scope of the syllabus. A possible assessment tool: report / write-up on chosen topics.

Scheme of Examination (SEE):

Answer five full questions selecting one from each module.
To set one question each from module 1, 4, 5 and two questions each from module 2 & 3

Course Outcomes:

At the end of the course, the student will be able to:

CO1	Describe & discuss fundamental principles of Mechanical Engineering as applied in the domains of machining, thermal, automotive and futuristic technologies such as non-conventional energy technology.
CO2	Differentiate and compare among various mechanical systems (such as energy, metal joining, IC engines etc.)
CO3	Derive and determine parameters related to different type of mechanical systems.
CO4	Demonstrate skills in fabrication techniques and experimental analysis related to different domains in Mechanical Engineering.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3						2					
CO2	3						2					
CO3	3											
CO4	2			3								

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B.M.S. COLLEGE OF ENGINEERING, BENGALURU-19
Autonomous Institute, Affiliated to VTU

Course Title	**Introduction to Civil Engineering**		
Course Code	**22CV1ESICV/22CV2ESICV**	CIE Marks	50
Course Type	Theory	SEE Marks	50
		Total Marks	03
Credits	03	Exam Hours	03
L:T:P	3:0:0		

Course outcomes:

1. Understand the scope of various specializations of civil engineering.
2. Relate to the concepts of sustainable and smart infrastructure.
3. Apply the concepts of force and moments to solve problems related to resultant and equilibrium of force system.
4. Apply the concepts of centroid and moment of inertia to locate centroid and evaluate second moment of area of composite shapes.

Module 1 - Civil Engineering Disciplines and Building Science

Introduction to Civil Engineering: 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

Module 2 - Societal and Global Impact of Infrastructure

Infrastructure: Introduction to sustainable development goals
Smart City Concept: Smart Buildings, Building Automation System – Temperature and sound control in building, recycling; water supply and sanitary systems, urban air pollution management, solid waste management, urban flood control system, Intelligent Transportation Systems (ITS).

Module 3 - Analysis of force systems

Concept of idealization, system of forces, principles of superposition and transmissibility, Resolution and composition of forces, Law of Parallelogram of forces, Resultant of concurrent and non-concurrent coplanar force systems, moment of forces, couple, Varignon's theorem, free body diagram, equations of equilibrium, equilibrium of concurrent and non-concurrent coplanar force systems.

Module 4 – Centroid

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

Module 5 – Moment of inertia

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 Examples.

Text Books

1. Bansal R. K., Rakesh Ranjan Beohar and Ahmad Ali Khan, Basic Civil Engineering and Engineering Mechanics, 2015,Laxmi Publications.
2. Kolhapure B K, Elements of Civil Engineering and Engineering Mechanics, 2014, EBPB

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

Continuous Internal Evaluation (CIE): Total 50 marks
Test total of 40 Marks - Best 2 out of 3 (40 marks reduced to 20 in each test)
Alternate Assessment Tools/ Quiz- 10 marks

Scheme of Examination (SEE):
Answer five full questions selecting one from each module.
To set one question each from module 1, 2 and 4 and two questions each from module 3 & 5

CO	Description	PO	**Strength**
CO1	Understand the scope of various specializations of Civil Engineering.	PO6	**2**
CO2	Relate to the concepts of sustainable and smart infrastructure.	PO7	2
CO3	Apply the concepts of force and moments to solve problems related to resultant and equilibrium of force system.	PO1, PO2	**3**
CO4	Apply the concepts of centroid and moment of inertia to locate centroid and evaluate second moment of area of composite shapes.	PO1,PO2	**3**

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B.M.S. COLLEGE OF ENGINEERING, BENGALURU-19
Autonomous Institute, Affiliated to VTU

Course Title: INTRODUCTION TO MECHANICAL ENGINEERING	**Course Code**:22ME1ESIME/22ME2ESIME	**Credits**: 03
L:T:P: 3:0:0 (credits)	**Contact Hours**:40	**Hours/Week**: 04

Course Learning Objectives

CLO 1: To impart the knowledge of fundamental principles of Mechanical Engineering as applied in the domains of machining, thermal, automotive and futuristic technologies.
CLO 2: To provide the knowledge on various mechanical systems and processes (energy, metal joining, IC engines etc.)
CLO 3: To explain the mathematical concepts and relationships concerning different mechanical systems.

Module 1 [8 hours]
Introduction to Mechanical Engineering: Role of Mechanical Engineering in Industries and Society- Emerging Trends and Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors and contribution to GDP (*Not for CIE/SEE*). **Energy Sources and Power Plants:** Introduction and application of energy sources, Construction and working of Hydel power plant, Solar power plant (Helio-thermal process, flat and parabolic collectors), Wind power plant, and Biogas Plant, Environmental issues like Global warming and ozone depletion.
Module 2 [8 hours]
Fundamentals of Machine Tools and Operations: (*Machine tool sketches are not included for CIE/SEE*) Working principle of Lathe, Milling and Drilling machine tools. Lathe Operations: Turning, Facing, Taper Turning and Knurling, Drilling Operation: drilling, boring, and reaming. Milling Operation: Plane milling and slot milling. **Modern Manufacturing Tools and Techniques:** CNC: Introduction, components of CNC, advantages and applications of CNC. 3D printing: Introduction and steps involved
Module 3 [8 hours]
Introduction to IC Engines: Classification, Working of 4-Stroke (petrol and diesel) engines, numericals on Power and Mechanical efficiency calculations, applications. **Insight into future mobility technology:** Introduction to Electric and Hybrid Vehicles, Components of Electric and Hybrid Vehicles (block diagram only). Advantages and disadvantages of EVs and Hybrid vehicles.
Module 4 [8 hours]
Materials and its Industrial Applications: (*Definitions, types and list of applications only*) Metals- Ferrous: Tool steels and stainless steels, Non-ferrous: Aluminum alloys. Ceramics- Glass, optical fiber glass, cermets. Composites- Fiber reinforced composites, Metal matrix composites, Smart materials: Piezoelectric materials, shape memory alloys, semiconductors, and super-insulators.

Metal Joining Processes:
Soldering, Brazing and Welding**:** Classification, definitions and principles of operation. Procedure followed in soldering, brazing and welding. Brief description of arc welding.

Module 5 [8 hours]

Introduction to Robotics and Mechatronics:
Robot anatomy, Joints & links, common robot configurations. Applications of Robotics. Concept of open-loop and closed-loop control systems, examples of Mechatronic systems.

Automation in Industry:
Definition, types - fixed, programmable and flexible automation, basic elements with block diagrams and advantages

Introduction to IoT: Definition and characteristics, physical design, protocols, logical design of IoT, functional blocks, and communication models

Teaching- Learning Process:

1. Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations.
2. Arrange visits to show the live working models other than laboratory topics.
3. Adopt collaborative (Group Learning) Learning in the class.
4. Adopt Problem Based Learning (PBL), which foster students' Analytical skills and develops thinking skills such as evaluating, generalizing, and analyzing information.

Text Books:

1. Elements of Mechanical Engineering, K R GopalaKrishna, Subhash Publications, 2019.
2. Elements of Mechanical Engineering, V. K. Manglik, PHI Learning, 2019

Additional References:

1. Textbook of Elements of Mechanical Engineering, S. Trymbaka Murthy, Medtech, 2019.
2. Elements of Mechanical Engineering, Kestoor Praveen, Suggi Publishing, 2019
3. Thermal Management in Electronic Equipment, HCL Technologies, 2010
4. Fundamentals of Robotics: Analysis and Control, Robert J. Schilling, Pearson Education (US).

Web-links:

1. https://www.tlv.com/global/TI/steam-theory/principal-applications-for-steam.html
2. https://www.forbesmarshall.com/Knowledge/SteamPedia/About-Steam/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)
5. Mechanisms and mechanical devices 4e.pdf (e-book- Mechanical Linkages)

Continuous Internal Evaluation (CIE): Total 50 marks
Test total of 40 Marks - Best 2 out of 3 (40 marks reduced to 20 in each test)
Alternate Assessment Tools/ Quiz- 10 marks

Scheme of Examination (SEE):
Answer five full questions selecting one from each module.
To set one question each from module 1, 4, 5 and two questions each from module 2 & 3

Course Outcomes:

At the end of the course, the student will be able to:

CO1	Describe & discuss fundamental principles of Mechanical Engineering as applied in the domains of machining, thermal, automotive and futuristic technologies.
CO2	Differentiate and compare among various mechanical systems (such as energy, metal joining, IC engines etc.)
CO3	Determine performance related parameters for IC engines.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3						2					
CO2	3						2					
CO3	2											

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B.M.S. COLLEGE OF ENGINEERING, BENGALURU-19
Autonomous Institute, Affiliated to VTU

Course Title	**INTRODUCTION TO C PROGRAMMING**		
Course-Code	**22CS1ESICP/22CS2ESICP**		
L-T-P	**2-0-1**	**Credits**	**03**

Unit No.	Topics	Hrs
1	**Module-1: Introduction to C** Algorithms, Flowcharts, Pseudo codes. Introduction to C ,Structure of a C program, Writing the first C program, Keywords, Identifiers, Basic Data Types in C, Variables, Constants, Input / Output Statements in C. Operators in C- Arithmetic, Relational, Logical, Conditional, Type conversion and Typecasting.Example Programs.	5
2	**Module-2: Decision Control and Looping Statements** Introduction to Decision Control Statements, Conditional Branching Statements (if, if-else, if-else-if, switch), Iterative Statements (while, do-while, for), Nested Loops, Break and Continue Statements, Example Programs.	5
3	**Module-3: Arrays** **Arrays:** Introduction, Declaration of Arrays, Accessing the elements of an Array, Storing values in Arrays Operations on 1-D Arrays: Inserting an Element in an array, Deleting an Element from an Array, searching for a value in an Array. Operations on 2-D Arrays – sum, difference, multiplication.	5
4	**Module-4: Functions and Strings** Functions: Function Declaration/Function Prototype, Function definition, Function call, passing parameters to functions. **Strings:** Introduction, Operations on Strings (Length of a String, Converting Lowercase to Uppercase and Vice Versa, String Concatenation, String Comparision), Example Programs.	5
5	**Module-5: Structures and Pointers** Structures: Introduction to Structures, Copying and comparing structures, Nested structures. **Pointers:** Introduction to Pointers, Declaring Pointer Variables, Pointer Expressions and Pointer Arithmetic, Passing Arguments to Functions using Pointers, Example Programs.	5

Lab Programs

1.	Develop a program to find the distance between two points in space using Euler's Formula.
2.	Develop a program to find whether the given number is odd or even.
3.	Develop a program to find the largest of three numbers with and without using ternary operator.
4.	Develop a program to check whether the given alphabet is a vowel or a consonant using switch statement.

5.	Develop a program to perform arithmetic operations using switch statement.
6.	Develop a program to reverse a given number.
7.	Develop a program to print a Pascal's triangle.
8.	Develop a program to generate Fibonacci series.
9.	Implement a program to perform a linear and binary search on 1D array.
10.	Implement a program to perform insertion/Selection/Bubble sort on 1D array.
11.	Develop a program perform addition and subtraction of two matrices.
12.	Develop a program perform multiplication of two matrices.
13.	Develop a program to find a factorial of given number using functions.
14.	Develop a program to concatenate two strings and determine the length of the concatenated string.
15.	Develop a program to reverse a given string.
16.	Develop a program to read and display the information about a student using structures.
17.	Develop a program to store N elements in an array and print the elements using pointers.

Prescribed Text Books

Sl.No.	Book Title	Authors	Edition	Publisher	Year
1	Computer Fundamentals and Programming in C	Reema Thareja	2nd Edition	Oxford Higher Education	2016

Reference Text Books

Sl.No.	Book Title	Authors	Edition	Publisher	Year
1	Programming in ANSI C	E. Balaguruswamy	7th Edition	Tata McGraw-Hill	2018
2	Let us C	Yashavanth Kanetkar	-	BPB publications	-

E-Book

Sl. No.	Book Title	Authors	Edition	Publisher	Year	URL
1	C Programming The ultimate way to learn the Fundamentals of the C language.	Harry H. Chaudhary	-	MIT-Createspace Inc. O-D-Publishing, LLC USA.	2014	https://www.pdfdrive.com/c-programming-the-ultimate-way-to-learn-the-fundamentals-of-the-c-language-e187584209.html

2	**C The Complete Reference**	Herbert Schildt	4th Edition	Tata McGraw-Hill	2000	https://viden.io/knowledge/programming-in-c-language/attachment/28313/c-the-complete-reference-herbert-schildt-4th-edition-pdf/preview

MOOC Courses				
Sl.No.	**Course name**	**Course Offered by**	**Year**	**URL**
1	Introduction to Programming in C	Swayam	2023	https://onlinecourses.nptel.ac.in/noc23_cs02/preview
2	C for Everyone: Programming Fundamentals	Coursera	2022	https://www.coursera.org/learn/c-for-everyone

Course Outcomes	
CO1	**Describe the concepts of C Programming.**
CO2	Apply the knowledge of C programming constructs for a given problem
CO3	Analyse the given problem to determine the output and correctness of the program given
CO4	Conduct practical experiments for demonstrating the features of C programming concepts.

Assessment Plan (for 50 marks of CIE)		
Tool	**Remarks**	**Marks**
Internals	Best 2 of 3	20
QUIZ	TWO	5
Lab Component	1 Lab Test+Record	25
Self-Study Component	NA	--
AAT	NA	--
	Total	50

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B.M.S. COLLEGE OF ENGINEERING, BENGALURU-19
Autonomous Institute, Affiliated to VTU

Course Title	Introduction to Electronics Engineering	Course Code	22EC1ESIEL/ 22EC2ESIEL
Credits	03	L – T – P (Credits)	3-0-0

Course Objectives:

The objectives of the course are to facilitate the learners to

- **Gain** fundamental knowledge in the field of Electronics and Communication Engineering
- **Equip** students with a basic foundation in electronic engineering fundamentals required for comprehending the operation and application of electronic circuits, logic design, embedded systems, and communication systems.

UNIT - 1	[08 hours]

Power Supplies –Block diagram, Half-wave rectifier, Full-wave rectifiers and filters, Voltage regulators, Output resistance and voltage regulation, Voltage multipliers.
Transistor: BJT structure and operation (npn), circuit symbol, configurations, relation between transistor currents.
Amplifiers – Definition, Types of amplifier, gain, Input-Output Resistance, Multi-stage amplifier; BJT as a switch: Cut-off and saturation modes.

(RBT Levels: L1, L2 and L3)

Teaching-Learning Process	Chalk and talk method / Power Point Presentation

UNIT - 2	[08 hours]

Operational amplifiers - Ideal op-amp; characteristics of ideal and practical op-amp; Practical opamp circuits: Inverting and non-inverting amplifiers, voltage follower, summer, subtractor, integrator, differentiator
Oscillators – Barkhausen criterion, sinusoidal and non-sinusoidal oscillators, Ladder network oscillator, Wein bridge oscillator, Crystal oscillator (Only Concepts, working, and waveforms. No mathematical derivations)

(RBT Levels: L1, L2, L3 and L4)

Teaching-Learning Process	Chalk and talk method / Power Point Presentation

UNIT - 3	[08 hours]

Boolean Algebra and Logic Circuits: Binary numbers, Number Base Conversion, octal & Hexa Decimal Numbers, Complements (1's and 2's complement), 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

(RBT Levels: L1, L2 and L3)

Teaching-Learning Process	Chalk and talk method / Power Point Presentation
UNIT - 4	**[08 hours]**
Embedded Systems – 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 **(RBT Levels: L1, L2, L3 and L4)**	
Teaching-Learning Process	Chalk and talk method / Power Point Presentation
UNIT - 5	**[08 hours]**
Communication: Modern communication system scheme, Information source, and input transducer, Transmitter, Channel or Medium – Wired and Wireless, Noise, Receiver, Multiplexing, Types of communication systems. Types of modulation-AM, FM Introduction to Cellular Communication, Computer Communication Networks. **(RBT Levels: L1, L2 and L3)**	
Teaching-Learning Process	Chalk and talk method / Power Point Presentation

Course outcomes (Course Skills Set)

After successfully completing the course, the student will be able to understand the topics:

Course Code	CO	COURSE OUTCOME (CO)	PO	Strength
22EC1ESIEL	CO-1	Apply the basic principles of electronics to solve analog and digital circuits.	1	3
	CO-2	Analyse and Identify a suitable electronic system for a given application.	2	1
	CO-3	Design the basic electronic circuits for a given specification to address engineering applications.	3	1
	CO-4	Involve in independent/team learning on recent trends in applied electronics and communicate with effective presentations and report.	9, 10	1

Assessment Details (both CIE and SEE)

Component	Type of assessment	Max. Marks	Total	Reduced Marks	Total	Min. Marks required for eligibility	Total Marks
CIE	Quiz 1	05	10	50	50	20	50
	AAT	05					
	Test 1	40	80				
	Test 2	40					
	Test 3	40					
SEE	End Exam	100		50		35	50
Grand Total Marks						**40**	**100**

Two best scores out of the three tests will be considered for CIE.

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

- Each unit consists of one full question.
- Five full questions to be answered.
- To set one question each from Units 2, 4, 5 and two questions each from Unit 1 and Unit 3.

Suggested Learning Resources:

Text Books

1. **Santiram Kal,** "Basic Electronics- Devices, circuits and IT fundamentals", PHI, 2012
2. **M. Morris Mano**, "Digital Logic and Computer Design", PHI Learning, 2008 ISBN-978-81-203-0417-84.
3. **K V Shibu**, "Introduction to Embedded Systems", 2nd Edition, McGraw Hill Education (India), Private Limited, 2016.

Reference Books:

1. **Mike Tooley**, "Electronic Circuits, Fundamentals & Applications", 4th Edition, Elsevier, 2015.DOI: https://doi.org/10.4324/9781315737980. eBook ISBN9781315737980
2. **S L Kakani and Priyanka Punglia**, "Communication Systems", New Age International Publisher, 2017. https://elib4u.ipublishcentral.com/pdfreader/communication-systems

Web links and Video Lectures (e-Resources):

1. https://www.elsevier.com/books/basic-electronics/holbrook/978-0-08-006865-7
2. http://www.worldcat.org/title/basic-electronics/oclc/681543319

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B.M.S. COLLEGE OF ENGINEERING, BENGALURU-19
Autonomous Institute, Affiliated to VTU

Course Title	**Introduction to Electrical Engineering**	**Course Code**	**22EE1ESIEE/ 22EE2ESIEE**
Credits	**03**	**L – T – P (Credits)**	**3-0-0**

Course Objectives:

The objectives of the course are to facilitate the learners to

- To understand structure of electrical power systems, energy sources and their utilization.
- To explain the laws used in the analysis of DC circuits and electromagnetism.
- To explain the behaviour of circuit elements in single-phase circuits.
- To explain the construction and operation of transformers, and DC motors.
- To introduce concepts of circuit protecting devices and earthing.
- To explain electric power generation, transmission and distribution, electricity billing, equipment and personal safety measures.

UNIT - 1	**[08 hours]**
Introduction: Conventional and non-conventional energy resources; General structure of electrical power systems using single line diagram approach. **Power Generation:** Hydel, Nuclear, Solar & wind power generation (Block Diagram approach). **DC Circuits:** Ohm's Law and its limitations. KCL & KVL, Simple Numerical. Teaching-Learning Process Chalk and talk method / Power Point Presentation	

UNIT - 2	**[08 hours]**
Circuit Theorems: Thevenin's Theorem, Superposition Theorem (Only for DC circuits), Simple Numerical (Only for Independent Voltage Sources). **Electromagnetism:** Faraday's Laws of Electromagnetic Induction, Lenz's Law, Flemings rules, statically and dynamically induced EMF; concepts of self and mutual inductance. Coefficient of Coupling. Energy stored in magnetic field. Simple Numerical.	
Teaching-Learning Process	Chalk and talk method / Power Point Presentation

UNIT - 3	**[08 hours]**
AC Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor (only definitions). **AC Circuits:** Voltage and current relationship with phasor diagrams in R, L, and C circuits. Analysis of R-L, R-C, R-L-C Series circuits.	
Teaching-Learning Process	Chalk and talk method / Power Point Presentation

UNIT - 4	**[08 hours]**
Single Phase Transformers: Construction and principle of operation, emf equation, losses, variation in losses with respect to load, efficiency, condition for maximum efficiency, illustrative examples. **DC Motors:** Construction, Principle of operation, back emf and its significance, Torque equation, types of motors (series & shunt only), applications of DC motors. Simple numerical.	
Teaching-Learning Process	Transformer topic: Cut-out demo /actual machine models and chalk and talk method of teaching, YouTube videos.
	DC Motors: Cut -out demo/actual machine models, video for working of machine, Chalk and talk.
UNIT - 5	**[08 hours]**
Electricity Bill: 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. **Equipment Safety measures:** Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits. **Personal safety measures:** Electric Shock, Earthing and its types, Safety Precautions to avoid shock. **Introduction to Electric Vehicles:** Overview and block diagram approach to Electric Vehicles.	
Teaching-Learning Process	Chalk and talk, Demonstration of functioning of MCB and Fuse.
	Self-study topic: Safety precautions to avoid shock.

CHOICE UNITS: II & IV

Course outcomes (Course Skills Set)

After successfully completing the course, the student will be able to understand the topics:

Course Code	CO	COURSE OUTCOME (CO)	PO	Strength
22EE1ESIEE	CO1	Understand the concepts of various energy sources, electric circuits and electromagnetism		
	CO2	Apply knowledge of mathematics to solve problems related to electrical circuits.	1	2
	CO3	Analyse the behaviour of electric circuits, transformers, DC motors and electric vehicles.	2	3
	CO4	Explain the concepts of electric power transmission and distribution, electricity billing, circuit protective devices and personal safety measures.	6	3
	CO5	Ability to engage in individual/team work to make effective technical presentation on electrical concepts and communicate effectively to the audience	9, 10	1, 1

Assessment Details (both CIE and SEE)

Component	Type of assessment	Max. Marks	Total	Reduced Marks	Min. Marks required for eligibility	Total Marks
CIE – Theory	Quiz/AAT	10	10	50	20	50
	Test 1	40	90			
	Test 2	40				
	Test 3	40				
CIE				50	**20**	
SEE	End Exam	100		50	35	50
Grand Total Marks					40	100

Two best scores out of the three tests will be considered for CIE.
CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

- Each unit consists of one full question.
- Five full questions to be answered.
- To set one question each from Units 1, 3, 5 and two questions each from Unit 2 and Unit 4.

Suggested Learning Resources:

Text Books

4. Basic Electrical Engineering by D C Kulshreshtha, Tata McGraw Hill, First Edition 2019.
5. A text book of Electrical Technology by B.L. Theraja, S Chand and Company, reprint edition 2014.
6. Basic Electrical Engineering by B Venkatesh, Madhura S, Divya. S and Chaitanya L, InSc Publishers, 2021

Reference Books

4. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Tata McGraw Hill 4th edition, 2019.
5. Principles of Electrical Engineering & Electronics by V. K. Mehta, Rohit Mehta, S. Chand and Company Publications, 2nd edition, 2015.
6. Fundamentals of Electrical Engineering by Rajendra Prasad, PHI, 3rd edition, 2014.

Web links and Video Lectures (e-Resources):

4. www.nptel.ac.in

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B.M.S. COLLEGE OF ENGINEERING, BENGALURU-19
Autonomous Institute, Affiliated to VTU

Course Title	Introduction to Python Programming	Course Code	22CS1ESPYP/ 22CS2ESPYP
Credits	03	L–T–P (Credits)	2-0-1

Course Objectives:

The objectives of the course are to facilitate the learners to

- Master the fundamentals of writing Python scripts, learn core Python scripting elements such as variables and flow control structures, discover how to work with lists and sequence data.
- Write Python functions to facilitate code reuse, make their code robust by handling errors and exceptions properly, Explore Python's object-oriented features, Search text using regular expressions, Use Python to read and write files.

UNIT - 1	[05 hours]

Python Basics: Variables, expressions, and statements: Values and types, Variables, Variable names and keywords, Statements, Operators and operands, Expressions, Order of operations, Modulus operator, String operations, Asking the user for input, Comments, Choosing mnemonic variable names, Debugging, **Conditional execution:** Boolean expressions, Logical operators, Conditional execution, Alternative execution, Chained conditionals, Nested conditionals, Catching exceptions using try and except, Short-circuit evaluation of logical expressions

Iteration: Updating variables, the while statement, Infinite loops, break, finishing iterations with continue, Definite loops using for, Loop patterns, Counting and summing loops, Maximum and minimum loops

(RBT Levels: L1, L2 and L3)

Teaching-Learning Process	Chalk and talk method/PowerPoint Presentation

UNIT - 2	[05 hours]

Strings: A string is a sequence, Getting the length of a string using len, Traversal through a string with a loop, String slices, Strings are immutable, Looping and counting, The in operator, String comparison, string methods, Parsing strings, Format operator

Lists: A list is a sequence, Lists are mutable, Traversing a list, List operations, List slices, List methods, Deleting elements, Lists and functions, Lists and strings, Parsing lines, Objects and values, Aliasing, List arguments.

(RBT Levels: L1, L2 and L3)

Teaching-Learning Process	Chalk and talk method/PowerPoint Presentation

UNIT - 3	[05 hours]

Dictionaries: Dictionary as a set of counters, Dictionaries and files, Looping and dictionaries, Advanced text parsing

Tuples: Immutable, comparing tuples, Tuple Assignment, Dictionaries and Tuples, Multiple Assignments with Dictionaries, Using Tuples as keys in Dictionary

Functions: Function calls, Built-in functions, Type conversion functions, Random numbers, Math functions, Adding new functions, Definitions and uses, Flow of execution, Parameters and arguments, Fruitful functions and void functions, Why functions

(RBT Levels: L1, L2 and L3)

Teaching-LearningProcess	Chalk and talk method/PowerPoint Presentation
UNIT - 4	**[05 hours]**

Object-Oriented Programming: Managing Larger Programs, Getting Started, Using Objects, Starting with Programs, Subdividing a Problem, Our First Python Object, Classes as Types, Object Lifecycle, Many Instances, Inheritance, Classes and Methods, Operator overloads

Exceptions: Exception Class Hierarchy, User-Defined Exceptions
(RBT Levels: L1, L2 and L3)

Teaching-LearningProcess	Chalk and talk method/PowerPoint Presentation
UNIT - 5	**[05 hours]**

Regular expressions: Character matching in regular expressions, Extracting data using regular expressions, combining searching and extracting, Escape character

Files: Persistence, Opening files, Text files and lines, Reading files, Searching through a file, Letting the user choose the file name, Using try, except, and open, Writing files
(RBT Levels: L1, L2 and L3)

Teaching-LearningProcess	Chalk and talk method/PowerPoint Presentation

List of Lab Programs

Weekly: 1 Session (2 hours) Batch strength :15 students
Number of Labs: 10

Write a program that asks the user how many Fibonacci numbers to generate and then generates them. Make sure to ask the user to enter the number of numbers in the sequence to generate.

1. Write a program that asks the user for a number and then prints out a list of all the divisors of that number.
2. Write a program to compute distance between two points taking input from the user (Pythagorean Theorem).
3. Write a Program for checking whether the given number is a even number or not.
4. Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.
5. Write a program to find the sum of all primes below two million.
6. **a)** Write a program to count the numbers of characters in the string and store them in a dictionary data structure.
   b) Write a program to use split and join methods in the string and trace a birthday with a dictionary data structure.
7. **a)** Write a Python program that takes this list and makes a new list that has only the even elements of this list in it.
   b) Write a function that takes an ordered list of numbers (a list where the elements are in order from smallest to largest) and another number. The function decides whether or not the given number is inside the list and returns (then prints) an appropriate Boolean.
9. **a)** Write a program combine_lists that combines these lists into a dictionary.
   b) Write a program to print each line of a file in reverse order.
10. **a)** Write a program to count frequency of characters in a given file.
    b) Write a program to compute the number of characters, words and lines in a file.

Suggested software: Python

Course outcomes (Course Skills Set)

After successfully completing the course, the student will be able to understand the topics:

Course Code	CO	COURSE OUTCOME (CO)	PO	Strength
22CS1ESPYP	CO 1	Apply knowledge of Python programming for various applications.	1	2
	CO 2	Analyse the given Python program to identify bugs.	2	3
	CO 3	Design Python programs/ applications for a given requirement.	3	3
	CO 4	Ability to conduct practical experiments for given requirements using python.	5	3

Assessment Details (both CIE and SEE)

Component	Type of assessment	Max. Marks	Total	Reduced Marks	Total	Min. Marks required for eligibility	Total Marks
CIE – Theory	Quiz/AAT	20	5	25	25	10	50
	Test 1	40	120				
	Test 2	40					
	Test 3	40					
CIE – Lab	CIE	100	115	10	25	10	
	Lab Test1(15)	15		15			
	CIE			50		20	
SEE	End Exam	100		50		35	50
Grand Total Marks						**40**	**100**

Two best scores out of the three tests will be considered for CIE.
CIE methods/question paper is designed to attain the different levels of Bloom's taxonomy As per the outcome defined for the course.

Semester End Examination:

- Each unit consists of one full question.
- Five full questions to be answered.
- To set one question each from Units1, 2, 5 and two questions each from Unit3 and Unit4.

Suggested Learning Resources:

TextBooks

1. **Charles R. Severance**:" Python for Everybody: Exploring Data Using Python 3" , University of Michigan, 4th Ed., 2016.
2. **Cody Jackson**: "Learning to Program using Python", Packt Publishing, 2nd Ed., 2018.

Reference Books

1. **David Amos, Dan Bader, Joanna Jablonski, Fletcher Heisler:** "Python Basics: A Practical Introduction to Python 3", Real Python, 4th Ed., 2012-2020.
2. **David M. Beazley**: "Python Essential Reference", Pearson, 4th Ed., 2009.
3. **Paul Barry**: "Head-First Python: A Brain-Friendly Guide", O'Reilly, 2nd Ed., 2016.

Weblinks for e-books and Video Lectures (e-Resources):

1. Think Python: https://greenteapress.com/ thinkpython2/thinkpython 2.pdf
2. A Hands-On, Project-Based Introduction to Programming: https://t.ly/fEOq(URL Shortened)
3. An Introduction to Interactive Programming in Python (Part 1): https://www.coursera.org/course/interactivepython1
4. An Introduction to Interactive Programming in Python (Part 2): https://www.coursera.org/course/interactivepython2
5. Introduction to Python Programming: https://www.edx.org/professionalcertificate/introduction-topython-programming

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B.M.S. COLLEGE OF ENGINEERING, BENGALURU-19
Autonomous Institute, Affiliated to VTU

Course Title	Introduction to Web Programming	Course Code	22CS1ESWEB/ 22CS2ESWEB
Credits	03	L – T – P (Credits)	2-0-1

Course Objectives:

The objectives of the course are to facilitate the learners to

- To **familiarize** with the current principles and practices of web design.
- To **design** static web pages using HTML, CSS and JavaScript.
- **Improve** the coding abilities using Modern Integrated Development tools.

UNIT - 1	**[05 hours]**

Fundamentals of www: A Brief Introduction to the Internet, The World Wide Web, Web Browsers, Web Servers, Uniform Resource Locators.
Introduction to Web Programming: Introduction, Creating a Website, Web Page Example, HTML Tags syntax, Commenting HTML content, HTML elements vs attributes,
HTML Elements: Heading Elements (h1 to h6), hr, p, br, sub, sup, s, mark, small, strong, em, b, u, and i, Lists (Unordered and Ordered).
(RBT Levels: L1, L2 and L3)

Teaching-Learning Process	Power Point Presentation / Live Coding

UNIT - 2	**[05 hours]**

HTML Elements:
Images, Hypertext Links, Tables, Form, Form Elements, Form Action (GET and POST Method differences), div and section tags,
Meta Elements: title, script, meta, link, style tags. Introduction to XHTML, Difference between HTML and XHTML.
(RBT Levels: L1, L2 and L3)

Teaching-Learning Process	Power Point Presentation / Live Coding

UNIT - 3	**[05 hours]**

Cascading Style Sheets: Introduction, Levels of style sheets, Style specification formats (Inline style, Internal CSS, external CSS, Content developer network CDN), Selectors (Universal, Class, id, Pseudo classes and Pseudo elements, combinators: space, child selector, adjacent sibling selector, general sibling selector), The box model, property-value, Font properties, Alignment of text, Color, Background images, CSS Position Properties (Static, Absolute and Relative).
Case Studies (Popular CDN Networks): Exploring googlefonts.com, fontsawesome.com, bootstrap css
(RBT Levels: L1, L2, L3, L4)

Teaching-Learning Process	Power Point Presentation / Live Coding

UNIT - 4	**[05 hours]**

The Basics of JavaScript

Overview of JavaScript, The <script> tag, Document Object Model (DOM), windows object, Primitives, variables, usage of let, var & const, Hoisting, typeof operator, Operators, Expressions, == and === operator differences, Screen output and Keyboard Input, Control Statements, Arrays, Array Methods, Map, Strings, String Methods, Objects, Regular Expressions.

Case Study: **JSON Object Notation**.

(RBT Levels: L1, L2, L3, L4)

Teaching-Learning Process	Power Point Presentation / Live Coding

UNIT - 5	**[05 hours]**

JavaScript Functions & Event Handling

Functions: Function basics, Recursive Functions,

Events: Event Handling, Event Listener, Event Objects, KeyBoard and Mouse Events.

Case Studies: Callback / Anonymous functions, Arrow functions

(RBT Levels: L1, L2, L3, L4)

Teaching-Learning Process	Power Point Presentation / Live Coding

List of Lab Programs

Weekly: 1 Session (2 hours) **Batch strength :15 students**

Number of Labs: 12 (10 Sessions+2 Lab Assessments)

1. Static webpage that depicts block level elements.
2. Static webpage to demonstrate inline elements.
3. Static webpage to demonstrate data visualization using tables for a given requirement.
4. Static webpage to demonstrate data inputs using forms for an employee detail.
5. Design a webpage that demonstrates CSS Styles using Inline, Style, External and CDN.
6. Design a webpage to explore various CSS rules and properties.
7. Build a webpage to show a login form using CSS bootstrap CDN Network.
8. Build a webpage to demonstrate event handling mechanism using JavaScript.
9. Build a webpage that validates the user inputs using JavaScript.
10. Build a calculator using JavaScript.

Suggested Software's: HTML5, CSS3 & JavaScript (ECMAScript – ES6)

Modern Integrate Development Tool: Visual Studio Code, VSCode Extensions (VScode Icons,
LiveServer & Emmet)

Course Outcomes (Course Skills Set)

After successfully completing the course, the student will be able to understand the topics:

Course Code	CO	COURSE OUTCOME (CO)	PO	Strength
22CS1ESWEB	CO 1	Understand the basic syntax of HTML, CSS and JavaScript.		
	CO 2	Apply the knowledge of HTML, CSS and JavaScript to develop web pages.	1	2
	CO 3	Analyze front end web coding languages to add dynamic content to the website.	2	2
	CO 4	Develop web applications on user-specific requirements using HTML, CSS and JavaScript.	3, 5, 9	2

Assessment Details (Both CIE and SEE)

Component	Type of assessment	Max. Marks	Total	Reduced Marks	Total	Min. Marks required for eligibility	Total Marks
CIE – Theory	Quiz	20	10	5	25	10	50
	Test 1	40	120	20			
	Test 2	40					
	Test 3	40					
CIE – Lab	Lab Test1(20)	20	45	25	25	10	
	Lab Test2(20)	20					
	AAT	5					
CIE				**50**		**20**	
SEE	End Exam	**100**		**50**		**35**	**50**
Grand Total Marks						**40**	**100**

Two best scores out of the three tests will be considered for CIE.
CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

- Each unit consists of one full question.
- Five full questions to be answered.
- To set one question each from Units 1, 2, 5 and two questions each from Unit 3 and Unit 4.

Suggested Learning Resources:

Text Books

1. **John Dean**: "Web Programming With HTML5, CSS and JavaScript", Jones & Bartlett Learning, 1st Ed., 2019.
2. **Robert W Sebesta:** "Programming the World Wide Web", Pearson Education, 7th Ed., 2017.

Reference Books

1. **Wendy Willard:** "HTML: A Beginner's Guide", McGraw-Hill Education, 4th Ed., 2009.
2. **Thomas A. Powell**: "HTML & CSS: The Complete Reference", Tata McGraw Hill, 5th Ed., 2010.

Web links and Video Lectures (e-Resources):

1. A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics: https://wtf.tw/ref/robbins.pdf
2. HTML & CSS Design: https://wtf.tw/ref/duckett.pdf
3. Introduction to web development with HTML, CSS and JavaScript: https://in.coursera.org/learn/introduction-to-web-development-with-html-css-javacript
4. Introduction to Web development: https://in.coursera.org/learn/web-development.

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B.M.S. COLLEGE OF ENGINEERING, BENGALURU-19
Autonomous Institute, Affiliated to VTU

Course Title: APPLIED CHEMISTRY FOR CSS & ALLIED BRANCHES	**Course Code**: 22CY1BSCCS/22CY2BSCCS	**Credits**: 04
L:T:P: 3:0:1	**Contact Hours**: 40	**Hours/Week**: 04

Course Objectives: To impart the knowledge of Chemistry involved in Electrochemical cells, Corrosion and its control; Conventional, electrochemical and renewable sources of energy; Polymers; memory and display systems; Water treatment; sensors; e-waste management; Nanomaterials and Instrumental methods of analysis.

Unit-1

Electrochemistry: Electrode Systems and Corrosion **08 hours**

Electrodes and Cells – Introduction- Classification of cells - primary, secondary and concentration cells; Reference electrodes - Calomel electrode; Ion-selective electrodes - Glass electrode. Determination of pH using glass electrode, numerical on concentration cells.
Corrosion - Definition, Electrochemical theory of corrosion, Types of corrosion - differential metal, differential aeration and stress corrosion; Factors affecting the rate of corrosion; Corrosion Penetration Rate (CPR), numerical. Corrosion control: Cathodic protection – Sacrificial anode, Impressed current method. Metal finishing - Introduction, technological importance; Electroless plating: Introduction, Electroless plating of copper (PCB). Inorganic coatings – anodizing and phosphating.

Unit-2

Energy : Sources, Conversion and Storage **08 hours**

Chemical fuels - Introduction, Calorific value - definition, gross and net calorific values; Determination of calorific value of a solid / liquid fuel using Bomb calorimeter and numerical on calorific value; Petroleum cracking - fluidized bed catalytic cracking; Octane number- Reformation of petrol.
Sustainable energy sources: Hydrogen as a fuel - advantages, production and storage. Biofuels- Production of Biodiesel. **Solar cells** - Construction and working of Si based PV cell, advantages. Quantum Dot Sensitized Solar Cells (QDSSC's)- Principle, Properties and Applications.
Electrochemical Energy Systems: Introduction to batteries, Classification of batteries - primary and secondary batteries; Battery characteristics; construction, working and applications of Lithium ion batteries.

Unit-3

Polymers for Engineering Applications **08 hours**

Polymers - Introduction, Molecular weight - number average and weight average molecular weight, Polydispersion index and its significance, numerical problems; Glass transition temperature (T_g); Structure and property relationship in polymers; **Plastics** - Definition of resins and plastics; Synthesis, properties and applications of PMMA and UF resin; **Elastomers** - Synthesis, properties and application of butyl rubber and nitrile rubber; **Polymer composites** - Composites as structural material; Synthesis and applications of Kevlar and Carbon fibers; **Conducting polymers** - Introduction, synthesis and conducting mechanism of polyacetylene and applications. **Biodegradable polymers** - Introduction, Polyglycolic acid - synthesis, degradation and uses.

Unit-4

Chemistry of Materials for Memory and Display Systems **08 hours**

Memory Devices: Introduction, concepts of electronic memory. Classification of electronic memory materials (organic molecules, polymeric materials, organic-inorganic hybrid materials).
Display Systems: Liquid crystals (LC's) - Introduction, classification, Liquid crystal behaviour and applications. Jablonski Diagram. Photoactive and electroactive materials, Light emitting electrochemical cells. Nanomaterials (QLED's) and organic materials (OLED's) used in optoelectronic devices.

Unit-5

Chemistry of materials for sensors, water treatment and E-waste management -08 hours

Sensors: Introduction, Construction, working and applications of conductometric sensors, Electrochemical sensors, Optical sensors, Gas sensors.
Water treatment - Introduction, hardness of water, types, determination of hardness by EDTA method, disadvantages of hard water, removal of hardness by ion exchange method, Desalination of water – Electrodialysis. BOD and COD - introduction and their significance in waste water treatment, experimental determination of COD of waste water - numerical on hardness & COD.
E-Waste: Introduction, sources of e-waste, Composition, Characteristics, and Need of e-waste management. Toxic materials used in manufacturing electronic and electrical products; Recycling and Recovery: Different approaches of recycling (separation, thermal treatments, hydrometallurgical extraction, pyrometallurgical methods, direct recycling). Recycling of Li-Ion batteries. Extraction of copper from E-waste.

Text Books

1. A Text Book of Engineering Chemistry, 4th edition, Shashi Chawla, Dhanpat Rai & Co. (P) Ltd. 2016.
2. Engineering Chemistry, Edited by Dr. Mahesh B and Dr. Roopashree B, Sunstar Publisher, Bengaluru, ISBN 978-93-85155-70-3, 2022

Reference Books

1. Wiley's Engineering Chemistry (Wiley India), Dr. Shubha Ramesh et al., 2nd Edition, 2013.
2. Engineering Chemistry, Satyaprakash & Manisha Agrawal, Khanna Book Publishing, Delhi, 1st edition, 2012.
3. A Text book of Engineering Chemistry, SS Dara & Dr. SS Umare, S Chand & Company Ltd., 12th Edition, 2011.

e-books

1. Electrochemistry basics by LibreTexts of UCDavis: https://chem.libretexts.org/LibreTexts/University_of_California_Davis/UCD_Chem_002C/UCD_Chem_2C%3A_Larsen/Chapters/Unit_1%3A_Electrochemistry
2. Introduction to Chemistry - Tracy Poulsen; 250 pages; ISBN-13: 9781478298601; ISBN-10: 147829860X.

NPTEL/SWAYAM/MOOCs

1. **http://nptel.ac.in/**
2. **https://swayam.gov.in/**

B.M.S. COLLEGE OF ENGINEERING, BENGALURU-19
Autonomous Institute, Affiliated to VTU

Course outcomes: On completion of the course, the student will have the ability to:	
CO1	Understand and Apply the principles of chemistry involved in water treatment, corrosion, energy sources, polymers, nanomaterials, phase equilibria, alloys, ceramics and instrumental methods of analysis.
CO2	Analyze the Engineering problems and draw meaningful inferences through applied chemistry.
CO3	Implement sustainable solutions through concepts of Applied Chemistry in the field of Materials, Energy and Environment.
CO4	Engage in self-study and make an effective oral presentation on contribution of Chemistry to society.
CO5	Apply the knowledge of chemistry to investigate engineering materials by volumetric and instrumental methods and analyze, interpret the data to assess and address the issues of Environmental Pollution

CO-PO mapping with strength

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3											
CO2		2										
CO3							2					
CO4						1				1		1
CO5	1	1										1

APPLIED CHEMISTRY PRACTICALS

A – Compulsory Experiments:

1. Potentiometric estimation of Iron using std. $K_2Cr_2O_7$ (Electrochemical sensor).
2. Determination of pKa of a weak acid using glass electrode (pH sensor).
3. Conductometric estimation of mixture of strong and weak acid (conductometric sensors).
4. Estimation of copper in electroplating effluent by colorimetry (optical sensor).
5. Estimation of sodium in effluent using flame photometry.
6. Estimation of total hardness of water by EDTA method.
7. Determination of COD of an industrial wastewater.
8. Estimation of percentage of copper in brass (analysis of alloy).
9. Estimation of iron on rusted TMT bar by external indicator method.

B – Demonstration (offline/virtual):

1. Determination of calorific value of a solid fuel using bomb calorimeter.
2. Determination of rate of corrosion of mild steel by weight loss method.
3. Determination of viscosity coefficient of lubricant (Ostwald's viscometer).
4. Synthesis of oxide nanoparticles.
5. Synthesis of polyaniline and its conductivity measurement.

C – Open Ended Experiments:

1. Electroless plating of Nickel on Copper
2. Determination of glucose by electrochemical sensors.
3. Electroplating of desired metal on substrate
4. Design an experiment to Identify the presence of proteins in given sample.

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B.M.S. COLLEGE OF ENGINEERING, BENGALURU-19
Autonomous Institute, Affiliated to VTU

Course Title: APPLIED CHEMISTRY FOR CIVIL ENGINEERING AND ALLIED BRANCHES	**Course Code**: 22CY1BSCCV/22CY2BSCCV	**Credits**: 04
L:T:P: 3:0:1	**Contact Hours**: 40	**Hours/Week**: 04

Course Objectives: To impart the knowledge of Chemistry involved in Electrochemical cells, Corrosion and its control; Conventional, electrochemical and renewable sources of energy; Polymers; memory and display systems; Water treatment; sensors; e-waste management; Nanomaterials and Instrumental methods of analysis.

Unit-1

Electrochemistry : Electrode Systems and Corrosion **08 hours**

Electrodes and Cells – Introduction- Classification of cells - primary, secondary and concentration cells; Reference electrodes - Calomel electrode; Ion-selective electrodes - Glass electrode. Determination of pH using glass electrode, numerical on concentration cells.

Corrosion - Definition, Electrochemical theory of corrosion, Types of corrosion - differential metal, differential aeration and stress corrosion; Factors affecting the rate of corrosion; Corrosion Penetration Rate (CPR) , numerical. Corrosion control: Cathodic protection – Sacrificial anode, Impressed current method. Metal finishing - Introduction, technological importance; Electroless plating: Introduction, Electroless plating of copper (PCB). Inorganic coatings – anodizing and phosphating.

Unit-2

Energy : Sources, Conversion and Storage **08 hours**

Chemical fuels - Introduction, Calorific value - definition, gross and net calorific values; Determination of calorific value of a solid / liquid fuel using Bomb calorimeter and numerical on calorific value; Petroleum cracking - fluidized bed catalytic cracking; Octane number- Reformation of petrol.

Sustainable energy sources: Hydrogen as a fuel - advantages, production and storage. Biofuels- Production of Biodiesel. **Solar cells** - Construction and working of Si based PV cell, advantages. Quantum Dot Sensitized Solar Cells (QDSSC's) - Principle, Properties and Applications.

Electrochemical Energy Systems: Introduction to batteries, Classification of batteries - primary and secondary batteries; Battery characteristics; construction, working and applications of Lithium ion batteries.

Unit-3

Polymers for Engineering Applications **08 hours**

Polymers - Introduction, Molecular weight - number average and weight average molecular weight, Polydispersion index and its significance, numerical problems; Glass transition temperature (T_g); Structure and property relationship in polymers; Plastics - Definition of resins and plastics; Synthesis, properties and applications of PMMA and UF resin; Elastomers - Synthesis, properties and application of butyl rubber and nitrile rubber; Adhesives: Synthesis, properties and applications of epoxy resin. Polymer composites - Composites as structural material; Synthesis and applications of Kevlar and Carbon fibers; Wood polymer composites: Synthesis, properties and applications, Biodegradable polymers - Introduction, Polyglycolic acid - synthesis, degradation and uses.

Unit-4

Structural Materials **08 hours.**

Metals and Alloys: Introduction, Properties and application of Iron and its alloys (any two), Aluminium (any two) and its alloys.
Cement: Introduction, composition, properties, classification, manufacturing process of cement, process of setting and hardening of cement, additives for cement.
Geo polymer concrete: Introduction, synthesis, constituents, properties and applications.
Refractories: Introduction, classification based on chemical composition, properties and application of refractory materials.
Glass: Introduction, Composition, Types, Preparation of Soda-lime glass, properties and applications of glass.

Unit-5

Water treatment, Nanomaterials and Analytical Techniques **08 hours**

Water treatment - Introduction, hardness of water, types, determination of hardness by EDTA method, disadvantages of hard water, removal of hardness by ion exchange method, Desalination of water – Electrodialysis. BOD and COD - introduction and their significance in waste water treatment, experimental determination of COD of waste water - numerical on hardness & COD, treatment of waste water - aerobic and anaerobic oxidation, primary, secondary (trickling filter method) and tertiary treatment methods.
Nano materials: Introduction, synthesis, properties and applications of nanomaterials for water treatment.
Analytical techniques: - Principle, Instrumentation and applications of Colorimetry (Copper), Flame Photometry (Sodium), Conductometry (Acid Mixtures).

Text Books

3. A Text Book of Engineering Chemistry, 4th edition, Shashi Chawla, Dhanpat Rai & Co. (P) Ltd. 2016.
4. Engineering Chemistry, Edited by Dr. Mahesh B and Dr. Roopashree B, Sunstar Publisher, Bengaluru, ISBN 978-93-85155-70-3, 2022

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3. A Text book of Engineering Chemistry, SS Dara & Dr. SS Umare, S Chand & Company Ltd., 12th Edition, 2011.

e-books 1. Electrochemistry basics by LibreTexts of UCDavis: https://chem.libretexts.org/LibreTexts/University_of_California_Davis/UCD_Chem_002C/UCD_Chem_2C%3A_Larsen/Chapters/Unit_1%3A_Electrochemistry

2. Introduction to Chemistry - Tracy Poulsen; 250 pages; ISBN-13: 9781478298601; ISBN-10: 147829860X.

NPTEL/SWAYAM/MOOCs

1. **http://nptel.ac.in/**
2. **https://swayam.gov.in/**

B.M.S. COLLEGE OF ENGINEERING, BENGALURU-19
Autonomous Institute, Affiliated to VTU

Course outcomes: On completion of the course, the student will have the ability to:	
CO1	Understand and Apply the principles of chemistry involved in water treatment, corrosion, energy sources, polymers, nanomaterials, phase equilibria, alloys, ceramics and instrumental methods of analysis.
CO2	Analyze the Engineering problems and draw meaningful inferences through applied chemistry.
CO3	Implement sustainable solutions through concepts of Applied Chemistry in the field of Materials, Energy and Environment.
CO4	Engage in self-study and make an effective oral presentation on contribution of Chemistry to society.
CO5	Apply the knowledge of chemistry to investigate engineering materials by volumetric and instrumental methods and analyze, interpret the data to assess and address the issues of Environmental Pollution

CO-PO mapping with strength

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3											
CO2		2										
CO3							2					
CO4						1				1		1
CO5	1	1										1

APPLIED CHEMISTRY PRACTICALS

A – Compulsory Experiments:

10. Potentiometric estimation of Iron using std. $K_2Cr_2O_7$ (Electrochemical sensor).
11. Determination of pKa of a weak acid using glass electrode (pH sensor).
12. Conductometric estimation of mixture of strong and weak acid (conductometric sensors).
13. Estimation of copper in electroplating effluent by colorimetry (optical sensor).
14. Estimation of sodium in effluent using flame photometry.
15. Estimation of total hardness of water by EDTA method.
16. Determination of COD of an industrial wastewater.
17. Estimation of percentage of copper in brass (analysis of alloy).
18. Estimation of iron on rusted TMT bar by external indicator method.

B – Demonstration (offline/virtual):

6. Determination of calorific value of a solid fuel using bomb calorimeter.
7. Determination of rate of corrosion of mild steel by weight loss method.
8. Determination of viscosity coefficient of lubricant (Ostwald's viscometer).
9. Synthesis of oxide nanoparticles.
10. Synthesis of polyaniline and its conductivity measurement.

C – Open Ended Experiments:

5. Electroless plating of Nickel on Copper
6. Determination of glucose by electrochemical sensors.
7. Electroplating of desired metal on substrate
8. Design an experiment to Identify the presence of proteins in given sample.

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B.M.S. COLLEGE OF ENGINEERING, BENGALURU-19
Autonomous Institute, Affiliated to VTU

Course Title: APPLIED CHEMISTRY FOR MECHANICAL ENGINEERING & ALLIED BRANCHES	**Course Code**: 22CY1BSCME/22CY2BSCME	**Credits**: 04
L:T:P: 3:0:1	**Contact Hours**: 40	**Hours/Week**: 04

Course Objectives: To impart the knowledge of Chemistry involved in Electrochemical cells, Corrosion and its control; Conventional, electrochemical and renewable sources of energy; Polymers; alloys, ceramics, Water treatment; Nanomaterials and Instrumental methods of analysis.

Unit-1

Electrochemistry : Electrode Systems and Corrosion **08 hours**

Electrodes and Cells – Introduction- Classification of cells - primary, secondary and concentration cells; Reference electrodes - Calomel electrode; Ion-selective electrodes - Glass electrode. Determination of pH using glass electrode, numerical on concentration cells.
Corrosion - Definition, Electrochemical theory of corrosion, Types of corrosion - differential metal, differential aeration and stress corrosion; Factors affecting the rate of corrosion; Corrosion Penetration Rate (CPR) , numerical. Corrosion control: Cathodic protection – Sacrificial anode, Impressed current method. Metal finishing - Introduction, technological importance; Electroless plating: Introduction, Electroless plating of copper (PCB). Inorganic coatings – anodizing and phosphating.

Unit-2

Energy: Sources, Conversion and Storage **08 hours**

Chemical fuels - Introduction, Calorific value - definition, gross and net calorific values; Determination of calorific value of a solid / liquid fuel using Bomb calorimeter and numerical on calorific value; Petroleum cracking - fluidized bed catalytic cracking; Knocking: Mechanism of knocking in IC engine, Octane number- Reformation of petrol.
Sustainable energy sources: Hydrogen as a fuel - advantages, production and storage. Biofuels- Production of Biodiesel. **Solar cells** - Construction and working of Si based PV cell, advantages.
Electrochemical Energy Systems: Introduction to batteries, Classification of batteries - primary and secondary batteries; Battery characteristics; construction, working and applications of Lithium-ion batteries.

Unit-3

Polymers for Engineering Applications **08 hours**

Polymers - Introduction, Molecular weight - number average and weight average molecular weight, Polydispersion index and its significance, numerical problems; Glass transition temperature (T_g); Structure and property relationship in polymers; **Plastics** - Definition of resins and plastics; Synthesis, properties and applications of PMMA and UF resin; **Elastomers** - Synthesis, properties and application of butyl rubber and nitrile rubber; **Polymer composites** - Composites as structural material; Synthesis and applications of Kevlar and Carbon fibers; **Biodegradable polymers** - Introduction, Polyglycolic acid - synthesis, degradation and uses. Polycarbonates – Synthesis, Properties and applications.

Unit-4

Materials for Engineering Applications **08 hours.**

Alloys: Introduction, classification, composition, properties and applications of stainless steel, solders, brass, alnico and shape memory alloys.
Ceramics: Introduction, classification based on chemical composition, properties and applications of perovskites.
Lubricants: Introduction, classification, properties and applications of lubricants.
Nanomaterials - Introduction, size dependent properties (Surface area, Electrical, Optical, Catalytic and Thermal properties). Synthesis of nanomaterials: top-down and bottom-up approaches; Synthesis by sol-gel (ZrO_2), chemical vapor deposition methods (CNTs). Graphene by Hummer's method – properties and applications.

Unit-5

Phase equilibria, Water Treatment and Analytical Techniques -08 hours

Phase equilibria – Gibbs phase rule; Concept of Phase component, degrees of freedom with examples; Numericals. Application of Phase rule to i) one component system - water system; ii) two component system - Pb-Ag system,
Water treatment - Introduction, hardness of water, types, determination of hardness by EDTA method, disadvantages of hard water, removal of hardness by ion exchange method, Desalination of water – Electrodialysis. BOD and COD - introduction and their significance in waste water treatment, experimental determination of COD of waste water - numerical on hardness & COD.
Analytical Techniques - Principle, Instrumentation and applications of Colorimetry (Copper), Flame Photometry (Sodium), Conductometry (Acid Mixtures).

Text Books

5. A Text Book of Engineering Chemistry, 4th edition, Shashi Chawla, Dhanpat Rai & Co. (P) Ltd. 2016.
6. Engineering Chemistry, Edited by Dr. Mahesh B and Dr. Roopashree B, Sunstar Publisher, Bengaluru, ISBN 978-93-85155-70-3, 2022

Reference Books

1. Wiley's Engineering Chemistry (Wiley India), Dr. Shubha Ramesh et al., 2nd Edition, 2013.
2. Engineering Chemistry, Satyaprakash & Manisha Agrawal, Khanna Book Publishing, Delhi, 1st edition, 2012.
3. A Text book of Engineering Chemistry, SS Dara & Dr. SS Umare, S Chand & Company Ltd., 12th Edition, 2011.

e-books

1. Electrochemistry basics by LibreTexts of UCDavis: https://chem.libretexts.org/LibreTexts/University_of_California_Davis/UCD_Chem_002C/UCD_Chem_2C%3A_Larsen/Chapters/Unit_1%3A_Electrochemistry
2. Introduction to Chemistry - Tracy Poulsen; 250 pages; ISBN-13: 9781478298601; ISBN-10: 147829860X.

NPTEL/SWAYAM/MOOCs

1. **http://nptel.ac.in/**
2. **https://swayam.gov.in/**

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Course outcomes: On completion of the course, the student will have the ability to:	
CO1	Understand and Apply the principles of chemistry involved in water treatment, corrosion, energy sources, polymers, nanomaterials, phase equilibria, alloys, ceramics and instrumental methods of analysis.
CO2	Analyze the Engineering problems and draw meaningful inferences through applied chemistry.
CO3	Implement sustainable solutions through concepts of Applied Chemistry in the field of Materials, Energy and Environment.
CO4	Engage in self-study and make an effective oral presentation on contribution of Chemistry to society.
CO5	Apply the knowledge of chemistry to investigate engineering materials by volumetric and instrumental methods and analyze, interpret the data to assess and address the issues of Environmental Pollution

CO-PO mapping with strength

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3											
CO2		2										
CO3							2					
CO4						1				1		1
CO5	1	1										1

APPLIED CHEMISTRY PRACTICALS

A – Compulsory Experiments:

19. Potentiometric estimation of Iron using std. $K_2Cr_2O_7$ (Electrochemical sensor).
20. Determination of pKa of a weak acid using glass electrode (pH sensor).
21. Conductometric estimation of mixture of strong and weak acid (conductometric sensors).
22. Estimation of copper in electroplating effluent by colorimetry (optical sensor).
23. Estimation of sodium in effluent using flame photometry.
24. Estimation of total hardness of water by EDTA method.
25. Determination of COD of an industrial wastewater.
26. Estimation of percentage of copper in brass (analysis of alloy).
27. Estimation of iron on rusted TMT bar by external indicator method.

B – Demonstration (offline/virtual):

11. Determination of calorific value of a solid fuel using bomb calorimeter.
12. Determination of rate of corrosion of mild steel by weight loss method.
13. Determination of viscosity coefficient of lubricant (Ostwald's viscometer).
14. Synthesis of oxide nanoparticles.
15. Synthesis of polyaniline and its conductivity measurement.

C – Open Ended Experiments:

9. Electroless plating of Nickel on Copper
10. Determination of glucose by electrochemical sensors.
11. Electroplating of desired metal on substrate
12. Design an experiment to Identify the presence of proteins in given sample.

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Course Title: APPLIED CHEMISTRY FOR EE & ALLIED BRANCHES	**Course Code**: 22CY1BSCEE/22CY2BSCEE	**Credits**: 04
L:T:P: 3:0:1	**Contact Hours**: 40	**Hours/Week**: 04

Course Objectives: To impart the knowledge of Chemistry involved in Electrochemical cells, Corrosion and its control; Conventional, electrochemical and renewable sources of energy; Polymers; memory and display systems; Water treatment; sensors; e-waste management; Nanomaterials and Instrumental methods of analysis.

Unit-1

Electrochemistry: Electrode Systems and Corrosion **08 hours**

Electrodes and Cells – Introduction- Classification of cells - primary, secondary and concentration cells; Reference electrodes - Calomel electrode; Ion-selective electrodes - Glass electrode. Determination of pH using glass electrode, numerical on concentration cells.
Corrosion - Definition, Electrochemical theory of corrosion, Types of corrosion - differential metal, differential aeration and stress corrosion; Factors affecting the rate of corrosion; Corrosion Penetration Rate (CPR) , numerical. Corrosion control: Cathodic protection – Sacrificial anode, Impressed current method. Metal finishing - Introduction, technological importance; Electroless plating: Introduction, Electroless plating of copper (PCB). Inorganic coatings – anodizing and phosphating.

Unit-2

Energy : Sources, Conversion and Storage **08 hours**

Chemical fuels - Introduction, Calorific value - definition, gross and net calorific values; Determination of calorific value of a solid / liquid fuel using Bomb calorimeter and numerical on calorific value; Petroleum cracking - fluidized bed catalytic cracking; Octane number- Reformation of petrol.
Sustainable energy sources: Hydrogen as a fuel - advantages, production and storage. Biofuels- Production of Biodiesel. **Solar cells** - Construction and working of Si based PV cell, advantages. Quantum Dot Sensitized Solar Cells (QDSSC's)- Principle, Properties and Applications.
Electrochemical Energy Systems: Introduction to batteries, Classification of batteries - primary and secondary batteries; Battery characteristics; construction, working and applications of Lithium ion batteries.

Unit-3

Polymers for Engineering Applications **08 hours**

Polymers - Introduction, Molecular weight - number average and weight average molecular weight, Polydispersion index and its significance, numerical problems; Glass transition temperature (T_g); Structure and property relationship in polymers; **Plastics** - Definition of resins and plastics; Synthesis, properties and applications of PMMA and UF resin; **Elastomers** - Synthesis, properties and application of butyl rubber and nitrile rubber; **Polymer composites** - Composites as structural material; Synthesis and applications of Kevlar and Carbon fibers; **Conducting polymers** - Introduction, synthesis and conducting mechanism of polyacetylene and applications. **Biodegradable polymers** - Introduction, Polyglycolic acid - synthesis, degradation and uses.

Unit-4

Chemistry of Electronic Materials **08 hours.**

Conductors, Semiconductors and Insulators: Introduction, Band theory and examples.
Semiconductors: production of electronic grade silicon, Refining- Float Zone method and Czochralski process.
Memory Devices: Introduction, **concepts of electronic memory**. Classification of electronic memory materials -organic/polymer electronic memory devices (organic molecules, polymeric materials, organic-inorganic hybrid materials).
Display Systems: Liquid crystals (LC's) - Introduction, classification, properties and application in Liquid Crystal Displays (LCD's). Jablonski Diagram. Photoactive and electroactive materials, Light emitting electrochemical cells. Nanomaterials(QLED's) and organic materials (OLED's) used in optoelectronic devices.

Unit-5

Nanomaterials, Sensors and E - Waste Management **-08 hours**

Nanomaterials: Introduction, size dependent properties of nanomaterials (Surface area, Catalytic, Conducting), preparation of nanomaterials by sol-gel (TiO_2), chemical vapour deposition (CVD) method (CNTs and GO by Hummer's Method).
Sensors: Introduction, Construction, working and applications of Conductometric sensors (Estimation of Acid Mixtures), Electrochemical sensors (Potentiometric estimation of FAS), Optical sensors (Colorimetric estimation of copper), Gas sensors.
E-waste Management: Introduction, sources, types, effects of e-waste on environment and human health, methods of disposal, advantages of recycling. Extraction of copper from e-waste.

Text Books

7. A Text Book of Engineering Chemistry, 4th edition, Shashi Chawla, Dhanpat Rai & Co. (P) Ltd. 2016.
8. Engineering Chemistry, Edited by Dr. Mahesh B and Dr. Roopashree B, Sunstar Publisher, Bengaluru, ISBN 978-93-85155-70-3, 2022

Reference Books

1. Wiley's Engineering Chemistry (Wiley India), Dr. Shubha Ramesh et al., 2nd Edition, 2013.
2. Engineering Chemistry, Satyaprakash & Manisha Agrawal, Khanna Book Publishing, Delhi, 1st edition, 2012.
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e-books

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2. Introduction to Chemistry - Tracy Poulsen; 250 pages; ISBN-13: 9781478298601; ISBN-10: 147829860X.

NPTEL/SWAYAM/MOOCs

1. **http://nptel.ac.in/**
2. **https://swayam.gov.in/**

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Course outcomes: On completion of the course, the student will have the ability to:	
CO1	Understand and Apply the principles of chemistry involved in water treatment, corrosion, energy sources, polymers, nanomaterials, phase equilibria, alloys, ceramics and instrumental methods of analysis.
CO2	Analyze the Engineering problems and draw meaningful inferences through applied chemistry.
CO3	Implement sustainable solutions through concepts of Applied Chemistry in the field of Materials, Energy and Environment.
CO4	Engage in self-study and make an effective oral presentation on contribution of Chemistry to society.
CO5	Apply the knowledge of chemistry to investigate engineering materials by volumetric and instrumental methods and analyze, interpret the data to assess and address the issues of Environmental Pollution

CO-PO mapping with strength

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3											
CO2		2										
CO3							2					
CO4						1				1		1
CO5	1	1										1

APPLIED CHEMISTRY PRACTICALS

A – Compulsory Experiments:

28. Potentiometric estimation of Iron using std. $K_2Cr_2O_7$ (Electrochemical sensor).
29. Determination of pKa of a weak acid using glass electrode (pH sensor).
30. Conductometric estimation of mixture of strong and weak acid (conductometric sensors).
31. Estimation of copper in electroplating effluent by colorimetry (optical sensor).
32. Estimation of sodium in effluent using flame photometry.
33. Estimation of total hardness of water by EDTA method.
34. Determination of COD of an industrial wastewater.
35. Estimation of percentage of copper in brass (analysis of alloy).
36. Estimation of iron on rusted TMT bar by external indicator method.

B – Demonstration (offline/virtual):

16. Determination of calorific value of a solid fuel using bomb calorimeter.
17. Determination of rate of corrosion of mild steel by weight loss method.
18. Determination of viscosity coefficient of lubricant (Ostwald's viscometer).
19. Synthesis of oxide nanoparticles.
20. Synthesis of polyaniline and its conductivity measurement.

C – Open Ended Experiments:

13. Electroless plating of Nickel on Copper
14. Determination of glucose by electrochemical sensors.
15. Electroplating of desired metal on substrate
16. Design an experiment to Identify the presence of proteins in given sample.

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B.M.S. COLLEGE OF ENGINEERING, BENGALURU-19
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Course Title: COMPUTER-AIDED ENGINEERING DRAWING	**Course Code**: 22ME1ESCED/22ME2ECED	**Credits**: 03
L:T:P: **1:0:2**	**Contact Hours**:65	**Hours/Week**: 05

Course Objectives:

1. To provide an understanding of the concept of systems of projection, standards and conventions.
2. To develop the views of basic geometrical entities i.e. points, lines, planes and solids.
3. To impart skills in manual sketching and usage of modern engineering tools necessary in engineering practice
4. To acquire the skill of expressing three -dimensional and two-dimensional objects into professional language and vice versa
5. To enable strong spatial visualization skills which are important to an engineer's ability to create and interpret technical drawings

UNIT– 1

A: Introduction: Engineering Visualization, Principles of Engineering Graphics and their significance, BIS Conventions, dimensioning, scales, line conventions, material conventions, sketching.

Introduction to CAD software, standard tool bar menu and description of most commonly used tool bars, and navigational tools. **[1L + 0T+2P Hrs.]**

Orthographic Projections

Introduction, quadrant system, Planes of projection, reference line and conventions employed, Projections of points in i and iii quadrants. Projections of straight lines (located in first quadrant and without reference to traces), True and apparent lengths, True and apparent inclinations to reference planes, simple application problems. **[2L +0T+ 6P Hrs.]**

B: Projections of Plane Surfaces (First Angle Projection Only)

Introduction, Projections of plane surfaces: triangle, square, rectangle, rhombus, circle, regular pentagon and regular hexagon in different positions by change of position method.

[2L + 0T+ 4P Hrs.]

UNIT – 2

Projections of solids (First Angle Projection Only)

Introduction, Projections of regular upright solid: tetrahedron, cube, prism, pyramid, cylinder and cone in different positions by change of position method. **[3L + 0T+ 10P Hrs.]**

UNIT – 3

A: Isometric Projection (Using Isometric Scale only)

Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of tetrahedron, hexahedron, right regular prisms, pyramids, cylinders, cones, spheres, cut spheres and combination of solids (maximum of two solids)

B: 3-D Modelling: Use of solid-modeling software for creating simple components: Solid and hollow right regular prisms and cylinders, solid pyramids, cones, spheres, and combination of solids and extracting orthographic views, sectional and Isometric views.**[2L+0T+ 10P Hrs.]**

UNIT – 4

Development of lateral surfaces of right regular prisms, cylinders, pyramids, and cones & their frustums and truncations (resting with base on HP only).

Problems on applications of development of lateral surfaces viz. Funnels, Trays, Transition pieces connecting two ducts**.** **[2L+ 0T+ 08P Hrs.]**

UNIT – 5

Using CAD software (for CIE only)

5A: Use of solid-modeling software for creating engineering components and assemblies and extracting orthographic views, sectional and Isometric views

5B: **Multidisciplinary Applications**

i. Basic Building Drawing; Like, Architectural floor plan, basic foundation drawing, steel structures- Frames, bridges, trusses using suitable software,

ii. Electric Wiring and lighting diagrams; Like, UPS system, EV battery, Automatic fire alarm, Call bell system, Basic power distribution system using suitable software

iii. Electronics Engineering Drawings- Simple Electronics Circuit Drawings

iv. Drawing for process simulation.

[0L+ 0T+ 12P Hrs.]

Text Books:

1. Engineering Drawing Vol 1 & 2 Combined, K. R. Gopala Krishna, ISBN 39789383214235, Subhas Stores, Bangalore,2017

2. Textbook Of Computer Aided Engineering Drawingby K.R.Gopala Krishna,Sudhir Gopalakrishna, ISBN-135551234102489,2017

Reference Books:

- Engineering Drawing, N.D. Bhat& V.M. Panchal, 45 Edition, Charotar Publishing,Gujarat, 2000
- Fundamental of EngineeringDrawing & Graphics Technology, French, Thomas E., Vierck, C. J. and Foster, R. J., McGraw Hill Book Company (2005). Fundamentals of Engineering Drawing with an Introduction to InteractiveComputer Graphics for Design and Production- Luzadder Warren J., Duff John M.,Eastern Economy Edition, 2005- Prentice-Hall of India Pvt. Ltd., New Delhi.
- A Primer on Computer Aided Engineering Drawing-2006, Published by VTU, Belagavi
- Electrical Engineering Drawing,Bhattacharya S. K., New Age International publishers, secondedition 1998, reprint 2005.
- Printed Circuit Board Design using AutoCAD,Chris Schroder, Newnes, 1997.
- Introduction to Architectural and Technical Drawing: Roksaneh Rahbarianyazd – Hourakhsh A. Nia · 2020

e-books:

- Siemens Solid Edge Exercises 200 Practice Drawings for Solid Edge and Other Feature-Based Modelling Software By Sachidanand Jha · 2019, ISBN:9781096479147, 1096479141, Amazon Digital Services LLC - KDP Print US.
- Solid Edge 2020 for Designers, 17th Editionbooks.google.co.in › books Prof. Sham Tickoo, CADCIM Technologies · 2020

Publications of Bureau of Indian Standards

https://law.resource.org/pub/in/bis/S01/is.sp.46.2003.pdf

a) IS 10711 – 2001: Technical products documentation – Size and lay out of drawing sheets.
b) IS 9609 (Parts 0 & 1) – 2001: Technical products documentation – Lettering.
c) IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
d) IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
e) IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

NPTEL/SWAYAM/MOOC:
NPTEL course on ENGINEERING DRAWING AND COMPUTER GRAPHICS https://nptel.ac.in/courses/112/105/112105294/#

Course Outcomes:
At the end of the Course the students will be able to:

CO1: Draw orthographic and Isometric projections of geometrical entities in various positions.
CO2: Develop 2D, 3D models and lateral surfaces of solids.
CO3: Use modern engineering tool (CAD software) necessary for engineering visualisation
CO4: Interpret and communicate with sketches and engineering drawings with enhanced spatial visualization skills.

Scheme of Evaluation:

CIE.

- Weightage should be 60% for sketching &40% for CIE using solid edge software.
- The Laboratory session shall be held every week as per the time table and the performance of the student shall be evaluated in every session the average of marks over number of units is considered for 20 marks.
- Three tests for CIE shall be conducted and average of best two considered for 20 marks.
- Project/Assignment/Experiential Learning covering Unit 5

Sl.No	Evaluation Method	Unit	Marks	Weightage
1.	CIE-Test 1	1B	40	20
2.	CIE-Test 2	2	40	
3.	CIE-Test 3	3,4	40	
4.	Sketching and lab assignments	1B -4	60	20
5.	Project/Assignment/Experiential Learning	5	10	10
			100	**50**

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SEE: Scheme:

- Manual sketching and drafting using CAD software as in table
- **UNIT** 1A & 5 shall not be considered for SEE
- Candidate shall answer 4 full questions selecting one from each unit.

Sl.No	**Unit**	**Number of questions**	**Weightage(To Answer one full question from each unit**		
			Sketching	**ON Software**	**Total**
1.	1B	02	20		20
2.	2	02	0	30	30
3.	3	02	0	30	30
4.	**4**	02	20	0	20
	Total	**08**	**40**	**60**	**100**

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B.M.S. COLLEGE OF ENGINEERING, BENGALURU-19
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Course Title	GREEN BUILDINGS		
Course Code	22CV1ESGBT/ 22CV2ESGBT	Course Type	Theory
Credits	03	CIE Marks	50
		SEE Marks	50
L:T:P	3:0:0	Total Marks	100
Contact hours	40	Exam Hours	03

Course outcomes:

1. Understand the concept and objectives of cost-effective construction materials in relation to green buildings.
2. Recognize cost effective and sustainable technologies and methods in construction.
3. Understand the Problems due to Global Warming and relevance of Green buildings.
4. Understand rating of Green Buildings and principles of sustainable building design.
5. Identify different options for energy and water efficiency in Buildings and Built Environment.

Teaching Learning Process:

Lecture: Chalk and talk method, PowerPoint presentation with short videos and image sharing. Live material demonstration whenever applicable; Laboratory and building visits within campus.

Module 1: Introduction to the concept of cost-effective construction

Introduction to the concept of cost-effective construction - 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. Environmental issues related to quarrying of building materials, Recycling of building materials – Brick- Concrete- Steel- Plastics.

Module 2: Environment friendly and cost-effective Building Technologies

Different substitute for wall construction: Flemish Bond - Rat Trap Bond – Arches – Panels - Cavity Wall - Ferro Cement and Ferro Concrete constructions, Alternate roofing systems: Filler Slab – Jack arch roof- Composite beam concrete deck roof, Pre-cast concrete and Pre-engineered/ Ready to use building elements, Contributions of non-profitable agencies towards cost effective construction practices.

Module 3: Global Warming and Buildings

Global warming: Definition - Causes and Effects, Contribution of Buildings towards Global Warming - Carbon Footprint – Global Efforts to reduce carbon Emissions, Major Energy efficient areas for buildings – Green Buildings – Definition - Features- Necessity – Benefits of Green buildings, Embodied Energy in Materials- Green Materials - Comparison of Initial cost of Green v/s Conventional Building –Life cycle cost of Buildings.

Module 4: Green Building Rating Systems Rating systems: 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)
Module 5: Efficiency in buildings and Built Environment: Energy, Water and Wastes Utility of Solar energy in buildings: Concepts of Solar Passive Cooling and Heating of Buildings - Low Energy Cooling. Case studies of Solar Passive Cooled and Heated Buildings. Water efficiency: Water Utilization in Buildings, Low Energy Approaches to Water Management, Waste 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

Reference sources:

1. Indian Green Building Council guidelines

Assessment details:

Continuous Internal Evaluation (CIE):

03 CIEs conducted - Best 2 out of 3 (40 marks reduced to 20 in each test)

Alternate Assessment Tools: Quiz/ Assignments - 10 marks

Scheme of Examination (SEE):

SEE question paper with total 07 questions.

Internal Choice offered from Module 1 and 2.

One question each from Module 3, 4, 5 and two questions each from module 1 & 2.

Answer five full questions selecting one from each module.

CO	Description	PO	Strength
CO1	Understand the concept & objectives of cost-effective construction materials in relation to green buildings.	PO7, PO6	**3,2**
CO2	Recognize cost effective and sustainable technologies and methods in construction.	PO7	3
CO3	Understand the problems due to Global Warming and relevance of Green buildings.	PO7	**3**
CO4	Understand rating of Green Buildings and principles of sustainable building design.	PO7	**2**
CO5	Identify different options for energy and water efficiency in Buildings and Built Environment.	PO7, PO9	**2,1**

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B.M.S. COLLEGE OF ENGINEERING, BENGALURU-19
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Course Title	Introduction to Sustainable Engineering		
Course Code	22ME1ETISE / 22ME2ETISE	CIE Marks	50
L:T:P	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03

Preamble: This course introduces the fundamentals of sustainability in engineering

Course Learning Objectives:

- 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.

Teaching-Learning Process (General Instructions)

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. 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.
2. Show Video films to explain concepts
3. Encourage collaborative (Group Learning) Learning in the class
4. Ask at least three HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking
5. Adopt various pedagogical approaches for teaching learning process
6. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.

Module-1

Introduction to Sustainable engineering: Introduction to engineering of products/services
Sustainable Development and Role of Engineers: 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 **(8Hours)**

Module-2
Sustainable Engineering and Concepts, Principles and Frame Work: Green Economy and Low Carbon Economy, Eco Efficiency, Triple bottom Line, Guiding principles of sustainable engineering, Frameworks for sustainable Engineering. **Tools for sustainability Assessment:** procedural tools-Environmental Management System, Environmental Auditing, Cleaner Production Assessment, Environmental Impact Assessment, Strategic Environmental Assessment, stakeholder engagement. **(8Hours)**
Module-3
Fundamentals of Life Cycle Assessment: 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 Softwares, Strength and Limitations of LCA. Environmental Life Cycle Costing, Social Life Cycle Assessment, Life Cycle Sustainability **(8Hours)**
Module-4
Life Cycle Assessment 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 **(8Hours)**
Module-5
Integrating Sustainability in Engineering Design: 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 **The contribution of engineers to sustainability**: innovation, role of engineers and sustainable engineering in focus. **(8Hours)**

Text Books

1. Introduction to Sustainability for Engineers, Toolseeram Ramjeawon, CRC Press, 1st Edition., 2020
2. Sustainability Engineering: Concepts, Design and Case studies, Prentice Hall, 1st Edition, 2015

Reference Books

1. System Analysis for sustainable Engineering: Theory and applications, Ni bin Chang, McGraw Hill Publications, 1st Edition., 2010
2. Engineering for Sustainable development: Delivery a sustainable development goals, UNESCO, International Centre for Engineering Education, France, 1st Edition., 2021
3. Introduction to Sustainable Engineering, Rag. R.L. and Ramesh Lakshmi Dinachandran, PHI Learning Pvt. Ltd., 2ndEdn, 2016

E-Books / Web References

1. https://unesdoc.unesco.org/
2. https://unesdoc.unesco.org/ark:/48223/pf0000375644.locale=en
3. https://engineeringforoneplanet.org

MOOCs

1. https://nptel.ac.in/courses/127105018
2. https://nptel.ac.in/courses/107103081/www.macfound.org
3. https://www.my-mooc.com/en/mooc/technology-innovation-for-sustainable-development/

https://www.edx.org/course/engineering-design-for-a-circular-economy

Course Outcomes:

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

CO's	At the end of the course, the student will have the ability to:	POs Mapped	Strength of mapping
CO1	Understand the basics of sustainability and sustainable engineering	**PO 1, PO7**	**3**
CO2	Apply Sustainable Engineering Concepts to various situations	**PO1, PO 7**	**2**
CO3	Analyze the sustainability of a system through various tools	**PO7, PO9, PO10**	**2**
CO4	Develop the ideas for integration of sustainability in engineering	**PO7, PO9, PO10**	**2**

Assessment Details (both CIE and SEE)

Continuous Internal Evaluation:

3 internal assessment tests of 40 marks each of 90 minutes duration

Alternate Assessment Tool of 10 marks to include case study presentation in groups

Semester End Examination:

Answer five full questions selecting one from each unit.

Two questions each to be set from units 1 and 5 and one question from units 2, 3, and 4.

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B.M.S. COLLEGE OF ENGINEERING, BENGALURU-19
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Course Title	Renewable Energy Sources		
Course Code	22EE1ESRES/ 22EE2ESRES	CIE Marks	50
L:T:P	3:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	03	Exam Hours	03

Course objectives

- 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.

Module – I **(08 Hrs)**

Introduction: Introduction to energy sources, conventional and non-conventional energy sources, Obstacle to the implementation of renewable energy, renewable energy availability (worldwide and India), brief descriptions on solar energy, wind energy, tidal energy, hydro energy, ocean thermal energy, biomass energy, and geothermal energy. (Block diagram approach only).

Teaching-Learning Process:	Chalk and talk

Module – II **(08 Hrs)**

Solar Energy: Solar Radiation, beam and diffuse radiation, solar radiation geometry– sketch and definitions only (latitude of location, declination, hour angle, solar Azimuth angle, Zenith angle, altitude angle, surface Azimuth angle), simple numerical on calculating declination, Solar radiation Measurements- Pyranometer, Pyrheliometers, Solar Thermal systems: Flat plate collector (water heating application), parabolic collector (dish and trough)

Solar electric power generation: Introduction to solar cells and its characteristics, Principle of Solar cell, Photovoltaic system for electric power generation, advantages, Disadvantages and applications of solar photovoltaic system (3 major applications).

Teaching-Learning Process:	Chalk and talk

Module – III **(08 Hrs)**

Wind Energy: Introduction, basic principle of wind energy conversion, wind velocity and power from wind, site selection considerations, Basic components of wind energy conversion system (WECS); Classification of WECS- Horizontal axis- single, double and 3 blade system. Vertical axis- Savonius and darrieus types, advantages and disadvantages, safety systems, environmental aspects associated with wind power.

Teaching-Learning Process:	Chalk and talk

Module – IV **(08 Hrs)**

Tidal Power: Principle of tidal power generation, operation method of utilizing tidal energy, working of single basin tidal system storage, advantages and limitations.

Ocean Thermal Energy Conversion: Principle of working, methods of power generation, working of closed OTEC cycle, prospects of OTEC power stations in India, problems associated with OTEC.

Teaching-Learning Process:	Chalk and talk

Module – V **(08 Hrs)**

Biomass Energy: Introduction; Photosynthesis Process; Biofuels; Biomass Resources; Biomass conversion technologies-fixed dome; Urban waste to energy conversion; Biomass gasification (Downdraft).

Fuel Cells: Introduction, classification of fuel cells, working of Phosphoric Acid Fuel Cell (PAFC), Alkaline Fuel Cell (AFC), Fuels for fuel cells, Fuel cell power plant, advantages and disadvantages, applications of fuel cells.

Teaching-Learning Process:	Chalk and talk

CHOICE UNITS: II & III

Course outcomes

At the end of the course the student 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 and acquire the conversion principles of wind, tidal energy, ocean thermal energy conversion, biomass energy resources
CO4	Ability to engage in individual/team work to make effective technical presentation on Renewable Energy concepts and communicate effectively to the audience

Text Books

1. Non-conventional Energy sources, G D Rai, Khanna Publishers, Fifth Edition,
2. Solar Energy – Principles of Thermal Collection and Storage, S.P. Sukhatme and J.K. Naik, Tata McGraw Hill Publishing Company, New Delhi, 3rd Edition, 2013.
3. Energy Technology, S. Rao and Dr. B.B. Parulekar, Khanna Publication.

Reference Books:

4. Non-Conventional Energy Sources, B.H. Khan, Tata McGraw Hill Publishing Company, New Delhi, 2nd Edition, 2010.
5. Principles of Energy Conversion, A.W. Culp Jr.,, McGraw Hill, 1996
6. Non-Convention Energy Resources, Shobh Nath Singh, Pearson, 2018

E-Resources:

- E-bookURL:https://www.pdfdrive.com/non-conventional-energy-sources10086374.html
- E-bookURL:https://www.pdfdrive.com/non-conventional-energy-systems-nptel-d17376903.html
- E-bookURL:https://www.pdfdrive.com/renewable-energy-sources-and-their-applications-e33423592.html
- E-bookURL:https://www.pdfdrive.com/lecture-notes-on-renewable-energy-sources-e34339149.htmlhttps://onlinecourses.nptel.ac.in/noc18_ge09/previe

COs and POs Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1							3					
CO2		2										
CO3	2											
CO4									1	1		

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B.M.S. COLLEGE OF ENGINEERING, BENGALURU-19
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Course Title:	**Waste Management**		
Course Code:	**22CV1ESWMT/ 22CV2ESWMT**	CIE Marks	50
Course Type (Theory/Practical /Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	3:0:0:0	Exam Hours	3 hours
Total Hours of Pedagogy	40 hours	Credits	03

Course objectives

- To learn broader understandings on various aspects of solid waste management practiced in industries.
- To learn recovery of products from solid waste to compost and biogas, incineration and energy recovery, hazardous waste management and treatment, and integrated waste management.

Teaching-Learning Process

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective

1. Include traditional teaching learning process such as Chalk and Talk using writing boards.
2. Construct graphical and pictorial representation of the subject in the form of Chart, hand-outs orPowerPoint presentations.
3. Collaborate with students how tools are applied to solve biological problems.
4. Integrate real time case studies in various scientific tools used.
5. Reflective approaches on analyzing how and why the tools are used in self-reflected or published data.
6. Incorporate Inquiry based approach using demonstration, field study, experiments and project work

Module-1 (08 HRS)

INTRODUCTION TO SOLID WASTE MANAGEMENT:

Classification of solid wastes (source and type based), solid waste management (SWM), elements of SWM, ESSWM (environmentally sound solid waste management) and EST (environmentally sound technologies), factors affecting SWM, Indian scenario, progress in MSW (municipal solid waste) management in India.

Module-2 (08 HRS)

WASTE GENERATION ASPECTS:

Waste stream assessment (WSA), waste generation and composition, waste characteristics (physical and chemical), health and environmental effects (public health and environmental), comparative assessment of waste generation and composition of developing and developed nations, a case study results from an Indian city, handouts on solid waste compositions.

Module-3 (08 HRS)
COLLECTION, STORAGE, TRANSPORT AND DISPOSAL OF WASTES: Waste Collection, Storage and Transport: Collection components, storage-containers/collection vehicles, collection operation, transfer station, waste collection system design, record keeping, control, inventory and monitoring, implementing collection and transfer system, a case study. Waste Disposal: key issues in waste disposal, disposal options and selection criteria, sanitary landfill, landfill gas emission, leachate formation, environmental effects of landfill, landfill operation issues, a case study.
Module-4 (08 HRS)
WASTE PROCESSING TECHNIQUES & SOURCE REDUCTION, PRODUCT RECOVERY & RECYCLING: Purpose of processing, mechanical volume and size reduction, component separation, drying and dewatering. Source Reduction, Product Recovery and Recycling: basics, purpose, implementation monitoring and evaluation of source reduction, significance of recycling, planning of a recycling programme, recycling programme elements, commonly recycled materials and processes, a case study.
Module-5 (08 HRS)
HAZARDOUS WASTE MANAGEMENT AND TREATMENT: Identification and classification of hazardous waste, hazardous waste treatment, pollution prevention and waste minimization, hazardous wastes management in India.

CO1	Apply the basics of solid waste management towards sustainable development
CO2	Apply technologies to process waste and dispose the same.
CO3	Design working models to convert waste to energy
CO4	Identify and classify hazardous waste and manage the hazard

Evaluation:

Continuous Internal Evaluation (CIE): Total 50 marks

Test total of 40 Marks - Best 2 out of 3 (40 marks reduced to 20 in each test)

Alternate Assessment Tools/ Quiz- 10 marks

Scheme of Examination (SEE):

Answer five full questions selecting one from each module.

To set one question each from module 1, 2, 5 and two questions each from module 3 & 4

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1			1			2	3				
CO2			1			2	3				
CO3			1			2	3				
CO4			1			2	3				

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INNOVATION AND DESIGN THINKING			
Course Code	**22ME1AEIDT / 22ME2AEIDT**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	1:0:0	SEE Marks	50
Total Hours of Pedagogy	13	Total Marks	100
Credits	01	Exam Hours	02

Course Category: Foundation

Preamble: This course introduces the basic concepts, process and techniques of design thinking to solve problems of various industries through a broader approach.

Course Learning Objectives:

- To explain the concept of design thinking for product and service design and 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.

1. 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.
2. Show Video films to explain concepts
3. Encourage collaborative (Group Learning) Learning in the class
4. Ask at least three HOTS (Higher-order Thinking) questions in the class, which promotes critical thinking
5. 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.
6. Topics will be introduced in multiple representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

Module-1

INTRODUCTION TO DESIGN THINKING: Introduction, scope and importance, steps in design thinking-
Empathize, Define, Ideate, Prototype and Test with examples

Teaching-Learning Process	-Introduction to design thinking: Chalk & talk - Real world examples through case study/role play/video/assignment/power point presentations

Module-2

Empathy: introduction, its role in creation of a successful product/service/brand, its consideration in design of product/service, Skills needed to implement design thinking

Teaching-Learning Process	Case study/examples/power point based discussions based discussions on products/services which empathize/do not empathize with customers

Module-3

Tools for Design Thinking

Creativity and innovation-scope and importance, defining the problem, ideation methods- mind mapping, brainstorming, story boarding, journey mapping, root cause analysis, suggestion box, visualization etc

Teaching-Learning Process	-Case studies on design thinking for real-time interaction and analysis -Class room exercises for collaboration enabled design thinking

Module-4

Prototyping and Testing- virtual, conventional and 3D printing, simulation, look alike, functional models- clay, foam, wood etc

Testing: destructive, non-destructive, user testing, role of social media in concept testing during early stages

Teaching - Learning Process	-Chalk and talk -power point presentations/case study/demonstration/videos/simulation

Module-5

Application of Design Thinking in IT

Design Thinking to Business Process modeling – Agile in Virtual collaboration environment

Teaching-Learning Process	Discussions through power point presentation/case studies/assignments

Course Outcomes:

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

CO's	At the end of the course, the student will have the ability to:	POs Mapped	Strength of mapping
CO1	Identify the situations, which need application of concepts of design thinking.	**PO 1**	**3**
CO2	Develop ideas to solve the identified societal and industrial problems through design thinking tools.	**PO 2**	**3**
CO3	Demonstrate the qualities pertaining to design thinking process through group activities.	**PO 9, PO 10, PO 12**	**3**

Assessment Details (both CIE and SEE)

Continuous Internal Evaluation:

i) Internal Tests to include Quiz/MCQ/descriptive/case study/any other for 20 Marks (CIE-1 for 20 Marks and CIE-2 for 20 Marks and considering the best out of two tests).

ii) Alternate Assessment Tool to include Group activity with Poster Presentation/power point presentation/Concept Video/any other for 30 Marks.

Semester End Examination:

The SEE shall include Viva-voce group wise through Poster Presentation/Concept Video/power point presentation/any other for 50 Marks.

Suggested Learning Resources:

Text Books:

1. Roger Martin, "The Design of Business: Why Design Thinking is the Next Competitive Advantage", Harvard Business Press, 2009.
2. Hasso Plattner, Christoph Meinel and Larry Leifer (eds), "Design Thinking: Understand – Improve – Apply", Springer, 2011
3. Idris Mootee, "Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School", John Wiley & Sons 2013.
4.
5. John.R.Karsnitz, Stephen O'Brien and John P. Hutchinson, "Engineering Design",Cengage learning (International edition) Second Edition, 2013.

References:

6. Yousef Haik and Tamer M. Shahin, "Engineering Design Process", Cengage Learning, Second Edition, 2011.
7. Book - Solving Problems with Design Thinking - Ten Stories of What Works (Columbia Business School Publishing) Hardcover – 20 Sep 2013 by Jeanne Liedtka (Author), Andrew King (Author), Kevin Bennett (Author).

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** https://support.microsoft.com/en-us/kb/273814
7. https://support.google.com/docs/answer/179740?hl=en
8. https://www.youtube.com/watch?v=2mjSDIBaUlM t
9. https://designthinkingforeducators.com/design-thinking/
10. www.designthinkingformobility.org
11. Human-Centered Design Toolkit (IDEO);
12. https://www.ideo.com/post/design-kit
13. https://dschool.stanford.edu/resources/the-bootcamp-bootleg

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SCIENTIFIC FOUNDATION OF HEALTH- AEC Course (I/II SEM)			
Course code	22MA1AESFH / 22MA2AESFH	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	1:0:0	SEE Marks	50
Total Hours of Pedagogy	01 Hours/Week	Total Mark	100
Credits	01	Exam hours	60 mins/1Hr

Course Objectives: This course enables the students to understand the values/ethics of life by building healthy lifestyle and avoiding bad habits.

The course will enable the students:

- To know about Health and wellness (and its Beliefs)
- To acquire Good Health & It's balance for positive mind-set
- To Build the healthy lifestyles for good health for their better future
- To Create of Healthy and caring relationships to meet the requirements of MNC and LPG world
- 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 mindset

Module-1 Good Health and it's balance for positive mindset:

Health- Importance of health, Influencing factors of health, Health beliefs,Advantages of good health, Health and Behavior, Health and Society, Health and family, Health and Personality. Psychological disorders-Methods to improve good psychological health. Changing health habits for good health.

Teaching-Learning Process	Chalk and talk method, Power Point presentation and you Tube videos, Animation videos. Creating real time stations in classroom discussions. Giving activities & assignments.

Module-2 Building of healthy Lifestyles for better future:

Developing a healthy diet for good health, Food and health, Nutritional guidelines for good health and well beingness, obesity and overweight disorders and its management, Eating disorders - proper exercises for its maintenance (Physical activities for health), Fitness components for health, Wellness and physical function.

Teaching-Learning Process	Chalk and talk method, Power Point presentation and you Tube videos, Animation videos . Creating real time stations in classroom discussions. Giving activities & assignments.

Module-3 Creation of Healthy and caring relationships: Building communication skills (Listening and speaking), Friends and friendship - education, the value of relationships and communication, Relationships for Better or worsening of life, understanding of basic instincts of life (more than a biology), Changing health behaviours through social engineering.	
Teaching-Learning Process	Chalk and talk method, Power Point presentation and you Tube videos, Animation videos. Creating real time stations in classroom discussions. Giving activities & assignments.
Module-4 Avoiding risks and Harmful habits : Characteristics of health compromising behaviors, Recognizing and avoiding of addictions, How addiction, develops and addictive behaviors, Types of addiction, influencing factors for addictions, Differences between addictive people and non-addictive people and their behavior with society, Effects and health hazards from addiction such as..., how to recovery from addictions.	
Teaching-Learning Process	Chalk and talk method, Power Point presentation and you Tube videos, Animation videos. Creating real time stations in classroom discussions. Giving activities & assignments.
Module-5 Preventing and fighting against diseases for good health: Process of infections and reasons for it, How to protect from different types of transmitted infections such ...., Current trends of socio economic impact of reducing your risk of disease, How to reduce risks for good health, Reducing risks and coping with chronic conditions, Management of chronic illness for Quality of life, Health and Wellness of youth: a challenge for the upcoming future. Measuring of health and wealth status.	
Teaching-Learning Process	Chalk and talk method, Power Point presentation and you Tube videos, Animation videos. Creating real time stations in classroom discussions. Giving activities & assignments.

Continuous Internal Evaluation (CIE)		
CIE	Multiple choice questions (MCQs)	20 marks
Alternate Assessments AAT	Poster Presentation (Group)	10 marks
	Power point presentation	10 marks
	Report writing	10 marks
	Total	**50 marks**

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Semester End Exam Scheme :
Max marks: 50
Duration- 1 Hour

PART-A

Multiple choice questions **25 X 1= 25 marks**

25 questions for 1 marks each from module 1, 2, 3, 4 and 5 of SFH syllabus

PART-B

Match the following **5 X 2=10 marks**

5 questions for 2 marks each from module 1, 2, 3, 4 and 5 of SFH syllabus

PART-C

Descriptive questions **5 X 3= 15 marks**

3 questions for 5 marks to be written out of 4 questions options.

One question from each module

CO1:	**To acquire Good Health and inculcate the healthy lifestyle habits with positive mindset**
CO2:	**To Create a Healthy and caring relationships to meet the requirements of outer world**
CO3:	**To adopt the innovative & positive methods to avoid risks from harmful habits inside & outside the campus.**
CO4:	**To positively fight against harmful diseases for good health and wellness.**
CO5:	**To enhance the students ability by working individually (or) as a team with professional ethics, effective communication and management skills.**

CO-PO mapping of SCIENTIFIC FOUNDATION OF HEALTH

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1:	**2**	**2**				**3**	**3**	**3**	**3**			**3**
CO2:	**3**	**2**				**3**	**3**	**3**	**3**		**2**	**3**
CO3:	**2**	**2**			**3**	**3**	**3**	**3**	**2**		**3**	**3**
CO4:	**3**	**2**				**3**	**3**	**3**	**3**		**2**	**3**
CO5:								**3**	**3**	**3**	**3**	**3**

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B.M.S. COLLEGE OF ENGINEERING, BENGALURU-19
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Course Title	Communicative English	Course Code	22MA1AECEN
Credits	01	L – T – P	1:0:0

Course Objectives:

- To understand the nuances of phonetics, accent, intonation and improve the pronunciation and communication skills
- To learn the basic English grammar and understand all types of English vocabulary and acquire professional communication skills
- Perform as a member of a team and engage in group discussion and oral presentation.

Teaching-Learning Process (General Instructions):

The strategies teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective:
Teachers shall adopt suitable pedagogy for effective teaching - learning process. The pedagogy shall involve the combination of different methodologies which suit modern technological tools and software's to meet the present requirements of the Global employment market.
(i) Direct instructional method (Low/Old Technology), (ii) Flipped classrooms (High/advanced Technological tools), (iii) Blended learning (Combination of both), (iv) Enquiry and evaluation-based learning, (v) Personalized learning, (vi) Problems based learning through discussion, (vii) Following the method of expeditionary learning Tools and techniques, (viii) Use of audio-visual methods through language Labs in teaching of LSRW skills.
Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adapted so that the delivered lesson can progress the students in theoretical applied and practical skills in teaching of communicative skills in general.

UNIT – 1	[03 hours]
Introduction to Communicative English: Communicative English, Fundamentals of Communicative English, Process of communication, Barriers to Effective Communication, Different styles and levels in Communication, Interpersonal and Intrapersonal Communication Skills.	
Teaching-Learning Process	Chalk and talk method / Power Point Presentation

UNIT - 2	[03 hours]
Introduction to Phonetics: Phonetic Transcription, English Pronunciation, Pronunciation Guidelines to consonants and vowels, Sounds Mispronounced, Silent and Non-silent Letters, Syllables, Intonation, Spelling Rules and Words often Misspelt. Common Errors in Pronunciation, Word Pairs (Minimal Pairs) – Exercises, Mother Tongue Influence (MTI), Various Techniques for Neutralization of Mother Tongue Influence.	
Teaching-Learning Process	Chalk and talk method / Power Point Presentation

UNIT - 3	**[03 hours]**
Basic English Communicative Grammar and Vocabulary PART - I: Grammar: Basic English Grammar and Parts of Speech, Articles and Preposition. Question Tags, One Word Substitutes, Strong and Weak forms of words	
Teaching-Learning Process	Chalk and talk method / Power Point Presentation
UNIT - 4	**[03 hours]**
Basic English Communicative Grammar and Vocabulary PART - II: Words formation - Prefixes and Suffixes, Contractions and Abbreviations, Vocabulary – Exercises on synonyms, antonyms, homophones and homonyms.	
Teaching-Learning Process	Chalk and talk method / Power Point Presentation
UNIT - 5	**[03hours]**
Communication Skills for Employment: Job application, Types of official/ employment/ business letters, Resume vs. Bio Data, profile, CV. Information Transfer: Oral Presentation and its Practice. Difference between Extempore/ Public Speaking, Communication Guidelines.	
Teaching-Learning Process	Chalk and talk method / Power Point Presentation

Course outcomes (Course Skills Set)

After successfully completing the course, the student will be able to understand the topics:

Course Code	CO	COURSE OUTCOME (CO)	PO
	CO 1	To understand the nuances of phonetics, accent, intonation and improve the pronunciation and communication skills	10
	CO 2	To learn the basic English grammar and understand all types of English vocabulary and acquire professional communication skills.	10
	CO 3	Perform as a member of a team and engage in group discussion and oral presentation.	9, 10

Assessment Details (both CIE and SEE)

Component	Type of assessment	Max. Marks	Total
CIE – Theory	AAT	10	50
	Test 1 (Descriptive + MCQ)	40	
SEE	End Exam		

Only one CIE shall be conducted.
CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:
SEE paper will be set for 50 marks. The pattern of the question paper is **Descriptive and MCQ Mode**. The time allotted for SEE is 120 minutes**.**

Suggested Learning Resources:

Textbook:

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, KN Shoba,** Cambridge University Press – 2020.
5. **Practical English Usage** by Michael Swan, Oxford University Press – 2016.

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Credits	04	L – T – P	2-1-1
Course Title	Mathematical foundation for Mechanical Engineering stream- 2	Course Code	22MA2BSMME

Course Objectives: The goal of the course

- **Appreciate** the importance of calculus and numerical methods essential for Mechanical engineering.
- **Gain the knowledge** of calculus and numerical methods to implement them in their core domain.
- Improve their **mathematical thinking** and **acquire skills** required for sustained lifelong learning.

Teaching-Learning Process (General Instructions)

These are sample strategies, which teachers can use to accelerate the attainment of the various course outcomes.

- Lecture method(L) does not mean only traditional method, but different type of teaching methods may be adopted to develop the outcomes.
- Show Video/animation films to explain functioning of various concepts.
- Encourage collaborative (Group Learning) Learning in the class.
- Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
- Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
- Topics will be introduced in a multiple representation 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 to improve the students' understanding.

UNIT – 1	[08 hours]

INTEGRAL CALCULUS

Multiple Integrals: Evaluation of double and triple integrals, evaluation of double integrals by change of order of integration, changing into polar coordinates.

Applications: Area (polar curves), Volume by triple integral, Mass of a plane laminar region.

Beta and Gamma functions: Definitions, properties, relation between Beta and Gamma functions.

Self-Study: Moment of Inertia along a particular direction.

(RBT Levels: L1, L2 and L3)

Teaching-Learning Process	Chalk and talk method / Power Point Presentation

UNIT - 2	[08 hours]

VECTOR CALCULUS

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

Vector Integration: Line integrals, Green's theorem and Stokes' theorem.

Application: Work done by a force.

Self-Study: Volume integral and Gauss divergence theorem.

(RBT Levels: L1, L2 and L3)

Teaching-Learning Process	Chalk and talk method / Power Point Presentation

UNIT - 3	**[08 hours]**
PARTIAL DIFFERENTIAL EQUATIONS Formation of PDE's by elimination of arbitrary constants and functions. Solution of nonhomogeneous PDE by direct integration. Solution of Lagrange's linear PDE. Solution of homogeneous PDE by separation of variables. **Applications:** Mathematical modelling in terms of one-dimensional heat equation and wave equation. **Self-Study:** Solution of one-dimensional heat equation and wave equation by the method of separation of variables. **(RBT Levels: L1, L2 and L3)**	
Teaching-Learning Process	Chalk and talk method / Power Point Presentation
UNIT - 4	**[08 hours]**
NUMERICAL METHODS -1 Solution of algebraic and transcendental equations: Newton-Raphson methods. Finite differences, Newton's forward and backward interpolation. Lagrange's interpolation and Lagrange's inverse Interpolation. N**umerical integration:** Simpson's (1/3)rd rule, Simpson's (3/8)th rule and Weddle's rule. **Applications:** Estimating the velocity, acceleration. Area, volume. **Self-Study:** Bisection method, Newton's divided difference formula. **(RBT Levels: L1, L2 and L3)**	
Teaching-Learning Process	Chalk and talk method / Power Point Presentation
UNIT - 5	**[08 hours]**
NUMERICAL METHODS -2: **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, **Applications:** Finding approximate solutions to ODE related to engineering fields. **Self-Study:** Adam-Bashforth method. **(RBT Levels: L1, L2 and L3)**	
Teaching-Learning Process	Chalk and talk method / Power Point Presentation

List of Lab Programs

Weekly: 1 Session (2 hours) **Batch strength :15 students**

Number of Labs: 12 (10 Sessions+2 Lab Assessments)

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 Bisection method and Newton- Raphson method.
7. Interpolation/Extrapolation using Newton's forward and backward interpolation.
8. Computation of area under the curve using Simpson's (1/3)rd rule, Simpson's (3/8)th rule and Weddle's 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 4th order and Milne's predictor-corrector method.

Suggested software: Python

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Course outcomes (Course Skills Set)
After successfully completing the course, the student will be able to understand the topics:

Course Code	CO	Course Outcome (CO)	PO	Strength
22MA2BSMME	CO 1	Apply the concepts of calculus and numerical methods in solving problems.	1	3
	CO 2	Relate the importance of calculus and numerical methods to Mechanical engineering stream.	1	1
	CO 3	Demonstrate the understanding of the concepts of Calculus and Numerical methods through programming skills using modern tool - Python.	1,5,10	2

Assessment Details (both CIE and SEE)

Component	Type of assessment	Max. Marks	Total	Reduced Marks	Total	Min. Marks required for eligibility	Total Marks
CIE – Theory	Quiz/AAT	10		50	25	10	50
	Test 1	40	90				
	Test 2	40					
	Test 3	40					
CIE – Lab	Record & Performance	100	120	10	25	10	
	Lab Test	15		15			
CIE				50		**20**	
SEE	End Exam	100		50		35	50
Grand Total Marks						**40**	**100**

Two best scores out of the three tests will be considered for CIE.
CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:
- Each unit consists of one full question.
- Five full questions to be answered.
- To set one question each from Units 2, 4, 5 and two questions each from Unit 1 and Unit 3.

Suggested Learning Resources:
Text Books

1. **B. S. Grewal**: "Higher Engineering Mathematics", Khanna publishers, 44th Ed., 2021.
2. **E. Kreyszig**: "Advanced Engineering Mathematics", John Wiley & Sons, 10th Ed., 2018.
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3. Vector Calculus: https://www.classcentral.com/course/mit-opencourseware-multivariable-calculus-fall-2007-40962/classroom and https://www.classcentral.com/course/vector-calculus-engineers-17387
4. Partial Differential Equations: https://ocw.mit.edu/courses/18-152-introduction-to-partial-differential-equations-fall-2011/, https://archive.nptel.ac.in/courses/111/101/111101153/ and https://nptel.ac.in/courses/111103021 and https://www.classcentral.com/course/swayam-partial-differential-equations-17721
5. Numerical Methods: https://www.classcentral.com/course/numerical-methods-engineers-32822, https://nptel.ac.in/courses/111107105 and https://ocw.mit.edu/courses/18-335j-introduction-to- numerical-methods-spring-2019/
6. Python:https://spokentutorial.org/tutorialsearch/?search_foss=Python%203.4.3&searchlanguage=English&page=1

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B.M.S. COLLEGE OF ENGINEERING, BENGALURU-19
Autonomous Institute, Affiliated to VTU

Course Title	Mathematical foundation for Civil Engineering – 2	Course Code	22MA2BSMCV
Credits	04	L – T – P	2-1-1

Course Objectives: The goal of the course is to

- **Appreciate** the importance of calculus and numerical methods in the field of civil engineering.
- **Gain the knowledge** of calculus and numerical methods in the field of civil engineering.
- Improve their **mathematical thinking** and **acquire skills** required for sustained lifelong learning.

Teaching-Learning Process (General Instructions)

These are sample strategies, which teachers can use to accelerate the attainment of the various course outcomes.

- Lecture method(L) does not mean only traditional method, but different type of teaching methods may be adopted to develop the outcomes.
- Show Video/animation films to explain functioning of various concepts.
- Encourage collaborative (Group Learning) Learning in the class.
- Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
- Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
- Topics will be introduced in a multiple representation 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 to improve the students' understanding.

UNIT - 1	**[08 hours]**

INTEGRAL CALCULUS

Multiple Integrals: Evaluation of double and triple integrals, evaluation of double integrals by change of order of integration, changing into polar coordinates.

Applications: Area(polar curves), Volume by triple integral, Mass of a plane laminar region.

Beta and Gamma functions: Definitions, properties, relation between Beta and Gamma functions.

Self-Study: Moment of Inertia along a particular direction.

(RBT Levels: L1, L2 and L3)

Teaching-Learning Process	Chalk and talk method / Power Point Presentation

UNIT - 2	**[08 hours]**

VECTOR CALCULUS

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

Vector Integration: Line integrals, Green's theorem and Stokes' theorem.

Application: Work done by a force.

Self-Study: Velocity and acceleration of a moving particle. Gauss divergence theorem.

(RBT Levels: L1, L2 and L3)

Teaching-Learning Process	Chalk and talk method / Power Point Presentation

UNIT - 3	**[08 hours]**
PARTIAL DIFFERENTIAL EQUATIONS Formation of partial differential equations (PDE) by elimination of arbitrary constants and functions. Solution of nonhomogeneous PDE by direct integration. Solution of Lagrange's linear PDE. Solution of homogeneous PDE by separation of variables. **Applications:** Mathematical modelling in terms of one-dimensional heat equation and wave equation. **Self-Study:** Solution of one-dimensional heat equation and wave equation by the method of separation of variables. **(RBT Levels: L1, L2 and L3)**	
Teaching-Learning Process	Chalk and talk method / Power Point Presentation
UNIT - 4	**[08 hours]**
NUMERICAL METHODS -1 Solution of algebraic and transcendental equations: Newton-Raphson methods. Finite differences, Newton's forward and backward interpolation. Lagrange's interpolation and Lagrange's inverse Interpolation. N**umerical integration:** Simpson's (1/3)rd rule, Simpson's (3/8)th rule and Weddle's rule. **Applications:** Estimating the velocity, acceleration. Area, volume. **Self-Study:** Bisection method, Newton's divided difference formula. **(RBT Levels: L1, L2 and L3)**	
Teaching-Learning Process	Chalk and talk method / Power Point Presentation
UNIT - 5	**[08 hours]**
NUMERICAL METHODS -2 **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, **Applications:** Finding approximate solutions to ODE related to civil engineering fields. **Self-Study:** Adam-Bashforth method. **(RBT Levels: L1, L2 and L3)**	
Teaching-Learning Process	Chalk and talk method / Power Point Presentation

List of Lab Programs

Weekly: 1 Session (2 hours) **Batch strength : 15 students**

Number of Labs: 12 (10 Sessions+2 Lab Assessments)

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 Bisection method and Newton- Raphson method.
7. Interpolation/Extrapolation using Newton's forward and backward interpolation.
8. Computation of area under the curve using Simpson's (1/3)rd rule, Simpson's (3/8)th rule and Weddle's 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 4th order and Milne's predictor-corrector method.

Suggested software: Python

Course outcomes (Course Skills Set)

After successfully completing the course, the student will be able to understand the topics:

Course Code	CO	COURSE OUTCOME (CO)	PO	Strength
22MA2BSMCV	CO 1	Apply the concepts of calculus and numerical methods in solving problems.	1	3
	CO 2	Relate the importance of calculus and numerical methods to civil engineering.	1	1
	CO 3	Demonstrate the understanding of the concepts of Calculus and Numerical methods through programming skills using modern tool - Python.	1, 5, 10	2

Assessment Details (both CIE and SEE)

Component	Type of assessment	Max. Marks	Total	Reduced Marks	Total	Min. Marks required for eligibility	Total Marks
CIE – Theory	Quiz/AAT	10		50	25	10	50
	Test 1	40	90				
	Test 2	40					
	Test 3	40					
CIE – Lab	Record & Performance	100	120	10	25	10	
	Lab Test	15		15			
CIE				50		**20**	
SEE	End Exam	100		50		35	50
Grand Total Marks						**40**	**100**

Two best scores out of the three tests will be considered for CIE.

CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

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   Python:https://spokentutorial.org/tutorialsearch/?search_foss=Python%203.4.3&searchlanguage=English&page=1

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B.M.S. COLLEGE OF ENGINEERING, BENGALURU-19
Autonomous Institute, Affiliated to VTU

Course Title	Mathematical foundation for Computer Science Stream-2	Course Code	22MA2BSMCS
Credits	4	L – T – P	2-1-1

Course Objectives: The objectives of the course are to facilitate the learners to

- **Appreciate** the importance of Calculus, Linear Algebra and Numerical methods in computer and allied engineering science.
- **Gain the knowledge** of concepts of Calculus, Linear Algebra and Numerical techniques to implement them in their core domain.
- Improve their **mathematical thinking** and **acquire skills** required for sustained lifelong learning.

Teaching-Learning Process (General Instructions)

These are sample strategies, which teachers can use to accelerate the attainment of the various course outcomes.

- Lecture method(L) does not mean only traditional method, but different type of teaching methods may be adopted to develop the outcomes.
- Show Video/animation films to explain functioning of various concepts.
- Encourage collaborative (Group Learning) learning in the class.
- Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
- Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
- Topics will be introduced in a multiple representation 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 to improve the students' understanding.

UNIT -1	**[08 hours]**

INTEGRAL CALCULUS

Multiple Integrals: Evaluation of double and triple integrals, evaluation of double integrals by change of order of integration, changing into polar coordinates.

Applications: Area(polar curves), Volume by triple integral.

Beta and Gamma functions: Definitions, properties, relation between Beta and Gamma functions.

Self-Study: Duplication formula. Moment of Inertia along a particular direction.

(RBT Levels: L1, L2 and L3)

Teaching-Learning Process	Chalk and talk method / Power Point Presentation

UNIT - 2	**[08 hours]**

VECTOR CALCULUS

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

Orthogonal Curvilinear coordinates: Scale factors, base vectors, transformation between cartesian and curvilinear systems, Cylindrical polar coordinates, Spherical polar coordinates.

Applications: Directional derivative, Scalar potential.

Self-Study: Area element, volume element in orthogonal curvilinear coordinates.

(RBT Levels: L1, L2 and L3)

Teaching-Learning Process	Chalk and talk method / Power Point Presentation

UNIT - 3	**[08 hours]**
VECTOR SPACE AND LINEAR TRANSFORMATIONS **Vector spaces:** Definition and examples, subspace, linear span, Linearly independent and dependent sets, Basis and dimension. **Linear transformations**: Definition and examples, Algebra of transformations, Matrix of a linear transformation. Rank and nullity of a linear operator, rank-nullity theorem. **Applications:** Geometric linear transformation in $\mathbb{R}^2$ for image processing. **Self-study:** Eigenspaces of a linear transformation. Invertible linear operators. **(RBT Levels: L1, L2 and L3)**	
Teaching-Learning Process	Chalk and talk method / Power Point Presentation
UNIT - 4	**[08 hours]**
NUMERICAL METHODS -1 Solution of algebraic and transcendental equations: Newton-Raphson methods. Finite differences, Newton's forward and backward interpolation. Lagrange's interpolation and Lagrange's inverse Interpolation. N**umerical integration:** Simpson's (1/3)rd rule, Simpson's (3/8)th rule and Weddle's rule. **Applications:** Estimating the velocity, acceleration. Area, volume. **Self-Study:** Bisection method, Newton's divided difference formula. **(RBT Levels: L1, L2 and L3)**	
Teaching-Learning Process	Chalk and talk method / Power Point Presentation
UNIT - 5	**[08 hours]**
NUMERICAL METHODS -2 **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, **Applications:** Finding approximate solutions to ODE related to engineering fields. **Self-Study:** Adam-Bashforth method. **(RBT Levels: L1, L2 and L3).**	
Teaching-Learning Process	Chalk and talk method / Power Point Presentation

List of Lab Programs

Weekly: 1 Session (2 hours) **Batch strength :15 students**

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1. Program to compute area, surface area, volume and centre of gravity.
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10. Solution of ODE of first order and first degree by Runge-Kutta 4th order and Milne's predictor-corrector method.

Suggested software: Python

B.M.S. COLLEGE OF ENGINEERING, BENGALURU-19
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Course outcomes (Course Skills Set)
After successfully completing the course, the student will be able to understand the topics:

Course Code	CO	COURSE OUTCOME (CO)	PO	Strength
22MA2BSMCS	CO 1	Apply the concepts of Calculus, Linear Algebra and numerical methods in solving problems.	1	3
	CO 2	Relate the importance of Calculus, Linear Algebra and numerical methods in computer science stream.	1	1
	CO 3	Demonstrate the understanding of Calculus, Linear Algebra and numerical methods through programming skills using modern tool - Python.	1, 5, 10	2

Assessment Details (both CIE and SEE)

Component	Type of assessment	Max. Marks	Total	Reduced Marks	Total	Min. Marks required for eligibility	Total Marks
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	Test 1	40					
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	Test 3	40					
CIE – Lab	Record & Performance	100	120	10	25	10	
	Lab Test	15		15			
CIE				50		**20**	
SEE	End Exam	100		50		35	50
Grand Total Marks						**40**	**100**

Two best scores out of the three tests will be considered for CIE.
CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

- Each unit consists of one full question.
- Five full questions to be answered.
- To set one question each from Units 2, 4, 5 and two questions each from Unit 1 and Unit 3.

Suggested Learning Resources:

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B.M.S. COLLEGE OF ENGINEERING, BENGALURU-19
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Course Title	Mathematical foundation for Electrical stream – 2	Course Code	22MA2BSMES
Credits	4	L – T – P	2-1-1

Course Objectives:

The objectives of the course are to facilitate the learners to

- **Appreciate** the importance of Calculus, Linear Algebra and Numerical methods in Electrical stream.
- **Gain the knowledge** of Calculus, Linear Algebra and Numerical methods in Electrical and allied engineering sciences.
- Improve their **mathematical thinking** and **acquire skills** required for sustained lifelong learning.

Teaching-Learning Process (General Instructions)

These are sample strategies, which teachers can use to accelerate the attainment of the various course outcomes.

- Lecture method(L) does not mean only traditional method, but different type of teaching methods may be adopted to develop the outcomes.
- Show Video/animation films to explain functioning of various concepts.
- Encourage collaborative (Group Learning) Learning in the class.
- Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
- Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyze information rather than simply recall it.
- Topics will be introduced in a multiple representation 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 to improve the students' understanding.

UNIT - 1	**[08 hours]**

INTEGRAL CALCULUS

Multiple Integrals: Evaluation of double and triple integrals, evaluation of double integrals by change of order of integration, changing into polar coordinates.
Applications: Area (polar curves), Volume by triple integral.
Beta and Gamma functions: Definitions, properties, relation between Beta and Gamma functions.
Self-Study: Duplication formula. Moment of Inertia along a particular direction.
(RBT Levels: L1, L2 and L3)

Teaching-Learning Process	Chalk and talk method / Power Point Presentation

UNIT - 2	**[08 hours]**

VECTOR CALCULUS

Vector Differentiation: Scalar and vector fields. Gradient, directional derivative, curl and divergence - physical interpretation, solenoidal and irrotational vector fields.
Vector Integration: Line integrals, Green's theorem and Stokes' theorem.
Application: Work done by a force.
Self-Study: Volume integral and Gauss divergence theorem.
(RBT Levels: L1, L2 and L3)

Teaching-Learning Process	Chalk and talk method / Power Point Presentation

UNIT - 3	**[08 hours]**
VECTOR SPACE AND LINEAR TRANSFORMATIONS **Vector spaces:** Definition and examples, subspace, linear span, Linearly independent and dependent sets, Basis and dimension. **Linear transformations**: Definition and examples, Algebra of transformations, Matrix of a linear transformation. Rank and nullity of a linear operator, rank-nullity theorem. **Applications:** Geometric linear transformation in $\mathbb{R}^2$ for image processing. **Self-study:** Eigen spaces of a linear transformation. Invertible linear operators. **(RBT Levels: L1, L2 and L3)**	
Teaching-Learning Process	Chalk and talk method / Power Point Presentation
UNIT - 4	**[08 hours]**
NUMERICAL METHODS -1 Solution of algebraic and transcendental equations: Newton-Raphson method. Finite differences, Newton's forward and backward interpolation. Lagrange's interpolation and Lagrange's inverse Interpolation. N**umerical integration:** Simpson's (1/3)rd rule, Simpson's (3/8)th rule and Weddle's rule. **Applications:** Estimating the velocity, acceleration. Area, volume. **Self-Study:** Bisection method, Newton's divided difference formula. **(RBT Levels: L1, L2 and L3)**	
Teaching-Learning Process	Chalk and talk method / Power Point Presentation
UNIT - 5	**[08 hours]**
Numerical methods - 2 **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, **Applications:** Finding approximate solutions to ODE related to Electrical Engineering fields. **Self-Study:** Adam-Bashforth method. **(RBT Levels: L1, L2 and L3).**	
Teaching-Learning Process	Chalk and talk method / Power Point Presentation

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Suggested software: Python

Course outcomes (Course Skills Set)
After successfully completing the course, the student will be able to understand the topics:

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2. **E. Kreyszig**: "Advanced Engineering Mathematics", John Wiley & Sons, 10th Ed., 2018.
3. **David C Lay:** "Linear Algebra and its Applications", Pearson Publishers, 4th Ed., 2018.
4. **C.R. Severance**: "Python for Everybody: Exploring Data Using Python 3", 1st edition, University of Michigan, 2016.
5. **J. Kiusalaas** : "Numerical Methods in Engineering with Python 3", Cambridge university press, 2013.

Reference Books

1. **V. Ramana:** "Higher Engineering Mathematics" McGraw-Hill Education, 11th Ed., 2017
2. **Srimanta Pal & Subodh C. Bhunia**: "Engineering Mathematics" Oxford University Press, 3rd Ed., 2016.
3. **N. P. Bali and Manish Goyal**: "A textbook of Engineering Mathematics" Laxmi Publications, 10th Ed., 2022.
4. **C. Ray Wylie, Louis C. Barrett:** "Advanced Engineering Mathematics" McGraw – Hill Book Co., Newyork, 6th Ed., 2017.
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.
6. **H. K. Dass and Er. Rajnish Verma:** "Higher Engineering Mathematics" S. Chand Publication, 3rd Ed., 2014.
7. **James Stewart: "**Calculus" Cengage Publications, 7th Ed., 2019.
8. **Gareth Williams:** "Linear Algebra with applications", Jones Bartlett Publishers Inc., 6th Ed., 2017.
9. **J. Kiusalaas:** "Numerical methods in Engineering with Python 3", Cambridge University Press, 3rd Ed., 2013.
10. **M Lutz,** "Programming Python", O'Reilly Media, 4th edition, 2010.
11. **C. Jackson,** "Learning to Program using Python", Packt Publishing, 2nd edition, 2018.

Web links and Video Lectures (e-Resources):

1. Integral Calculus: https://www.classcentral.com/course/youtube-integral-calculus-90616 and https://www.edx.org/course/mathtrackx-integral-calculus
2. Integral and Vector Calculus: https://onlinecourses.nptel.ac.in/noc22_ma03/preview
3. Vector Calculus: https://www.classcentral.com/course/mit-opencourseware-multivariable-calculus-fall-2007-40962/classroom and https://www.classcentral.com/course/vector-calculus-engineers-17387
4. Partial Differential Equations: https://ocw.mit.edu/courses/18-152-introduction-to-partial-differential-equations-fall-2011/, https://archive.nptel.ac.in/courses/111/101/111101153/ and https://nptel.ac.in/courses/111103021 and https://www.classcentral.com/course/swayam-partial-differential-equations-17721
5. Numerical Methods: https://www.classcentral.com/course/numerical-methods-engineers-32822, https://nptel.ac.in/courses/111107105 and https://ocw.mit.edu/courses/18-335j-introduction-to-numerical-methods-spring-2019/
   Python:https://spokentutorial.org/tutorialsearch/?search_foss=Python%203.4.3&searchlanguage=English&page=1

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B.M.S. COLLEGE OF ENGINEERING, BENGALURU-19
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Course Title	Professional Writing Skills in English	Course Code	22MA2AEPWE
Credits	01	L – T – P	1:0:0

Course Objectives:

- To understand and identify the common errors in writing and speaking
- Developing listening and speaking skills through classroom activities based on listening comprehension, recapitulation, interpretation and debate on the same
- To read technical proposals and write good technical reports, to acquire better analytical skills and methodology required for writing projects and research papers.
- Perform as a member of a team and engage in group presentation.

Teaching-Learning Process (General Instructions):

The strategies teacher can use to accelerate the attainment of the various course outcomes and make Teaching –Learning more effective:
Teachers shall adopt suitable pedagogy for effective teaching - learning process. The pedagogy shall involve the combination of different methodologies which suit modern technological tools and software's to meet the present requirements of the Global employment market.
(i) Direct instructional method (Low/Old Technology), (ii) Flipped classrooms (High/advanced Technological tools), (iii) Blended learning (Combination of both), (iv) Enquiry and evaluation-based learning, (v) Personalized learning, (vi) Problems based learning through discussion, (vii) Following the method of expeditionary learning Tools and techniques, (viii) Use of audio-visual methods through language Labs in teaching of LSRW skills.
Apart from conventional lecture methods, various types of innovative teaching techniques through videos, animation films may be adapted so that the delivered lesson can progress the students in theoretical applied and practical skills in teaching of communicative skills in general.

UNIT – 1	**[03 hours]**
Identifying Common Errors in Writing and Speaking English: 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. Analogy of Comparison	
Teaching-Learning Process	Chalk and talk method / Power Point Presentation
UNIT - 2	**[03 hours]**
Nature and Style of Sensible Writing: Organizing Principles of Paragraphs, Writing Introduction and Conclusion, Importance of Proper Punctuation, Precis writing, Essay writing, Sentence arrangements and Corrections activities. Misplaced modifiers, Contractions, Collocations, Word Order, Errors due to the Confusion of words.	
Teaching-Learning Process	Chalk and talk method / Power Point Presentation

UNIT - 3	**[03 hours]**
Technical Reading and Writing Practices: 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.	
Teaching-Learning Process	Chalk and talk method / Power Point Presentation
UNIT - 4	**[03 hours]**
Professional Communication for Employment: Listening Comprehension, Types of Listening, Listening Barriers, Improving Listening Skills. Reading Comprehension, Tips for effective reading. Emails, Blog Writing and Memos.	
Teaching-Learning Process	Chalk and talk method / Power Point Presentation
UNIT - 5	**[03hours]**
Professional Communication at Workplace: Group Discussion and Professional Interviews, Characteristics and Strategies of a GD and PI's, Non-Verbal Communication Skills and its importance in GD and Interview. Presentation skills and Formal Presentations by Students, Strategies of Presentation Skills	
Teaching-Learning Process	Chalk and talk method / Power Point Presentation

Course outcomes (Course Skills Set)

Course Outcomes		**PO**
CO1	To understand and identify the common errors in writing and speaking.	10
CO2	Developing listening and speaking skills through classroom activities based on listening comprehension, recapitulation, interpretation and debate on the same.	10
CO3	To read Technical proposals and write good technical reports, to acquire better analytical skills and methodology required for writing projects and research papers.	10
CO4	Perform as a member of a team and engage in group presentation.	9, 10

Assessment Details (both CIE and SEE)

Component	**Type of assessment**	**Max. Marks**	**Total**
CIE – Theory	AAT	10	50
	Test 1 (Descriptive + MCQ)	40	
SEE	End Exam		

Only one CIE shall be conducted.
CIE methods /question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examination:

SEE paper will be set for 50 marks. The pattern of the question paper is **Descriptive and MCQ mode**. The time allotted for SEE is 120 minutes**.**

Suggested Learning Resources:

Textbook:

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- 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

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ಬಳಕೆ ಕನ್ನಡ			
ವಿಷಯ ಸಂಕೇತ (Course Code)	22MA1HSBAK / 22MA2HSBAK	ನಿರಂತರ ಆಂತರಿಕ ಮೌಲ್ಯ ಮಾಪನ ಅಂಕಗಳು.	50
ಒಂದು ವಾರಕ್ಕೆ ಬೋಧನಾ ಅವಧಿ (Teaching Hours / week (L:T:P:S)	1-0-0	ಸೆಮಿಸ್ಟರ್ ಅಂತ್ಯದ ಪರೀಕ್ಷೆಯ ಅಂಕಗಳು	50
ಒಟ್ಟು ಬೋಧನಾ ಅವಧಿ Total Hours of Pedagogy	15 ಗಂಟೆಗಳು	ಒಟ್ಟು ಅಂಕಗಳು	100
ಕ್ರೆಡಿಟ್ಸ್ (Credits)	01		

ಬಳಕೆ ಕನ್ನಡ ಪಠ್ಯದ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು:

1. To create the awareness regarding the necessity of learning local language for comfortable and healthy life.
2. To enable learners to Listen and understand the Kannada language properly.
3. To speak, read and write Kannada language as per requirement.
4. To train the learners for correct and polite conservation.
5. To know about Karnataka state and its language, literature and General information about this state.

ಭೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವ್ಯವಸ್ಥೆ (Teaching – Learning Process – General Instructions):

These are sample Strategies; which teacher can use to accelerate the attainment of the course outcomes.

1. ಬಳಕೆ ಕನ್ನಡವನ್ನು ತರಗತಿಯಲ್ಲಿ ಶಿಕ್ಷಕರು ಬೋಧಿಸಲು ವಿಟಿಯು ಸೂಚಿಸಿರುವ ಪಠ್ಯಪುಸ್ತಕವನ್ನು ಉಪಯೋಗಿಸಬೇಕು.
2. ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ಸ್‌ಗಳನ್ನು ತಯಾರಿಸಲು ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಉತ್ತೇಜಿಸುವುದು ಮತ್ತು ತರಗತಿಯಲ್ಲಿ ಅವುಗಳನ್ನು ಚರ್ಚಿಸಲು ಅವಕಾಶ ಮಾಡಿ ಕೊಡುವುದು.
3. ಪ್ರತಿ ವಿದ್ಯಾರ್ಥಿ ಪುಸ್ತಕವನ್ನು ತರಗತಿಯಲ್ಲಿ ಬಳಸುವಂತೆ ನೋಡಿಕೊಳ್ಳುವುದು ಮತ್ತು ಪ್ರತಿ ಪಾಠ ಮತ್ತು ಪ್ರವಚನಗಳ ಮೂಲ ಅಂಶಗಳಿಗೆ ಸಂಬಂಧ ಪಟ್ಟ ಪೂರಕ ಚಟುವಟಿಕೆಗಳಿಗೆ ತೊಡಗಿಸತಕ್ಕದ್ದು.
4. ಡಿಜಿಟಲ್ ತಂತ್ರಜ್ಞಾನದ ಮುಖಾಂತರ ಇತ್ತೀಚಿಗೆ ಡಿಜಿಟಲೀಕರಣ ಗೊಂಡಿರುವ ಭಾಷೆ ಕಲಿಕೆಯ ವಿಧಾನಗಳನ್ನು ಪಿಪಿಟಿ ದೃಶ್ಯ ಮಾಧ್ಯಮದ ಮುಖಾಂತರ ಚರ್ಚಿಸಲು ಕ್ರಮ ಕೈಗೊಳ್ಳುವುದು . ಇದರಿಂದ ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ತರಗತಿಯಲ್ಲಿ ಹೆಚ್ಚು ಏಕಾಗ್ರತೆಯಿಂದ ಪಾಠ ಕೇಳಲು ಮತ್ತು ಅಧ್ಯಯನದಲ್ಲಿ ತೊಡಗಲು ಅನುಕೂಲವಾಗುತ್ತದೆ.
5. ಭಾಷಾಕಲಿಕೆಯ ಪ್ರಯೋಗಾಲಯದ ಮುಖಾಂತರ ಬಹುಬೇಗ ಕನ್ನಡ ಭಾಷೆಯನ್ನು ಕಲಿಯಲು ಅನುಕೂಲವಾಗುವಂತೆ ಕಾರ್ಯ ಚಟುವಟಿಕೆಗಳನ್ನು ಮತ್ತು ಕ್ರಿಯಾ ಯೋಜನೆಗಳನ್ನು ರೂಪಿಸುವುದು.

UNIT – 1	**2 Hours**

1. Introduction, Necessity of learning a local language. Methods to learn the Kannada language.
2. Easy learning of a Kannada Language: A few tips. Hints for correct and polite conservation, Listening and Speaking Activities. Key to Transcription.
3. ವ್ಯಯಕ್ತಿಕ, ಸ್ವಾಮ್ಯ ಸೂಚಕ / ಸಂಬಂಧಿತ ಸಾರ್ವನಾಮಗಳು ಮತ್ತು ಪ್ರಶ್ನಾರ್ಥಕ ಪದಗಳು - **Personal Pronouns, Possessive Forms, Interrogative words**

ಭೋದನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವೀಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಕಾಂತರ ಚರ್ಚಿಸುವುದು.
UNIT – 2	**3 Hours**
1. ನಾಮಪದಗಳ ಸಂಬಂಧಾರ್ಥಕ ರೂಪಗಳು, ಸಂದೇಹಾಸ್ಪದ ಪ್ರಶ್ನೆಗಳು ಮತ್ತುಸಂಬಂಧವಾಚಕ ನಾಮಪದಗಳು – Possesive forms of nouns, dubitive question and Relative nouns. 2. ಗುಣ ಪರಿಮಾಣ ಮತ್ತು ವರ್ಣ ಬಣ್ಣ ವಿಶೇಷಣಗಳು, ಸಂಖ್ಯಾವಾಚಕಗಳು Qualitative, Quantitative and colour Adjectives, Numerals.	
ಭೋದನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವೀಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಕಾಂತರ ಚರ್ಚಿಸುವುದು.
UNIT – 3	**3 Hours**
1. ಚತುರ್ಥಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯದ ಬಳಕೆ ಮತ್ತು ಸಂಖ್ಯಾವಾಚಕಗಳು – Dative cases, and numerals. 2. ಸಂಖ್ಯಾವಾಚಕಗಳು ಮತ್ತು ಬಹುವಚನ ನಾಮರೂಪಗಳು – Ordinal numerals and Plural markers.	
ಭೋದನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವೀಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಕಾಂತರ ಚರ್ಚಿಸುವುದು.
UNIT – 4	**3 Hours**
1. ಅಪ್ಪಣೆ / ಒಪ್ಪಿಗೆ, ನಿರ್ದೇಶನ, ಪ್ರೋತ್ಸಾಹ ಮತ್ತು ಒತ್ತಾಯ ಅರ್ಥರೂಪ ಪದಗಳು ಮತ್ತು ವಾಕ್ಯಗಳು. Permission, Commands, encouraging and Urging words (Imperative words and sentences) 2. "ಇರು ಮತ್ತು ಇರಲ್ಲ" ಸಹಾಯಕ ಕ್ರಿಯಾಪದಗಳು, ಸಂಭಾವ್ಯ ಸೂಚಕ ಮತ್ತು ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾ ಪದಗಳು. – Helping verbs “iru and iralla”, corresponding Future and negation verbs.	
ಭೋದನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವೀಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಕಾಂತರ ಚರ್ಚಿಸುವುದು.
UNIT – 5	**4 Hours**
1. ಕನ್ನಡ ಭಾಷೆ ಮತ್ತು ಸಾಹಿತ್ಯ. Kannada Language and History. 2. Kannada Language Script Part – 1	
ಭೋದನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವೀಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಕಾಂತರ ಚರ್ಚಿಸುವುದು.

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ಬಳಕೆ ಕನ್ನಡ ಕಲಿಕೆಯಿಂದ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಆಗುವ ಅನುಕೂಲಗಳು ಮತ್ತು ಫಲಿತಾಂಶಗಳು:

Course outcomes (Course Skills Set)

After successfully completing the course, the student will be able to understand the topics:

Course Code	CO	COURSE OUTCOME (CO)	PO	Strength
22MA1HSBAK / 22MA2HSBAK	**CO 1**	To create an awareness regarding the necessity of learning local language for a comfortable living and to know more about Kannada culture and literature.	PO10	3
	CO 2	To develop proper speaking, reading and writing skills in Kannada.	PO10	3
	CO 3	To engage as a member of a team and enhance the skill in group communication and presentation.	PO9	1

Assessment Details (both CIE and SEE)

Component	Type of assessment	Max. Marks	Total
CIE – Theory	AAT 1	10	100
	Test 1	40	
SEE	End Exam	50	

Only one CIE shall be conducted after CIE2 and before CIE 3. SEE paper shall be set for 50 Questions, each of the 01 marks. The pattern of the Question paper is MCQ (Multiple Choice Questions). The time allotted 01 hour.

ಪಠ್ಯ ಪುಸ್ತಕ:

ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ, ಬಳಕೆ ಕನ್ನಡ, ಪ್ರಸಾರಾಂಗ, ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ.

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SYLLABUS (2022 - 2023)

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ

ವಿಷಯ ಸಂಕೇತ (Course Code)	22MA1HSSAK / 22MA2HSSAK	ನಿರಂತರ ಆಂತರಿಕ ಮೌಲ್ಯ ಮಾಪನ ಅಂಕಗಳು.	50
ಒಂದು ವಾರಕ್ಕೆ ಬೋಧನಾ ಅವಧಿ (Teaching Hours / week (L:T:P:S)	1-0-0	ಸೆಮಿಸ್ಟರ್ ಅಂತ್ಯದ ಪರೀಕ್ಷೆಯ ಅಂಕಗಳು	50
ಒಟ್ಟು ಬೋಧನಾ ಅವಧಿ Total Hours of Pedagogy	15 ಗಂಟೆಗಳು	ಒಟ್ಟು ಅಂಕಗಳು	100
ಕ್ರೆಡಿಟ್ಸ್ (Credits)	01		

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಪಠ್ಯದ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು :

1. ವೃತ್ತಿಪರ ಪದವಿ ವಿದ್ಯಾರ್ಥಿಗಳಾಗಿರುವುದರಿಂದ ಕನ್ನಡ ಭಾಷೆ, ಸಾಹಿತ್ಯ ಮತ್ತು ಕನ್ನಡದ ಸಂಸ್ಕೃತಿಯ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.
2. ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಪ್ರಧಾನ ಭಾಗವಾದ ಆಧುನಿಕ ಪೂರ್ವ ಮತ್ತು ಆಧುನಿಕ ಕಾವ್ಯಗಳನ್ನು ಸಾಂಕೇತಿಕವಾಗಿ ಪರಿಚಯಿಸಿ ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯ ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ಅರಿವು ಹಾಗೂ ಆಸಕ್ತಿಯನ್ನು ಮೂಡಿಸುವುದು.
3. ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯವನ್ನು ಹಾಗೂ ಅವರುಗಳ ಸಾದಿಸಿದ ವಿಷಯಗಳನ್ನು ಪರಿಚಯಿಸುವುದು. ಕನ್ನಡ ಶಬ್ದ ಸಂಪತ್ತಿನ ಪರಿಚಯ.

ಭೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವ್ಯವಸ್ಥೆ (Teaching – Learning Process – General Instructions):

These are sample Strategies; which teacher can use to accelerate the attainment of the course outcomes.

1. ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡವನ್ನು ಬೋಧಿಸಲು ತರಗತಿಯಲ್ಲಿ ಶಿಕ್ಷಕರು ಪ್ರಸ್ತುತ ಪುಸ್ತಕ ಆಧರಿಸಿ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನವನ್ನು ಅನುಸರಿಸುವುದು. ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ಗಳನ್ನು ತಯಾರಿಸಲು ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಪ್ರೇರೇಪಿಸುವುದು ಮತ್ತು ತರಗತಿಯಲ್ಲಿ ಅವುಗಳನ್ನು ಚರ್ಚಿಸಲು ಅವಕಾಶ ಮಾಡಿಕೊಡುವುದು.
2. ಇವತ್ತಿನ ತಂತ್ರಜ್ಞಾನದ ಅನುಕೂಲಗಳನ್ನು ಬಳಸಿಕೊಳ್ಳುವುದು - ಅಂದರೆ ಕವಿ - ಕಾವ್ಯ ಪರಿಚಯದಲ್ಲಿ ಕವಿಗಳ ಚಿತ್ರಣ ಮತ್ತು ಲೇಖನಗಳು ಮತ್ತು ಕಥೆ ಕಾವ್ಯಗಳ ಮೂಲ ಅಂಶಗಳಿಗೆ ಸಂಬಂದಪಟ್ಟ ಧ್ವನಿ ಚಿತ್ರಗಳು, ಸಂಭಾಷಣೆಗಳು. ಈಗಾಗಲೇ ಇತರ ವಿಮರ್ಶಕರು ಬರೆದಿರುವ ವಿಮರ್ಶನಾತ್ಮಕ ವಿಷಯಗಳನ್ನು ಟಿಪಿಟಿ, ಡಿಜಿಟಲ್ ಮಾಧ್ಯಮಗಳ ಮುಕಾಂತರ ವಿಶ್ಲೇಷಿಸುವುದು.
3. ನವೀನ ಮಾದರಿಯ ಸಾಹಿತ್ಯ ಬೋಧನೆಗೆ ಸಂಬಂಧಪಟ್ಟ ವಿಧಾನಗಳನ್ನು ಶಿಕ್ಷಕರು ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಅನುಕೂಲವಾಗುವ ರೀತಿಯಲ್ಲಿ ಅಳವಡಿಸುವುದು.

ಘಟಕ - 1	**3 Hours**

ಲೇಖನಗಳು:

1. ಕರ್ನಾಟಕದ ಏಕೀಕರಣ: ಒಂದು ಅಪೂರ್ವ ಚರಿತ್ರೆ - ಜಿ. ವೆಂಕಟಸುಬ್ಬಯ್ಯ.
2. ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕನ್ನಡ - ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ ಮತ್ತು ಪ್ರೊ. ವಿ. ಕೇಶವಮೂರ್ತಿ.

ಭೋದನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪ್ಟ್ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವೀಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಕಾಂತರ ಚರ್ಚಿಸುವುದು.
ಘಟಕ - 2	**4 Hours**

ಆಧುನಿಕ ಪೂರ್ವದ ಕಾವ್ಯ ಭಾಗ:

1. ವಚನಗಳು: ಬಸವಣ್ಣ, ಅಕ್ಕ ಮಹಾದೇವಿ, ಅಲ್ಲಮಪ್ರಭು, ಜೇಡರದಾಸಿಮಯ್ಯ , ಆಯ್ದಕ್ಕಿ ಲಕ್ಕಮ್ಮ.
2. ಕೀರ್ತನೆಗಳು: ಅದರಿಂದೇನು ಫಲ ಇದರಿಂದೇನು ಫಲ - ಪುರಂದರದಾಸರು ತಲ್ಲಣಿಸದಿರು ಕಂಡ್ಯ ತಾಳು ಮನವೇ - ಕನಕದಾಸರು

ಭೋದನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪ್ಟ್ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವೀಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಕಾಂತರ ಚರ್ಚಿಸುವುದು .
ಘಟಕ - 3	**3 Hours**
ಆಧುನಿಕ ಕಾವ್ಯ ಭಾಗ: 1. ಡಿ. ವಿ. ಜಿ ರವರ ಮಂಕುತಿಮ್ಮನ ಕಗ್ಗದಿಂದ ಆಯ್ದ ಕೆಲ ಭಾಗಗಳು 2. ಕುರುಡು ಕಾಂಚಾಣ : ದಾ. ರಾ. ಬೇಂದ್ರೆ . 3. ಹೊಸಬಾಳಿನ ಗೀತೆ : ಕುವೆಂಪು	
ಭೋದನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪ್ಟ್ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವೀಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಕಾಂತರ ಚರ್ಚಿಸುವುದು .
ಘಟಕ - 4	**3 Hours**
1. ಡಾ. ಸರ್. ಎಂ. ವಿಶ್ವೇಶ್ವರಯ್ಯ: ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹ್ಯ - ಎ ಎನ್ ಮೂರ್ತಿರಾವ್ 2. ಕರಕುಶಲ ಕಲೆಗಳು ಮತ್ತು ಪರಂಪರೆಯ ವಿಜ್ಞಾನ : ಕರೀಗೌಡ ಬೀಚನಹಳ್ಳಿ	
ಭೋದನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪ್ಟ್ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವೀಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಕಾಂತರ ಚರ್ಚಿಸುವುದು.
ಘಟಕ - 5	**2 Hours**
ಮೆಗಾನೆ ಎಂಬ ಗಿರಿಜನ ಪರ್ವತ: ಹಿ ಚಿ ಬೋರಲಿಂಗಯ್ಯ	
ಭೋದನೆ ಮತ್ತು ಕಲಿಕಾ ವಿಧಾನ	ಪುಸ್ತಕ ಆಧಾರಿತ ಬ್ಲಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನ, ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ಬಳಸುವುದು, ಪಿಪ್ಟ್ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ವೀಡಿಯೋಗಳನ್ನು ಬಳಸುವುದು, ವಿದ್ಯಾರ್ಥಿಗಳೊಂದಿಗೆ ಚಟುವಟಿಕೆಗಳ ಮುಕಾಂತರ ಚರ್ಚಿಸುವುದು.

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಕಲಿಕೆಯಿಂದ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಆಗುವ ಪರಿಣಾಮಗಳು (course Outcomes):

Course outcomes (Course Skills Set)

After successfully completing the course, the student will be able to understand the topics:

Course Code	CO	COURSE OUTCOME (CO)	PO
22MA1HSSAK / 22MA2HSSAK	**CO 1**	ಕನ್ನಡ ಭಾಷೆ, ಸಾಹಿತ್ಯ ಮತ್ತು ಕನ್ನಡ ಸಂಸ್ಕೃತಿಯ ಪರಿಚಯವಾಗುತ್ತದೆ.	PO10
	CO 2	ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಆಧುನಿಕ ಪೂರ್ವ ಮತ್ತು ಆಧುನಿಕ ಕಾವ್ಯಗಳ ಹಾಗೂ ಕನ್ನಡ ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ಆಸಕ್ತಿ ಮೂಡುತ್ತದೆ.	PO10
	CO 3	ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯ, ಕನ್ನಡ ಭಾಷಾಭ್ಯಾಸ ಹಾಗೂ ಪ್ರವಾಸ ಕಥನಗಳ ಪರಿಚಯವಾಗುತ್ತದೆ.	PO9

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Assessment Details (both CIE and SEE)

Component	Type of assessment	Max. Marks	Total
CIE – Theory	AAT 1	10	100
	Test 1	40	
SEE	End Exam	50	

Only one CIE shall be conducted after CIE2 and before CIE 3. SEE paper shall be set for 50 Questions, each of the 01 marks. The pattern of the Question paper is MCQ (Multiple Choice Questions). The time allotted 01 hour.

ಪಠ್ಯ ಪುಸ್ತಕ:

ಡಾ. ಹಿ. ಚಿ. ಬೋರಲಿಂಗಯ್ಯ ಮತ್ತು ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ, ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ, ಪ್ರಸಾರಾಂಗ, ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ.

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Course Title	Constitution of India and Professional Ethics	Course Code	22MA1HSCIP / 22MA2HSCIP
Credits	01	L-T-P-S	1-0-0-0

Total Hours: 15

Course objectives:

The course **Constitution of India and Professional Ethics (22MA1HSCIP/22MA2HSCIP)** will enable the students,

- To educate students about the country's highest law.
- To be familiar with the political system and practices of both state and the central government.
- To know about the risk, workplace safety and to understand issues related to the profession.

Teaching-Learning Process

These are sample strategies, which teachers can use to accelerate the attainment of the various course outcomes.

- Innovative lecture methodologies to be adapted to improve the teaching and learning process.
- Short videos for better understanding and group discussion.
- Encourage collaborative (Group Learning) learning in the class.
- Ask Higher Order Thinking (HOT) questions in the class, which promotes critical thinking.
- Classroom discussions focused on case studies help students strengthen their analytical skills and thinking abilities, such as the capacity to assess, generalise, and analyse knowledge rather than just recollect it.

UNIT-1

[03 hours]

Introduction to Indian Constitution

Indian Constitution: Introduction and Necessity of the Indian constitution, Making of the Constitution, Role of the Constituent Assembly. Preamble and Salient features of the Constitution of India, Fundamental Rights and its limitations.

Teaching-Learning Process	Chalk and talk method / Power Point Presentation

UNIT -2

[03 hours]

Fundamental Duties and Directive Principles of State Policy

Fundamental Duties and their significance. Directive Principles of State Policy: Importance and its relevance. Case Studies.

Teaching-Learning Process	Chalk and talk method / Power Point Presentation

UNIT -3

[03 hours]

Union Executive and State Executive

The Union Executive – The President and the Vice President, the Prime Minister and The Council of Ministers. The Union Parliament – Lok Sabha & Rajya Sabha. The Supreme Court of India.

State Executive – The Governors, the Chief Ministers and the Council of Ministers. The State Legislature – Legislative Assembly and Legislative Council. State High Courts.

Teaching-Learning Process	Chalk and talk method / Power Point Presentation

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UNIT-4

[03 hours]

Election Commission of India, Amendments and Emergency Provisions

Election Commission of India – Powers & Functions – Electoral Process in India.
Methods of Constitutional Amendments and their Limitations.
Important Constitutional Amendments – 42nd, 44th, 61st, 74th, 76th, 77th, 86th and 91st. Emergency Provisions. Case Studies.

Teaching-Learning Process	Chalk and talk method / Power Point Presentation

UNIT-5

[03 hours]

Professional Ethics

Scope and Aims of Engineering Ethics, Responsibilities of Engineers and impediments to Responsibilities. Honesty, Integrity and Reliability; Risks – Safety and Liability in Engineering. Case Studies

Teaching-Learning Process	Chalk and talk method / Power Point Presentation

Course outcomes (Course Skills Set)

At the end of the course, the student will have the ability to

COURSE CODE	CO	COURSE OUTCOME (CO)	PO	Strength
22MA1HSCIP / 22MA2HSCIP	CO1	Recognize the significance of the Indian Constitution as the supreme legal authority.	PO6, PO12	3
	CO2	Understand the powers & functions of organs of the government at the centre and state level.	PO6, PO12	3
	CO3	Apply the principles of moral obligations and duties to safeguard the public's welfare and safety.	PO8, PO12	2

Assessment Details (both CIE and SEE)

Component	Type of assessment	Max. Marks	Total
CIE – Theory	AAT 1	10	100
	Test 1	40	
SEE	End Exam	50	

Only one CIE shall be conducted after CIE2 and before CIE 3. SEE paper shall be set for 50 Questions, each of the 01 marks. The pattern of the Question paper is MCQ (Multiple Choice Questions). The time allotted 01 hour.

Text Books:

- "An Introduction to Constitution of India and Professional Ethics" by Merunandan K.B. and B.R. Venkatesh, Meragu Publications, 3rd edition, 2011.
- "Constitution of India & Professional Ethics & Human Rights" by Phaneesh K. R., Sudha Publications, 10th edition, 2016.

Reference Books:

- "V.N. Shukla's Constitution of India" by Prof (Dr.) Mahendra Pal Singh (Revised), Eastern Book Company, Edition: 13th Edition, 2017, Reprint 2019.
- "Ethics in Engineering" by Martin, W. Mike., Schinzinger, Roland., McGraw-Hill Education; 4th edition (February 6, 2004).

E books and online course materials:

1. https://www.smartzworld.com/notes/constitution-of-india-and-professional-ethics-notes-vtu-cip-pdf/
2. https://legalstudymaterial.com/constitution-of-india/

Question Paper Pattern:

SEE Multiple Choice Questions (Online Examination)

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