NEW HORIZON COLLEGE OF ENGINEERING

Autonomous College Permanently Affiliated to VTU, approved by AICTE & UGC
Accredited by NAAC with 'A' Grade, Accredited by NBA
New Horizon Knowlegde Park, Ring Road, Bellandur Post, Near Marathalli, Bangalore - 560103, INDIA

SCHEME &SYLLABUS OF FIRST YEAR BE

AS PER THE NATIONAL EDUCATION POLICY 2020

(COMMON TO ALL BRANCHES)

ACADEMIC YEAR 2022 -23

Program Outcomes as defined by NBA (PO)

Engineering Graduates will be able to:

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

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

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

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

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

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

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

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

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

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

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

NEW HORIZON COLLEGE OF ENGINEERING

VISION

To emerge as an institute of eminence in the fields of engineering, technology and management in serving the industry and the nation by empowering students with a high degree of technical, managerial and practical competence.

MISSION

To strengthen the theoretical, practical and ethical dimensions of the learning process by fostering a culture of research and innovation among faculty members and students.

To encourage long-term interaction between the academia and industry through their involvement in the design of the curriculum and its hands-on implementation.

To strengthen and mould students in professional, ethical, social and environmental dimensions by encouraging participation in co-curricular and extracurricular activities.

QUALITY POLICY

To provide educational services of the highest quality both curricular and co-curricular to enable students integrate skills and serve the industry and society equally well at a global level.

VALUES

Academic Freedom	Innovation
Integrity	Professionalism
Inclusiveness	Social Responsibility

DEPARTMENT OF APPLIED SCIENCES

VISION

To build strong and sustainable platform for churning out quality students bearing appreciable conceptual knowledge and engineering mind sets to their respective branch department(s)

MISSION

To develop and nurture dedicated teaching-learning team equipped with strong personality traits towards application driven approach, encompassing all stakeholders

QUALITY POLICY

To provide education services of the highest quality both curricular and co-curricular so that our students can integrate skills and serve industry and society equally well at the Global level.

CREDIT SCHEME FOR I SEMESTER BE

AIML/ DS /ISE/ ME												**Chemistry Cycle**		
S. No.	**Course and Course Code**		**Course Title**	**BOS**	**Credit Distribution**				**Overall Credits**	**Contact Hours**	**Marks**		
					L	**T**	**P**	**S**			**CIE**	**SEE**	**Total**
1	ASC	22MAT11	Applied Mathematics for Engineers – I	AS	3	0	1	0	4	4+2	50	50	100
2	ASC	22CHE12	Applied Chemistry for Engineers	AS	3	0	1	0	4	4+2	50	50	100
3	ESC	22CAD13	Computer Aided Engineering Drawing	ME	2	0	1	0	3	5	50	50	100
4	ESC-I	22ESC14*	Engineering Science Course	Any Dept.	3	0	0	0	3	4	50	50	100
5	PLC-I	22PLC15*	Program Language Course	CS/IS	2	0	1	0	3	3+2	50	50	100
6	AEC	22ENG16	Communicative English	HSS	0	0	1	0	1	2	50	50	100
7	HSS	22CIP17	Indian Constitution and Professional Ethics	HSS	1	0	0	0	1	2	50	50	100
8	AEC	22SFH18	Scientific Foundation for Health with Yoga	CV	1	0	0	0	1	2	50	50	100
Total									20	32	400	400	800

CSE/ECE/EEE												**Physics Cycle**	
S. No.	**Course and Course Code**		**Course Title**	**BOS**	**Credit Distribution**				**Overall Credits**	**Contact Hours**	**Marks**		
					L	**T**	**P**	**S**			**CIE**	**SEE**	**Total**
1	ASC	22MAT11	Applied Mathematics for Engineers - I	AS	3	0	1	0	4	4+2	50	50	100
2	ASC	22PHY12	Applied Physics for Engineers	AS	3	0	1	0	4	4+2	50	50	100
3	ESC	22CSE13	Data Structures using C	CS	2	0	0	0	2	3	50	50	100
4	ESC	22CSL13	Data Structures using C Lab	CS	0	0	1	0	1	2	50	50	100
5	ESC-I	22ESC14*	Engineering Science Course	Any Dept.	3	0	0	0	3	4	50	50	100
6	ETC-I	22ETC15*	Emerging Technology Course	Any Dept.	3	0	0	0	3	4	50	50	100
7	AEC	22ENG16	Communicative English	HSS	0	0	1	0	1	2	50	50	100
8	HSS	22KSK17 / 22KBK17	Samskrutika Kannada/ Balake Kannada	HSS	1	0	0	0	1	2	50	50	100
9	AEC	22IDT18	Innovation and Design Thinking	CV	1	0	0	0	1	2	50	50	100
Total									20	31	450	450	900

CREDIT SCHEME FOR II SEMESTER BE

CSE/ECE/EEE **Chemistry Cycle**

S. No.	Course and Course Code		Course Title	BOS	Credit Distribution				Overall Credits	Contact Hours	Marks		
					L	T	P	S			CIE	SEE	Total
1	ASC	22MAT21	Applied Mathematics for Engineers – II	AS	3	0	1	0	4	4+2	50	50	100
2	ASC	22CHE22	Applied Chemistry for Engineers	AS	3	0	1	0	4	4+2	50	50	100
3	ESC	22CAD23	Computer Aided Engineering Drawing	ME	1	0	2	0	3	5	50	50	100
4	ESC-II	22ESC24*	Engineering Science Course -1	Any Dept.	3	0	0	0	3	4	50	50	100
5	PLC-II	22PLC25*	Program Language Course -1	CS/ IS	2	0	1	0	3	3+2	50	50	100
6	AEC	22ENG26	Communicative English	HSS	0	0	1	0	1	2	50	50	100
7	HSS	22CIP27	Indian Constitution and Professional Ethics	HSS	1	0	0	0	1	2	50	50	100
8	AEC	22SFH28	Scientific Foundation for Health with Yoga	CV	1	0	0	0	1	2	50	50	100
Total									20	32	400	400	800

AIML/ DS /ISE/ ME **Physics Cycle**

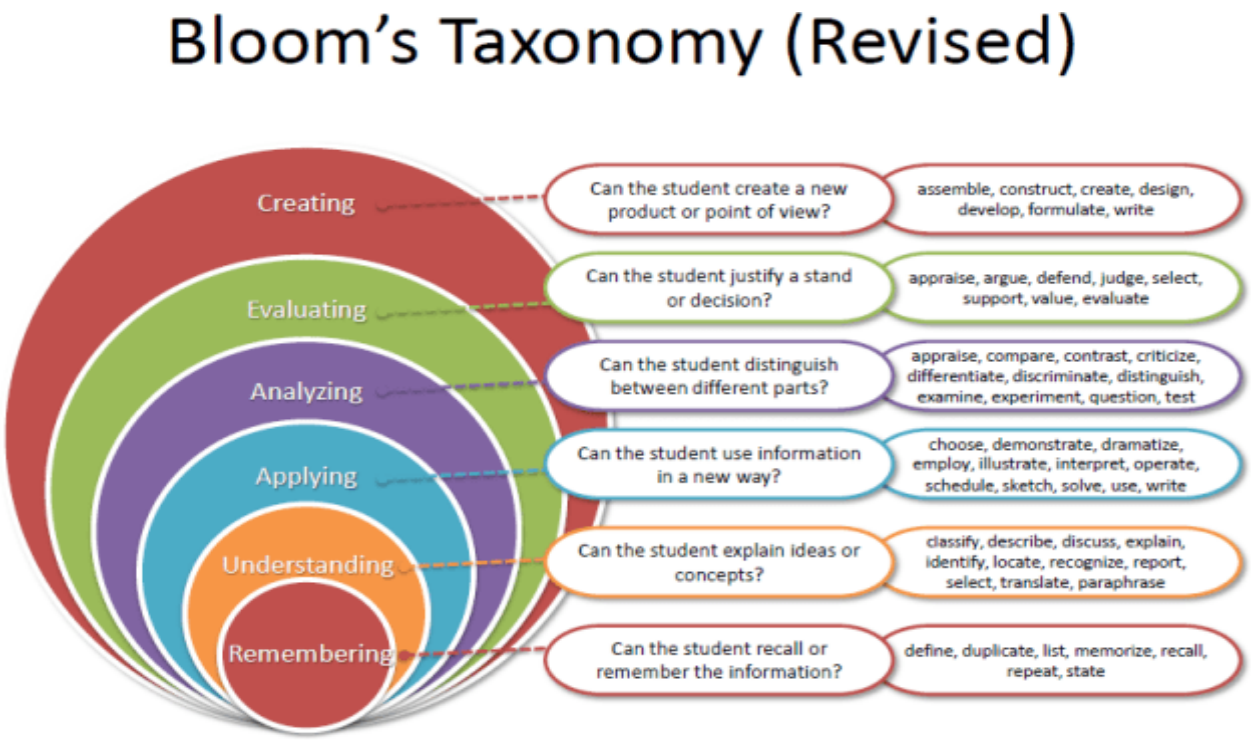
S. No.	Course and Course Code		Course Title	BOS	Credit Distribution				Overall Credits	Contact Hours	Marks		
					L	T	P	S			CIE	SEE	Total
1	ASC	22MAT21	Applied Mathematics for Engineers – II	AS	3	0	1	0	4	4+2	50	50	100
2	ASC	22PHY22	Applied Physics for Engineers	AS	3	0	1	0	4	4+2	50	50	100
3	ESC	22CSE23	Data Structures using C	CS	2	0	0	0	2	3	50	50	100
4	ESC	22CSL23	Data Structures using C Lab	CS	0	0	1	0	1	2	50	50	100
5	ESC-II	22ESC24*	Engineering Science Course	Any Dept.	3	0	0	0	3	4	50	50	100
6	ETC-II	22ETC25*	Emerging Technology Course 1	Any Dept.	3	0	0	0	3	4	50	50	100
7	AEC	22ENG26	Communicative English	HSS	0	0	1	0	1	2	50	50	100
8	HSS	22KSK27 / 22KBK27	Samskrutika Kannada/ Balake Kannada	HSS	1	0	0	0	1	2	50	50	100
9	AEC	22IDT28	Innovation and Design Thinking	CV	1	0	0	0	1	2	50	50	100
Total									20	31	450	450	900

KEY WORDS AND TERMINOLOGIES

OBE	Outcome Based Education (Outcome-Based Education is a student-centric teaching and learning methodology in which the course delivery, assessment are planned to achieve stated objectives and outcomes.
BoS	Board of Studies
L: T: P: S	Lecture: Tutorial: Practical: Self study
CIE	Continuous Internal Evaluation
SEE	Semester End Examination
CREDIT	A unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (lecture) or two hours of tutorial or two hours practical or two hours self-study per week. Credits of a course are distributed across L: T:P:S
CO	Course outcome (Is a statement that clearly describes what and how much or how well the student will know and be able to do after successfully completing the specified course – the essential knowledge, abilities, and attitudes that constitute the basic learning needed by a graduate of the course.
POs	Programme Outcomes (POs are statements about the knowledge, skills and attitudes (attributes) the graduate of a formal engineering program should have. POs deal with the general aspect of graduation for a particular program, and the competencies and expertise a graduate will possess after completion of the program). (Refer POs defined by NBA)
SGPA	Semester Grade Point Average (The performance of a student in a semester is indicated by a number called SGPA) $SGPA = \frac{\sum [\text{Course Credits x Grade Points}] \text{ for all the Courses in that semester}}{\sum [\text{Course Credits }] \text{ for all the Courses in that Semester}}$
CGPA	Cumulative Grade Point Average (which is the sum total of the SGPA's of all semesters or that of an academic year) $CGPA = \frac{\sum [\text{Course Credits x Grade Points}] \text{ for all Courses excluding those with F grades until that semester}}{\sum [\text{Course Credits}] \text{for all Courses excluding those with F grades until that semester}}$

Letter Grade and corresponding Grade Points on a typical 10 - Point scale									
Level	**Outstanding**	**Excellent**	**Very Good**	**Good**	**Above Average**	**Average**	**Pass**	**Fail**	**Not Eligible**
Grade	O	A+	A	B+	B	C	P	F	NE
Grade Points	10	9	8	7	6	5	4	0	0
Score (Marks) Range %	90-100	80-89	70-79	60-69	55-59	50-54	40-49	0-39	-

RBT	**Revised Blooms Taxonomy Levels** (There are six levels of cognitive learning according to the revised version of Bloom's Taxonomy. Each level is conceptually different. The six levels are **remembering(L1), understanding(L2), applying(L3), analyzing(L4), evaluating(L5), and creating(L6).**



APPLIED SCIENCES

APPLIED MATHEMATICS FOR ENGINEERS–I
(for AIML, CEE, CSE, DSE and ISE)

Course Code	**:22MAT11**	**CIE Marks**	**:50**
L: T: P: S	**:3: 0:1:0**	**SEE Marks**	**:50**
Credits	**:04**	**Exam Hours**	**:03**

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

CO1	Solve the system of linear equations by applying the ideas of linear algebra.
CO2	Compute eigenvalues and eigenvectors of a square matrix. Also analyze and simplify square matrices to diagonal forms.
CO3	Determine the extreme values of a function of two variables.
CO4	Explain the principles of applied mathematics through calculus.
CO5	Explain the counting techniques and combinatorics by using the context of discrete probability.
CO6	Demonstrate Python code for challenging problems in all modules using plots/displays, interpret and illustrate the mathematical procedures.

Mapping of Course Outcomes to Program Outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-
CO6	3	2	-	-	-	-	-	-	-	-	-	-

Course Syllabus			
Module No.	**Contents of the Module**	**Hours**	**COs**
1.	**Linear Algebra-1:** Elementary transformations, Reduction of the given matrix to echelon form, Rank of a Matrix, Consistency of a system of linear equations and solution. Solution of a system of linear homogeneous equations (trivial and non-trivial solutions), Solution of a system of non-homogeneous equations by Gauss-Jordon method.	**8**	**CO1 CO6**
2.	**Linear Algebra-2:** Linear transformations. Eigen values and Eigen vectors of a square matrix, Quadratic forms. Reduction of quadratic forms into canonical form, Nature of quadratic forms. **Application** to power of matrices using Diagonalization.	**8**	**CO2 CO6**
3.	**Partial derivatives**: Introduction to partial differentiation, partial differentiation of symmetric functions, Euler's theorem (Derivation and Problems), Jacobian-definition and Problems. **Applications:** Maxima and Minima of functions of two variables-Problems.	**8**	**CO3 CO6**

4.	**Differential Calculus:** **Polar Curves:** Angle between the radius vector and tangent (Derivation and Problems), angle between two curves (Problems), Pedal equation for polar curves (Problems). **Curvature and radius of curvature:** Cartesian, Parametric, Polar and Pedal forms (without proof) Problems.	**8**	**CO4** **CO6**
5.	**Properties of the Integers**: The Well Ordering Principle, Mathematical Induction, Fundamental Principles of Counting: Permutations, Combinations without repetition, The Binomial Theorem.	**8**	**CO5** **CO6**

List of Experiments in Python:

Sl. No.	Experiments	COs
1.	Finding the rank of a Matrix.	CO1 CO6
2.	Solving the system of linear homogeneous equations (trivial and non-trivial solutions).	CO1 CO6
3.	Compute the Eigen values and Eigen vectors of a square matrix.	CO2 CO6
4.	Diagonalize the Matrix.	CO2 CO6
5.	Finding the Partial Derivatives.	CO3 CO6
6.	Partial Derivatives by Jacobian Method.	CO3 CO6
7.	Finding the angle between the radius vector and tangent.	CO4 CO6
8.	Finding the radius of curvature in cartesian, parametric, polar and pedal forms.	CO4 CO6
9.	Finding the Permutations.	CO5 CO6
10.	Finding the Combinations.	CO5 CO6

Learning Resourses:

1. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley-India Publishers, 10th Edition, 2014, ISBN: 978-81-265-5423-2.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43rd Edition, 2014, ISBN: 978-81-7409-195-5.
3. Glyn James, Modern Engineering Mathematics, Prentice Hall, 4th Edition, 2015, ISBN: 978-0-273-73409-3
4. B. V. Ramana, Higher Engineering Mathematics, McGraw Hill Education (India) Private Limited, 4th Edition, 2016, ISBN: 978-0-07-063419-0.
5. H. K. Dass, Advanced Engineering Mathematics, S. Chand & Company Ltd., 28th Edition, 2012, ISBN: 81-219-0345-9.
6. N.P.Bali and Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publications (P) Ltd., 9th Edition, 2014, ISBN: 978-81-318-0832-0.
7. David C Lay, Linear Algebra and its Applications, Pearson Publishers, 4th Edition, 2011, ISBN: 978-0321385178.

Assessment Pattern:

CIE- Continuous Internal Evaluation (50 Marks).

Bloom's Category	Theory		Practical
	Three Tests (25 Marks)	Assignment (5 Marks)	Test (20 Marks)
Remember	5	2.5	2.5
Understand	5	2.5	2.5
Apply	10	-	10
Analyze	2.5	-	2.5
Evaluate	2.5	-	2.5
Create	-	-	-

SEE- Semester End Examination (50 Marks).

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	10
Understand	10
Apply	20
Analyze	5
Evaluate	5
Create	-

APPLIED MATHEMATICS FOR ENGINEERS–I
(for ECE and EEE)

Course Code:	**22MAT11**	**CIE Marks:**	**50**
L: T: P: S	**3:0:1:0**	**SEE Marks:**	**50**
Credits:	**04**	**Exam Hours:**	**03**

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

CO1	Solve the system of linear equations by applying the ideas of linear algebra.
CO2	Compute eigenvalues and eigenvectors of a square matrix. Also analyze and simplify square matrices to diagonal forms.
CO3	Determine the extreme values of a function of two variables.
CO4	Explain the principles of applied mathematics through calculus.
CO5	Explain the counting techniques and combinatorics by using the context of discrete probability.
CO6	Demonstrate Python code for challenging problems in all modules using plots/displays, interpret and illustrate the mathematical procedures.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-
CO6	3	2	-	-	-	-	-	-	-	-	-	-

Course Syllabus			
Module No.	**Contents of the Module**	**Hours**	**COs**
1.	**Linear Algebra-1:** Elementary transformations, Reduction of the given matrix to echelon form, Rank of a Matrix, Consistency of a system of linear equations and solution. Solution of a system of linear homogeneous equations (trivial and non-trivial solutions), Solution of a system of non-homogeneous equations by Gauss-Jordon method.	**8**	**CO1 CO6**
2.	**Linear Algebra-2:** Linear transformations. Eigen values and Eigen vectors of a square matrix, Quadratic forms. Reduction of quadratic forms into canonical form, Nature of quadratic forms. **Application** to power of matrices using Diagonalization.	**8**	**CO2 CO6**
3.	**Partial derivatives**: Introduction to partial differentiation, partial differentiation of symmetric functions, Euler's theorem (Derivation and Problems), Jacobian-definition and Problems. **Applications:** Maxima and Minima of functions of two variables-Problems.	**8**	**CO3 CO6**

4.	**Differential Calculus:** **Polar Curves:** Angle between the radius vector and tangent (Derivation and Problems), angle between two curves (Problems), Pedal equation for polar curves (Problems). **Curvature and radius of curvature:** Cartesian, Parametric, Polar and Pedal forms (without proof) Problems.	**8**	**CO4** **CO6**
5.	**Vector Calculus:** Gradient, Divergence, Curl-physical significance and problems. Solenoidal and Irrotational vector fields. **Applications:** Potential functions, line integral, Problems on Greens theorem (without proof and verification) and work done-Problems.	**8**	**CO5** **CO6**

List of Experiments in Python:

Sl. No.	Experiments	COs
1.	Finding the rank of a Matrix.	CO1 CO6
2.	Solving the system of linear homogeneous equations (trivial and non-trivial solutions).	CO1 CO6
3.	Compute the Eigen values and Eigen vectors of a square matrix.	CO2 CO6
4.	Diagonalize the Matrix.	CO2 CO6
5.	Finding the Partial Derivatives.	CO3 CO6
6.	Partial Derivatives by Jacobian Method.	CO3 CO6
7.	Finding the angle between the radius vector and tangent.	CO4 CO6
8.	Finding the radius of curvature in cartesian, parametric, polar and pedal forms.	CO4 CO6
9.	Finding the Gradient of a function	CO5 CO6
10.	Calculating the curl of a vector field/Evaluating the Line integral.	CO5 CO6

Learning Resourses:

1. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley-India Publishers, 10th Edition, 2014, ISBN: 978-81-265-5423-2.
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6. N.P.Bali and Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publications (P) Ltd., 9th Edition, 2014, ISBN: 978-81-318-0832-0.
7. David C Lay, Linear Algebra and its Applications, Pearson Publishers, 4th Edition, 2011, ISBN: 978-0321385178.

Assessment Pattern:

CIE- Continuous Internal Evaluation (50 Marks).

Bloom's Category	Theory		Practical
	Three Tests (25 Marks)	Assignment (5 Marks)	Test (20 Marks)
Remember	5	2.5	2.5
Understand	5	2.5	2.5
Apply	10	-	10
Analyze	2.5	-	2.5
Evaluate	2.5	-	2.5
Create	-	-	-

SEE- Semester End Examination (50 Marks).

Bloom's Category	SEE Marks (90% Theory+10% Practical Questions)
Remember	10
Understand	10
Apply	20
Analyze	5
Evaluate	5
Create	-

APPLIED MATHEMATICS FOR ENGINEERS–I
(for MEE)

Course Code:	**22MAT11**	**CIE Marks:**	**50**
L: T: P: S	**3:0:1:0**	**SEE Marks:**	**50**
Credits :	**04**	**Exam Hours:**	**03**

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

CO1	Solve the system of linear equations by applying the ideas of linear algebra.
CO2	Compute eigenvalues and eigenvectors of a square matrix. Also analyze and simplify square matrices to diagonal forms.
CO3	Determine the extreme values of a function of two variables.
CO4	Explain the principles of applied mathematics through calculus.
CO5	Apply the concepts of integration of functions on two/three variables over a region.
CO6	Demonstrate Python code for challenging problems in all modules using plots/displays, interpret and illustrate the mathematical procedures.

Mapping of Course Outcomes to Program Outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-
CO6	3	2	-	-	-	-	-	-	-	-	-	-

Course Syllabus

Module No.	**Contents of the Module**	**Hours**	**COs**
1.	**Linear Algebra-1:** Elementary transformations, Reduction of the given matrix to echelon form, Rank of a Matrix, Consistency of a system of linear equations and solution. Solution of a system of linear homogeneous equations (trivial and non-trivial solutions), Solution of a system of non-homogeneous equations by Gauss-Jordon method.	**8**	**CO1 CO6**
2.	**Linear Algebra-2:** Linear transformations. Eigen values and Eigen vectors of a square matrix, Quadratic forms. Reduction of quadratic forms into canonical form, Nature of quadratic forms. **Application** to power of matrices using Diagonalization.	**8**	**CO2 CO6**
3.	**Partial derivatives**: Introduction to partial differentiation, partial differentiation of symmetric functions, Euler's theorem (Derivation and Problems), Jacobian-definition and Problems. **Applications:** Maxima and Minima of functions of two variables-Problems.	**8**	**CO3 CO6**
4.	**Differential Calculus:** **Polar Curves:** Angle between the radius vector and tangent (Derivation and Problems), angle between two curves (Problems), Pedal equation for polar curves (Problems).	**8**	**CO4 CO6**

	Curvature and radius of curvature: Cartesian, Parametric, Polar and Pedal forms (without proof) Problems.		
5.	**Integral Calculus:** Problems on Double and triple integrals, evaluation of double integrals by changing the order of integration and changing into polar coordinates. **Applications:** Applications of double and triple integrals to find Area enclosed by plane curves and Volume of sphere and tetrahedron.	**8**	**CO5 CO6**

List of Experiments in Python:

Sl. No.	Experiments	COs
1.	Finding the rank of a Matrix.	CO1 CO6
2.	Solving the system of linear homogeneous equations (trivial and non-trivial solutions).	CO1 CO6
3.	Compute the Eigen values and Eigen vectors of a square matrix.	CO2 CO6
4.	Diagonalize the Matrix.	CO2 CO6
5.	Finding the Partial Derivatives.	CO3 CO6
6.	Partial Derivatives by Jacobian Method.	CO3 CO6
7.	Finding the angle between the radius vector and tangent.	CO4 CO6
8.	Finding the radius of curvature in cartesian, parametric, polar and pedal forms.	CO4 CO6
9.	Evaluating the Double Integration	CO5 CO6
10.	Evaluating the Triple Integration	CO5 CO6

Learning resourses:

1. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley-India Publishers, 10th Edition, 2014, ISBN: 978-81-265-5423-2.
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Assessment Pattern:

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Bloom's Category	Theory		Practical
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Apply	10	-	10
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Evaluate	2.5	-	2.5
Create	-	-	-

SEE- Semester End Examination (50 Marks).

Bloom's Category	SEE Marks
Remember	10
Understand	10
Apply	20
Analyze	
Evaluate	5
Create	-

APPLIED MATHEMATICS FOR ENGINEERS–II
(for AIML, CEE, CSE, DSE and ISE)

Course Code :	**22MAT21**	**CIE Marks:**	**50**
L: T: P: S	**3:0:1:0**	**SEE Marks:**	**50**
Credits :	**04**	**Exam Hours:**	**03**

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

CO1	Fit a suitable curve by the method of least squares and determine the lines of regression for a set of statistical data.
CO2	Solve initial and boundary value problems by using Laplace transform and also find the response of the system.
CO3	Develop the ability to construct mathematical models involving differential equations and interpret their solutions physically.
CO4	Interpret the linear differential equations.
CO5	Justify the concept of vectors as a tool for solving engineering problems.
CO6	Demonstrate Python code for challenging problems in all modules using plots/displays, interpret and illustrate the mathematical procedures.

Mapping of Course Outcomes to Program Outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-
CO6	3	2	-	-	-	-	-	-	-	-	-	-

Course Syllabus

Module No.	**Contents of the Module**	**Hours**	**CO'S**
1.	**Statistical Methods:** Fitting of the curves of the form $y = a + bx$, $y = a + bx + cx^2$, $y = ae^{bx}$, $y = ax^b$, and $y = ab^x$ by the method of least square-Problems. Correlation and Regression Lines-Problems.	**8**	**CO1 CO6**
2.	**Laplace and Inverse Laplace Transforms:** Definition and Laplace transforms of standard functions. Properties of Laplace transforms: Shifting properties, $t^n f(t)$, $\frac{f(t)}{t}$ forms. Periodic functions (without proof), unit-step function-Problems. Inverse Laplace Transform by partial fractions. **Applications of Laplace Transform:** Solution of linear differential equations.	**8**	**CO2 CO6**
3.	**Ordinary Differential Equations of first order:** Solution of first-order and first-degree differential equations: Problems on Exact, Linear and Bernoulli's differential equations. **Applications**: Orthogonal Trajectories, Newton's law of cooling, laws of decay and growth-Problems.	**8**	**CO3 CO6**

4.	**Linear differential equations of second and higher order:** Solution of initial and boundary value problems, Inverse differential operator techniques for the functions-e^{ax}, e^{ax} f(x), $\text{Sin}\,(ax+b), \text{Cos}\,(ax+b)$ and a x^n. Solution of Cauchy's and Legendre's homogeneous linear equations.	**8**	**CO4** **CO6**
5.	**Vector Calculus:** Gradient, Divergence, Curl-physical significance and problems. Solenoidal and Irrotational vector fields. **Applications:** Potential functions, line integral, Problems on Greens theorem (without proof and verification) and work done-Problems.	**8**	**CO5** **CO6**

List of Experiments in Python:

Sl. No.	Experiments	COs
1.	Finding the mean of x and y.	CO1 CO6
2.	Finding the Correlation coefficient between x and y.	CO1 CO6
3.	Finding the Laplace transform of a function.	CO2 CO6
4.	Finding the Inverse Laplace transform of a function by Partial fractions method.	CO2 CO6
5.	Solution of first-order differential equation.	CO3 CO6
6.	Solution by Newton's law of cooling.	CO3 CO6
7.	Solution of second order linear differential equation.	CO4 CO6
8.	Solution of homogeneous linear equation.	CO4 CO6
9.	Finding the Gradient of a function	CO5 CO6
10.	Calculating the curl of a vector field/Evaluating the Line integral.	CO5 CO6

Learning Resourses:

1. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley-India Publishers, 10th Edition, 2014, ISBN: 978-81-265-5423-2.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43rd Edition, 2014, ISBN: 978-81-7409-195-5.
3. Glyn James, Modern Engineering Mathematics, Prentice Hall, 4th Edition, 2015, ISBN: 978-0-273-73409-3
4. B. V. Ramana, Higher Engineering Mathematics, McGraw Hill Education (India) Private Limited, 4th Edition, 2016, ISBN: 978-0-07-063419-0.
5. H. K. Dass, Advanced Engineering Mathematics, S. Chand & Company Ltd., 28th Edition, 2012, ISBN: 81-219-0345-9.
6. N.P.Bali and Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publications (P) Ltd., 9th Edition, 2014, ISBN: 978-81-318-0832-0.
7. David C Lay, Linear Algebra and its Applications, Pearson Publishers, 4th Edition, 2011, ISBN: 978-0321385178.

Assessment Pattern:

CIE- Continuous Internal Evaluation (50 Marks).

Bloom's Category	Theory		Practical
	Three Tests (25 Marks)	Assignment (5 Marks)	Test (20 Marks)
Remember	5	2.5	2.5
Understand	5	2.5	2.5
Apply	10	-	10
Analyze	2.5	-	2.5
Evaluate	2.5	-	2.5
Create	-	-	-

SEE- Semester End Examination (50 Marks).

Bloom's Category	SEE Marks
Remember	10
Understand	10
Apply	20
Analyze	5
Evaluate	5
Create	-

APPLIED MATHEMATICS FOR ENGINEERS–II
(for ECE and EEE)

Course Code :	**22MAT21**	**CIE Marks:**	**50**
L: T: P: S	**3:0:1:0**	**SEE Marks:**	**50**
Credits :	**04**	**Exam Hours:**	**03**

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

CO1	Fit a suitable curve by the method of least squares and determine the lines of regression for a set of statistical data.
CO2	Solve initial and boundary value problems by using Laplace transform and also find the response of the system.
CO3	Develop the ability to construct mathematical models involving differential equations and interpret their solutions physically.
CO4	Interpret the linear differential equations.
CO5	Demonstrate the idea of Linear Dependence and Independence of sets in the vector space.
CO6	Demonstrate Python code for challenging problems in all modules using plots/displays, interpret and illustrate the mathematical procedures.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-
CO6	3	2	-	-	-	-	-	-	-	-	-	-

Course Syllabus			
Module No.	**Contents of the Module**	**Hours**	**CO'S**
1.	**Statistical Methods:** Fitting of the curves of the form $y = a + bx$, $y = a + bx + cx^2$, $y = ae^{bx}$, $y = ax^b$, and $y = ab^x$ by the method of least square-Problems. Correlation and Regression Lines-Problems.	**8**	**CO1 CO6**
2.	**Laplace and Inverse Laplace Transforms:** Definition and Laplace transforms of standard functions. Properties of Laplace transforms: Shifting properties, $t^n f(t)$, $\frac{f(t)}{t}$ forms. Periodic functions (without proof), unit-step function-Problems. Inverse Laplace Transform by partial fractions. **Applications of Laplace Transform:** Solution of linear differential equations.	**8**	**CO2 CO6**
3.	**Ordinary Differential Equations of first order:** Solution of first-order and first-degree differential equations: Problems on Exact, Linear and Bernoulli's differential equations. **Applications**: Orthogonal Trajectories, Newton's law of cooling, laws of decay and growth-Problems.	**8**	**CO3 CO6**

4.	**Linear differential equations of second and higher order:** Solution of initial and boundary value problems, Inverse differential operator techniques for the functions-e^{ax}, e^{ax} f(x), $\sin(ax+b)$, $\cos(ax+b)$ and $a\,x^n$. Solution of Cauchy's and Legendre's homogeneous linear equations.	**8**	**CO4** **CO6**
5.	**Vector Spaces:** Vector Space definition and examples, Subspaces and Spanning sets, Linear Dependence and Independence, Linear Independence and Spanning Sets, Basis and Dimension.	**8**	**CO5** **CO6**

List of Experiments in Python:

Sl. No.	Experiments	COs
1.	Finding the mean of x and y.	CO1 CO6
2.	Finding the Correlation coefficient between x and y.	CO1 CO6
3.	Finding the Laplace transform of a function.	CO2 CO6
4.	Finding the Inverse Laplace transform of a function by Partial fractions method.	CO2 CO6
5.	Solution of first-order differential equation.	CO3 CO6
6.	Solution by Newton's law of cooling.	CO3 CO6
7.	Solution of second order linear differential equation.	CO4 CO6
8.	Solution of homogeneous linear equation.	CO4 CO6
9.	Determine the set is linearly dependent/independent and its visualization.	CO5 CO6
10.	Computation of basis and dimension for a vector space.	CO5 CO6

Learning Resourses:

1. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley-India Publishers, 10th Edition, 2014, ISBN: 978-81-265-5423-2.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43rd Edition, 2014, ISBN: 978-81-7409-195-5.
3. Glyn James, Modern Engineering Mathematics, Prentice Hall, 4th Edition, 2015, ISBN: 978-0-273-73409-3
4. B. V. Ramana, Higher Engineering Mathematics, McGraw Hill Education (India) Private Limited, 4th Edition, 2016, ISBN: 978-0-07-063419-0.
5. H. K. Dass, Advanced Engineering Mathematics, S. Chand & Company Ltd., 28th Edition, 2012, ISBN: 81-219-0345-9.
6. N.P.Bali and Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publications (P) Ltd., 9th Edition, 2014, ISBN: 978-81-318-0832-0.
7. David C Lay, Linear Algebra and its Applications, Pearson Publishers, 4th Edition, 2011, ISBN: 978-0321385178.

Assessment Pattern:

CIE- Continuous Internal Evaluation (50 Marks).

Bloom's Category	Theory		Practical
	Three Tests (25 Marks)	Assignment (5 Marks)	Test (20 Marks)
Remember	5	2.5	2.5
Understand	5	2.5	2.5
Apply	10	-	10
Analyze	2.5	-	2.5
Evaluate	2.5	-	2.5
Create	-	-	-

SEE- Semester End Examination (50 Marks).

Bloom's Category	SEE Marks
Remember	10
Understand	10
Apply	20
Analyze	5
Evaluate	5
Create	-

APPLIED MATHEMATICS FOR ENGINEERS–II
(for MEE)

Course Code:	**22MAT21**	**CIE Marks:**	**50**
L: T: P: S	**3:0:1:0**	**SEE Marks:**	**50**
Credits:	**04**	**Exam Hours:**	**03**

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

CO1	Fit a suitable curve by the method of least squares and determine the lines of regression for a set of statistical data.
CO2	Solve initial and boundary value problems by using Laplace transform and also find the response of the system.
CO3	Develop the ability to construct mathematical models involving differential equations and interpret their solutions physically.
CO4	Interpret the linear differential equations.
CO5	Formulate real world problems using partial differential equations.
CO6	Demonstrate Python code for challenging problems in all modules using plots/displays, interpret and illustrate the mathematical procedures.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-
CO6	3	2	-	-	-	-	-	-	-	-	-	-

Course Syllabus

Module No.	Contents of the Module	Hours	CO'S
1.	**Statistical Methods:** Fitting of the curves of the form $y = a + bx$, $y = a + bx + cx^2$, $y = ae^{bx}$, $y = ax^b$, and $y = ab^x$ by the method of least square-Problems. Correlation and Regression Lines-Problems.	**8**	**CO1 CO6**
2.	**Laplace and Inverse Laplace Transforms:** Definition and Laplace transforms of standard functions. Properties of Laplace transforms: Shifting properties, $t^n f(t)$, $\frac{f(t)}{t}$ forms. Periodic functions (without proof), unit-step function-Problems. Inverse Laplace Transform by partial fractions. **Applications of Laplace Transform:** Solution of linear differential equations.	**8**	**CO2 CO6**
3.	**Ordinary Differential Equations of first order:** Solution of first-order and first-degree differential equations: Problems on Exact, Linear and Bernoulli's differential equations. **Applications**: Orthogonal Trajectories, Newton's law of cooling, laws of decay and growth-Problems.	**8**	**CO3 CO6**

4.	**Linear differential equations of second and higher order:** Solution of initial and boundary value problems, Inverse differential operator techniques for the functions-e^{ax}, e^{ax} f(x), $\text{Sin}\,(ax+b)$, $\text{Cos}\,(ax+b)$ and a x^n. Solution of Cauchy's and Legendre's homogeneous linear equations.	**8**	**CO4** **CO6**
5.	**Partial Differential equations:** Formation of partial differential equation by eliminating arbitrary constants and functions**.** Solution of Lagrange's partial differential equation, Solution by separation of variables method. **Applications:** Solutions of one-dimensional heat, wave and two-dimensional Laplace equation by separation of variables method.	**8**	**CO5** **CO6**

List of Experiments in Python:

Sl. No.	Experiments	COs
1.	Finding the mean of x and y.	CO1 CO6
2.	Finding the Correlation coefficient between x and y.	CO1 CO6
3.	Finding the Laplace transform of a function.	CO2 CO6
4.	Finding the Inverse Laplace transform of a function by Partial fractions method.	CO2 CO6
5.	Solution of first-order differential equation.	CO3 CO6
6.	Solution by Newton's law of cooling.	CO3 CO6
7.	Solution of second order linear differential equation.	CO4 CO6
8.	Solution of homogeneous linear equation.	CO4 CO6
9.	Solution of one-dimensional heat equation.	CO5 CO6
10.	Solution of one-dimensional wave equation	CO5 CO6

Learning Resourses:

1. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley-India Publishers, 10th Edition, 2014, ISBN: 978-81-265-5423-2.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43rd Edition, 2014, ISBN: 978-81-7409-195-5.
3. Glyn James, Modern Engineering Mathematics, Prentice Hall, 4th Edition, 2015, ISBN: 978-0-273-73409-3
4. B. V. Ramana, Higher Engineering Mathematics, McGraw Hill Education (India) Private Limited, 4th Edition, 2016, ISBN: 978-0-07-063419-0.
5. H. K. Dass, Advanced Engineering Mathematics, S. Chand & Company Ltd., 28th Edition, 2012, ISBN: 81-219-0345-9.
6. N.P.Bali and Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publications (P) Ltd., 9th Edition, 2014, ISBN: 978-81-318-0832-0.
7. David C Lay, Linear Algebra and its Applications, Pearson Publishers, 4th Edition, 2011, ISBN: 978-0321385178.

Assessment Pattern:

CIE- Continuous Internal Evaluation (50 Marks).

Bloom's Category	Theory		Practical
	Three Tests (25 Marks)	Assignment (5 Marks)	Test (20 Marks)
Remember	5	2.5	2.5
Understand	5	2.5	2.5
Apply	10	-	10
Analyze	2.5	-	2.5
Evaluate	2.5	-	2.5
Create	-	-	-

SEE- Semester End Examination (50 Marks).

Bloom's Category	SEE Marks
Remember	10
Understand	10
Apply	20
Analyze	5
Evaluate	5
Create	-

APPLIED CHEMISTRY FOR ENGINEERS
(FOR CSE/ISE/AIML/CE/DS)

Course Code: 22CHE12/22 **Credits:4**
L: T: P: S - 3:0:1:0 **CIE Marks:50**
Exam: 03hours **SEE Marks:50**

Course Outcomes: On completion of the course, student will be able to

CO1	Select the alternative technologies and methods to exploit natural resources in an efficient way.
CO2	Explain the chemistry behind engineering materials used in various devices.
CO3	Apply the knowledge of advanced engineering materials in emerging fields
CO4	Analyze the existing problems and find the solutions with respect to engineering materials, energy production and other natural resources.
CO5	Examine the performance and usage of engineering materials with the knowledge of chemistry.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12
CO1	3	1	-	-	-	-	1	-	-	-	-	-
CO2	3	1	-	-	-	-	1	-	-	-	-	-
CO3	3	1	-	-	-	-	1	-	-	-	-	-
CO4	3	1	-	-	-	-	1	-	-	-	-	-
CO5	3	1	-	-	-	-	1	-	-	-	-	-

	COURSE SYLLABUS		
Module No	**CONTENTS OF THE MODULE**	**Hours**	**COS**
1	**Energy Conversion and Storage** **Fundamentals of Electrochemistry**: Gibb's free energy, Single electrode potential, Galvanic cell, Concentration cell, EMF, Derivation of Nernst equation and Numerical. (2Hrs) **Batteries:** Introduction, classification, characteristics. Construction, working and applications of Zn- air and Li -ion battery (2Hrs) **Fuel cell** -Definition and classification. Construction, working and applications of solid oxide fuel cell (SOFC) (1Hr) **Photo Voltaic Cells –** Introduction. Construction and working of silicon solar cell and Dye-sensitized solar cell, Advantages and disadvantages of PV cells (2Hrs) **Super Capacitors:** Introduction and classification. Construction, working and applications of electro chemical double layer capacitors. (1Hr)	**8**	CO1 CO2 CO3 CO4 CO5
2	**Corrosion Science and Analytical techniques:** Electrochemical theory of corrosion. Types of corrosion - differential metal, differential aeration corrosion (pitting and waterline) and stress corrosion Caustic embrittlement. Factors influencing rate of corrosion- Nature of the metal, Relative anodic and cathodic areas and Nature of the corrosion product, selection and design of materials. Corrosion penetration rate (CPR) - Introduction and numerical problem. (3Hrs)		CO1 CO2 CO3

	Corrosion control techniques: – protective coatings – metal coatings (Anodic and Cathodic metal coatings taking Galvanization and Tinning as example). Inorganic coatings - Anodizing of aluminum. Cathodic protection by sacrificial anodic method and Impressed voltage method. (2Hrs) **Metal Finishing** -Introduction and technological importance. Electro plating of Chromium and applications (1Hr) **Analytical Techniques:** Introduction. Principle, instrumentation and applications of UV-Visible spectrophotometry and conductometry.	**8**	CO4 CO5
3	**Nano Materials and Display Systems** **Nanomaterials**: Introduction, Size dependent properties. Classification based on dimensions (0D, 1D, 2D and 3D. Bottom up and top down approach of nano material synthesis, Synthesis and applications of copper oxide nanoparticles by co-precipitation method, carbon nano tubes(CNTs) by chemical vapor deposition. (4Hrs). Nano composites – Introduction **Display systems**: Liquid crystals - Introduction, classification, properties and application in Liquid Crystal Displays (LCD's). Properties and application of Organic light emitting diodes (OLED's) and Quantum Light emitting diodes (QLED's). Perovskite materials- Introduction, structure, properties and applications in optoelectronic devices. (4 Hrs)	**8**	CO1 CO2 CO3 CO4 CO5
4	**Air and water Chemistry** **Chemical aspects of air pollution**: Introduction to Primary and secondary air pollutants, Selective catalytic reduction of NOx, Chemical capturing of carbon dioxide, Electro static precipitation technique for the removal of particulate matter and smoke in mining industries. **Chemical aspects of water pollution**: Determination of chemical oxygen demand of Industry waste water sample, problems on it. Sewage treatment - primary and secondary methods. Softening of water by ion exchange method. Desalination of sea water by electro-dialysis. Reverse osmosis process in water purification. Photo catalytic dye degradation in water by TiO_2 nano particles.	**8**	CO1 CO2 CO3 CO4 CO5
5	**Chemistry of Materials for memory and E-Waste Management:** **Materials for memory:** Introduction, Basic concepts of electronic memory, History of organic/polymer electronic memory devices, Classification of electronic memory devices, types of organic memory devices (organic molecules, polymeric materials, organic-inorganic hybrid materials), organic superconducting materials. **E-Waste Management:** Introduction, sources of e-waste, Composition, Characteristics, and Need of e-waste management. E - waste. Toxic materials used in manufacturing electronic and electrical products, health hazards due to exposure to e-waste, recycling and recovery, different approaches of recycling (separation, Thermal treatments, hydrometallurgical extraction, pyro metallurgical methods, direct recycling). Extraction of gold and Cu from E-waste. Li – ion battery recycling.	**8**	CO1 CO2 CO3 CO4 CO5

Learning Resources:

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

1. Wiley Engineering Chemistry, Wiley India Pvt. Ltd. New Delhi, 2013- 2nd Edition. 20.11.2022
2. Engineering Chemistry, Satyaprakash & Manisha Agrawal, Khanna Book Publishing, Delhi
3. A Text Book of Engineering Chemistry, Shashi Chawla, Danpat Rai prakashan.
4. Essentials of Physical Chemistry, Bahl&Tuli, S.Chand Publishing
5. Text Book of Polymer Science, F.W. Billmeyer, John Wiley & Sons, 4th Edition, 1999.
6. Nanotechnology A Chemical Approach to Nanomaterials, G.A. Ozin & A.C. Arsenault, RSC Publishing, 2005.
7. Corrosion Engineering, M. G. Fontana, N. D. Greene, McGraw Hill Publications, New York, 3rd Edition, 1996.
8. Linden's Handbook of Batteries, Kirby W. Beard, Fifth Edition, McGraw Hill, 2019.
9. OLED Display Fundamentals and Applications, Takatoshi Tsujimura, Wiley–Blackwell , 2012
10. Supercapacitors: Materials, Systems, and Applications, Max Lu, Francois Beguin, Elzbieta Frackowiak, Wiley-VCH; 1st edition, 2013.
11. Expanding the Vision of Sensor Materials. National Research Council 1995, Washington, DC: The National Academies Press. doi: 10.17226/4782.
12. Principles of Instrumental Analysis, Douglas A. Skoog, F. James Holler, Stanley R. Crouch Seventh Edition, Cengage Learning, 2020
13. Chemistry for Engineering Students, B. S. Jai Prakash, R. Venugopal, Sivakumaraiah & Pushpa Iyengar., Subash Publications, 5th Edition, 2014
14. "Engineering Chemistry", O. G. Palanna, Tata McGraw Hill Education Pvt. Ltd. New Delhi, Fourth Reprint, 2015.

Journal references

1. Design of materials for solid oxide fuel cells, permselective membranes, and catalysts for biofuel transformation into syngas and hydrogen based on fundamental studies of their real structure, transport properties, and surface reactivity, Current Opinion in Green and Sustainable Chemistry 2022, 33:100558.

2. Graphene and graphene oxide as new class of materials for corrosion control and protection: Present status and future scenario, Progress in Organic Coatings, Volume 147, October 2020, 105741.

3. Review on dye-sensitized solar cells (DSSCs): Advanced techniques and research trends, Renewable and Sustainable Energy Reviews, Volume 68, Part 1, February 2017, Pages 234-246

4. Photocatalytic degradation of organic pollutants using TiO2-based photocatalysts: A review, Journal of Cleaner Production 268 (2020) 121725.

5. Production, structural design, functional control, and broad applications of carbon nanofiber-based nanomaterials: A comprehensive review, Chemical Engineering Journal, Volume 402, 15 December 2020, 126189.

Web Links:

https://youtu.be/2zr1-GKKet0 - demonstration of galvanic cell 4 min
https://youtu.be/s6rQI7t9XM4 - p and n type extrensic semiconductor
https://youtu.be/8nJXN6kwyqA -solar
https://youtu.be/9OVtk6G2TnQ - Battery history – how does it works
https://youtu.be/G5McJw4KkG8 - Li-ion battery works
https://youtu.be/g1TfQ9rypHI - DSSC
https://youtu.be/f6WYxkhum-s - Galvanizing of Steel
https://www.youtube.com/watch?v=0yl35W0o9S0&t=118s - Anodizing of Al
https://www.youtube.com/watch?v=iLgiTAz86Hw - Cr plating

Assessment Matrix
CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Internal Test (25Marks)	Assignment/Quiz/ alternate assessment (5 Marks)	Lab CIE (20 Marks)
Remember	5		**20**
Understand	10		
Apply	5	3	
Analyze	5	2	
Evaluate		-	
Create	-	-	

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE (50)
Remember	10
Understand	20
Apply	10
Analyze	10

APPLIED CHEMISTRY FOR ENGINEERS
(For ECE& EEE)

Course Code: 22CHE12/22 **Credits:4**
L: T: P: S - 3:0:1:0 **CIE Marks:50**
Exam: 03hours **SEE Marks:50**

Course Outcomes: On completion of the course, student will be able to

CO1	Select the alternative technologies and methods to exploit natural resources in an efficient way.
CO2	Explain the chemistry behind engineering materials used in various devices.
CO3	Apply the knowledge of advanced engineering materials in emerging fields
CO4	Analyze the existing problems and find the solutions with respect to engineering materials, energy production and other natural resources.
CO5	Examine the performance and usage of engineering materials with the knowledge of chemistry.

Mapping of Course Outcomes to Program Outcomes:

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

	COURSE SYLLABUS		
Module No	**CONTENTS OF THE MODULE**	**Hours**	**COS**
1	**Energy Conversion and Storage** **Fundamentals of Electrochemistry**: Gibb's free energy, Single electrode potential, Galvanic cell, Concentration cell EMF, Derivation of Nernst equation and Numerical. (2Hrs) **Batteries:** Introduction, classification, characteristics. Construction, working and applications of Zn- air and Li -ion battery (2Hrs) **Fuel cell** -Definition and classification. Construction, working and applications of solid oxide fuel cell (SOFC) (1Hr) **Photo Voltaic Cells –** Introduction. Construction and working of silicon solar cell and Dye-sensitized solar cell, Advantages and disadvantages of PV cells (2Hrs) **Super Capacitors:** Introduction and classification. Construction, working and applications of electro chemical double layer capacitors. (1Hr)	**8**	CO1 CO2 CO3 CO4 CO5
2	**Corrosion Science and Analytical techniques:** Electrochemical theory of corrosion. Types of corrosion –differential metal, differential aeration corrosion (pitting and waterline) and stress corrosion Caustic embrittlement. Factors influencing rate of corrosion- Nature of the metal, Relative anodic and cathodic areas and Nature of the corrosion product, selection and design of materials. Corrosion penetration rate (CPR) - Introduction and numerical problem. (3Hrs)	**8**	CO1 CO2 CO3 CO4 CO5

	Corrosion control techniques: – protective coatings – metal coatings (Anodic and Cathodic metal coatings taking Galvanization and Tinning as example). Inorganic coatings - Anodizing of aluminum. Cathodic protection by sacrificial anodic method and Impressed voltage method. (2Hrs) **Metal Finishing** -Introduction and technological importance. Electro plating of Chromium and applications (1Hr) **Analytical Techniques:** Introduction. Principle, instrumentation and applications of UV-Visible spectrophotometry and conductometry.		
3	**Nano Materials and Display Systems** **Nanomaterials**: Introduction, Size dependent properties. Classification based on dimensions (0D, 1D, 2D and 3D. Bottom up and top down approach of nano material synthesis, Synthesis and applications of copper oxide nanoparticles by co-precipitation method, carbon nano tubes(CNTs) by chemical vapor deposition. (4Hrs). Nano composites – Introduction. **Display systems**: Liquid crystals - Introduction, classification, properties and application in Liquid Crystal Displays (LCD's). Properties and application of Organic light emitting diodes (OLED's) and Quantum Light emitting diodes (QLED's). Perovskite materials- Introduction, Structure, properties and applications in optoelectronic devices. (4 Hrs)	**8**	CO1 CO2 CO3 CO4 CO5
4	**Air and water Chemistry** **Chemical aspects of air pollution**: Introduction to Primary and secondary air pollutants, Selective catalytic reduction of NOx, Chemical capturing of carbon dioxide, Electro static precipitation technique for the removal of particulate matter and smoke in mining industries. **Chemical aspects of water pollution**: Determination of chemical oxygen demand of Industry waste water sample, problems on it. Sewage treatment - primary and secondary methods. Softening of water by ion exchange method. Desalination of sea water by electro-dialysis. Reverse osmosis process in water purification. Photo catalytic dye degradation in water by TiO_2 nano particles.	**8**	CO1 CO2 CO3 CO4 CO5
5	**Chemistry of Electronic Materials and Sensors** **Semiconductors:** Introduction, production of electronic grade silicon by Czochralski process (CZ) and solar grade by Union carbide process. **Polymers:** Introduction, Glass transition temperature - Definition**,** Factors influencing Tg- Flexibility, intermolecular forces, molecular mass. Significance of Tg. **Conducting polymers** – Synthesis and conducting mechanism of polyacetylene and Poly aniline **PCB:** Double sided PCB making using copper electro less plating. **Sensors:** Introduction to Electrochemical sensors, Thermometric sensors and Optical sensors. Construction and working of P^H sensor.	**8**	CO1 CO2 CO3 CO4 CO5

Learning Resources:

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

1. Wiley Engineering Chemistry, Wiley India Pvt. Ltd. New Delhi, 2013- 2nd Edition. 20.11.2022
2. Engineering Chemistry, Satyaprakash & Manisha Agrawal, Khanna Book Publishing, Delhi
3. A Text Book of Engineering Chemistry, Shashi Chawla, Danpat Rai prakashan.
4. Essentials of Physical Chemistry, Bahl&Tuli, S.Chand Publishing
5. Text Book of Polymer Science, F.W. Billmeyer, John Wiley & Sons, 4th Edition, 1999.

6. Nanotechnology A Chemical Approach to Nanomaterials, G.A. Ozin & A.C. Arsenault, RSC Publishing, 2005.
7. Corrosion Engineering, M. G. Fontana, N. D. Greene, McGraw Hill Publications, New York, 3rd Edition, 1996.
8. Linden's Handbook of Batteries, Kirby W. Beard, Fifth Edition, McGraw Hill, 2019.
9. OLED Display Fundamentals and Applications, Takatoshi Tsujimura, Wiley–Blackwell , 2012
10. Supercapacitors: Materials, Systems, and Applications, Max Lu, Francois Beguin, Elzbieta Frackowiak, Wiley-VCH; 1st edition, 2013.
11. Expanding the Vision of Sensor Materials. National Research Council 1995, Washington, DC: The National Academies Press. doi: 10.17226/4782.
12. Principles of Instrumental Analysis, Douglas A. Skoog, F. James Holler, Stanley R. Crouch Seventh Edition, Cengage Learning, 2020
13. Chemistry for Engineering Students, B. S. Jai Prakash, R. Venugopal, Sivakumaraiah & Pushpa Iyengar., Subash Publications, 5th Edition, 2014
14. "Engineering Chemistry", O. G. Palanna, Tata McGraw Hill Education Pvt. Ltd. New Delhi, Fourth Reprint, 2015.

Journal references

6. Design of materials for solid oxide fuel cells, permselective membranes, and catalysts for biofuel transformation into syngas and hydrogen based on fundamental studies of their real structure, transport properties, and surface reactivity, Current Opinion in Green and Sustainable Chemistry 2022, 33:100558.
7. Graphene and graphene oxide as new class of materials for corrosion control and protection: Present status and future scenario, Progress in Organic Coatings, Volume 147, October 2020, 105741.
8. Review on dye-sensitized solar cells (DSSCs): Advanced techniques and research trends, Renewable and Sustainable Energy Reviews, Volume 68, Part 1, February 2017, Pages 234-246
9. Photocatalytic degradation of organic pollutants using TiO_2-based photocatalysts: A review, Journal of Cleaner Production 268 (2020) 121725.
10. Production, structural design, functional control, and broad applications of carbon nanofiber-based nanomaterials: A comprehensive review, Chemical Engineering Journal, Volume 402, 15 December 2020, 126189.

Web Links:

https://youtu.be/2zr1-GKKet0 - demonstration of galvanic cell 4 min
https://youtu.be/s6rQI7t9XM4 - p and n type extrensic semiconductor
https://youtu.be/8nJXN6kwyqA -solar
https://youtu.be/9OVtk6G2TnQ - Battery history – how does it works
https://youtu.be/G5McJw4KkG8 - Li-ion battery works
https://youtu.be/g1TfQ9rypHI - DSSC
https://youtu.be/f6WYxkhum-s - Galvanizing of Steel
https://www.youtube.com/watch?v=0yl35W0o9S0&t=118s - Anodizing of Al
https://www.youtube.com/watch?v=iLgiTAz86Hw - Cr plating

Assessment Matrix
CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Internal Test (25Marks)	Assignment/Quiz/ alternate assessment (5 Marks)	Lab CIE (20 Marks)
Remember	5		**20**
Understand	10		
Apply	5	3	
Analyze	5	2	
Evaluate		-	
Create	-	-	

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE (50)
Remember	10
Understand	20
Apply	10
Analyze	10

APPLIED CHEMISTRY FOR ENGINEERS
(FOR MEE)

Course Code: 22CHE12/22 **Credits:4**
L: T: P: S - 3:0:1:0 **CIE Marks:50**
Exam: 03hours **SEE Marks:50**

Course Outcomes: On completion of the course, student will be able to

CO1	Select the alternative technologies and methods to exploit natural resources in an efficient way.
CO2	Explain the chemistry behind engineering materials used in various devices.
CO3	Apply the knowledge of advanced engineering materials in emerging fields
CO4	Analyze the existing problems and find the solutions with respect to engineering materials, energy production and other natural resources.
CO5	Examine the performance and usage of engineering materials with the knowledge of chemistry.

Mapping of Course Outcomes to Program Outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO 12**
CO1	3	1	-	-	-	-	1	-	-	-	-	-
CO2	3	1	-	-	-	-	1	-	-	-	-	-
CO3	3	1	-	-	-	-	1	-	-	-	-	-
CO4	3	1	-	-	-	-	1	-	-	-	-	-
CO5	3	1	-	-	-	-	1	-	-	-	-	-

	COURSE SYLLABUS		
	CONTENTS OF THE MODULE	**Hours**	**COS**
1	**Energy Conversion and Storage** **Fundamentals of Electrochemistry**: Gibb's free energy, Single electrode potential, Galvanic cell, Concentration cell EMF, Derivation of Nernst equation and Numerical. (2Hrs) **Batteries:** Introduction, classification, characteristics. Construction, working and applications of Zn- air and Li -ion battery (2Hrs) **Fuel cell** -Definition and classification. Construction, working and applications of solid oxide fuel cell (SOFC) (1Hr) **Photo Voltaic Cells –** Introduction. Construction and working of silicon solar cell and Dye-sensitized solar cell, Advantages and disadvantages of PV cells (2Hrs) **Super Capacitors:** Introduction. Construction, working and applications of electro chemical double layer capacitors. (1Hr)	**8**	CO1 CO2 CO3 CO4 CO5
2	**Corrosion Science and Analytical techniques:** Electrochemical theory of corrosion. Types of corrosion –differential metal, differential aeration corrosion (pitting and waterline) and stress corrosion- Caustic embrittlement. Factors influencing rate of corrosion- Nature of the metal, Relative anodic and cathodic areas and Nature of the corrosion product. Corrosion penetration rate (CPR) - Introduction and numerical problem. (3Hrs)	**8**	CO1 CO2 CO3 CO4 CO5

	Corrosion control techniques: – protective coatings – metal coatings (Anodic and Cathodic metal coatings taking Galvanization and Tinning as example). Inorganic coatings - Anodizing of aluminum. Cathodic protection by sacrificial anodic method and Impressed voltage method. Selection and design of materials. (2Hrs) **Metal Finishing** -Introduction and technological importance. Electro plating of Chromium and applications (1Hr) **Analytical Techniques:** Introduction. Principle, instrumentation and applications of UV-Visible spectrophotometry and conductometry.		
3	**Nano Materials and Display Systems** **Nanomaterials**: Introduction, Size dependent properties. Classification based on dimensions (0D, 1D, 2D and 3D. Bottom up and top down approach of nano material synthesis, Synthesis and applications of copper oxide nanoparticles by co-precipitation method, carbon nano tubes(CNTs) by chemical vapor deposition. (4Hrs). Nano composites – Introduction **Display systems**: Liquid crystals - Introduction, classification, properties and application in Liquid Crystal Displays (LCD's). Properties and application of Organic light emitting diodes (OLED's) and Quantum Light emitting diodes (QLED's). Perovskite materials- Introduction, Structure, properties and applications in optoelectronic devices. (4 Hrs)	**8**	CO1 CO2 CO3 CO4 CO5
4	**Air and water Chemistry** **Chemical aspects of air pollution**: Introduction to Primary and secondary air pollutants, Selective catalytic reduction of NOx, Chemical capturing of carbon dioxide, Electro static precipitation technique for the removal of particulate matter and smoke in mining industries. **Chemical aspects of water pollution**: Determination of chemical oxygen demand of Industry waste water sample, problems on it. Sewage treatment - primary and secondary methods. Softening of water by ion exchange method. Desalination of sea water by electro-dialysis. Reverse osmosis process in water purification. Photo catalytic dye degradation in water by TiO_2 nano particles.	**8**	CO1 CO2 CO3 CO4 CO5
5	**Phase Rule and Macromolecules for Engineering Applications:** **Phase rule:** Introduction, Definition of terms: phase, components, degree of freedom, phase rule equation. Phase diagram: two component-lead-silver system. **Polymers:** Introduction, Synthesis, properties and industrial applications of polyvinylchloride (PVC) and polystyrene. **Fibers:** Introduction, synthesis, properties and industrial applications of Kevlar. **Plastics:** Introduction, synthesis, properties and industrial applications of Teflon. **Composites:** Introduction, properties and industrial applications of carbon-based reinforced composites (graphene/carbon nano-tubes as fillers) and metal matrix polymer composites. **Lubricants:** Introduction, classification, properties and applications of lubricants.	**8**	CO1 CO2 CO3 CO4 CO5

Learning Resources:

Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

1. Wiley Engineering Chemistry, Wiley India Pvt. Ltd. New Delhi, 2013- 2nd Edition. 20.11.2022
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4. Essentials of Physical Chemistry, Bahl &Tuli, S.Chand Publishing
5. Text Book of Polymer Science, F.W. Billmeyer, John Wiley & Sons, 4th Edition, 1999.
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14. "Engineering Chemistry", O. G. Palanna, Tata McGraw Hill Education Pvt. Ltd. New Delhi, Fourth Reprint, 2015.

15. Journal references

16. Design of materials for solid oxide fuel cells, permselective membranes, and catalysts for biofuel transformation into syngas and hydrogen based on fundamental studies of their real structure, transport properties, and surface reactivity, Current Opinion in Green and Sustainable Chemistry 2022, 33:100558.
17. Graphene and graphene oxide as new class of materials for corrosion control and protection: Present status and future scenario, Progress in Organic Coatings, Volume 147, October 2020, 105741.
18. Review on dye-sensitized solar cells (DSSCs): Advanced techniques and research trends, Renewable and Sustainable Energy Reviews, Volume 68, Part 1, February 2017, Pages 234-246
19. Photocatalytic degradation of organic pollutants using TiO_2-based photocatalysts: A review, Journal of Cleaner Production 268 (2020) 121725.
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Web Links:

https://youtu.be/2zr1-GKKet0 - demonstration of galvanic cell 4 min
https://youtu.be/s6rQI7t9XM4 - p and n type extrensic semiconductor
https://youtu.be/8nJXN6kwyqA -solar
https://youtu.be/9OVtk6G2TnQ - Battery history – how does it works
https://youtu.be/G5McJw4KkG8 - Li-ion battery works
https://youtu.be/g1TfQ9rypHI - DSSC
https://youtu.be/f6WYxkhum-s - Galvanizing of Steel
https://www.youtube.com/watch?v=0yl35W0o9S0&t=118s - Anodizing of Al
https://www.youtube.com/watch?v=iLgiTAz86Hw - Cr plating

Assessment Matrix
CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Internal Test (25Marks)	Assignment/Quiz/ alternate assessment (5 Marks)	Lab CIE (20 Marks)
Remember	5		**20**
Understand	10		
Apply	5	3	
Analyze	5	2	
Evaluate		-	
Create	-	-	

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE (50)
Remember	10
Understand	20
Apply	10
Analyze	10

APPLIED CHEMISTRY LAB FOR ENGINEERS
(COMMON FOR ALL THE BRANCHES)

Sl. No.	List of Experiments	COs
	Instrumental Methods Analysis (Part A)	
1.	Estimation of iron in pharmaceutical sample by Electro chemical sensor.	CO1, CO2, CO3, CO4 & CO5
2.	Estimation of amount of copper in E -waste by optical sensor.	
3.	Estimation of mixture of acids using standard NaOH by conductometry sensor.	
4.	Determination of pKa value of a weak acid using pH sensor.	
5.	Determination of viscosity coefficient of a given organic liquid using Ostwald 's viscometer.	
	Volumetric Methods of Analysis (Part B)	
6.	Determination of total hardness of a sample of water by using standard EDTA solution	
7.	Estimation of percentage of calcium oxide in cement solution/ Milk.	
8.	Determination of chemical oxygen demand (COD) of the given industrial waste water sample	
9	Estimation of manganese dioxide in pyrolusite ore.	
10	Open ended experiment	
	Demonstration experiments &Application of Software tools in Chemistry	
11	Chemical Structure drawing using Chem Draw/ Chem Sketch	
12.	Statistical Analysis using Origin software	
13.	Synthesis of ZnO nano particles.	
14.	Determination of percentage of iron in TMT bar External indicator/ Internal indicator method	

Learning resources:

1. Vogel's A.I. A text book of quantitative analysis, 35th edition, 2012.
2. Willard, Merit, Dean and Settle, A text book of Instrumental analysis, 6th edition 2012.
3. G.H Jeffery, J Bassett, J Mendham and R.C. Denney Vogel's A.I. A text book of quantitative analysis, Dorling Kindersley (India) Pvt., Ltd. 35th edition, 2012.
4. Gary D Christian, Analytical Chemistry, Wiley India, 6th edition, 2015.

Assessment Matrix

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Performance in each lab session (10 experiments each for 10 marks)	Internal Test (25 marks scaled to 10)
Marks (Out of 25)	**10**	**10**
Remember	2	2
Understand	4	4
Apply	2	2
Analyze	2	2
Evaluate		
Create		

APPLIED PHYSICS FOR ENGINEERS
(FOR CSE/ISE/AIML/CE/DS BRANCHES)

Course Code	**: 22PHY12/22**	**Credits**	**: 04**
L: T: P: S	**: 3:0:1:0**	**CIE Marks**	**: 50**
Exam Hours	**: 03**	**SEE Marks**	**: 50**

Course Outcomes: On completion of the course, student would be able to:

CO1	Acquire various scientific phenomena related to physics
CO2	Embrace the concepts of physics for various Engineering fields.
CO3	Apply the concepts of physics to explore solutions in Engineering and technology
CO4	Analyze and solve problems related to Physics

Mapping of Course Outcomes to Program Outcomes:

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

COURSE SYLLABUS			
Module No.	**CONTENTS OF THE MODULE**	**Hours**	**Cos**
1	**Quantum Mechanics**: Wave-Particle dualism, de-Broglie hypothesis, phase velocity, group velocity, expression for de-Broglie wavelength from the concept of group velocity, Heisenberg's uncertainty principle, physical significance and application (non-existence of electron in nucleus), Wave function Properties, Physical significance, derivation of Time independent Schrödinger wave equation, eigen value and eigen function, Application of Schrödinger Equation (one dimensional potential well) Numerical problems. **Extra Learning: Application of Heisenberg's principle – Broadening of spectral lines, Application of Schrödinger Equation (free particle)**	**8**	**CO1, CO2, CO3, CO4.**
2	**Lasers & Fiber Optics** Introduction, Interaction of radiation with matter, expression for energy density at thermal equilibrium in terms of Einstein's coefficient, conditions and requisites of Laser, characteristics of laser, Quantum Dot Laser and their applications, Problems. Principle and propagation of light in optical fibers, Numerical aperture and Acceptance Angle, Types of Optical fibers, Attenuation, application- point to point telecommunication network, Problems. **Extra Learning: Application of Lasers & Optical fiber endoscopy**	**8**	**CO1, CO2, CO3, CO4**
3	**Conductors & Semiconductors** Quantum free electron theory, Fermi factor, variation of Fermi factor with Energy at T = 0K, T> 0K, Density of states (qualitative), Problems based on fermi factor. Introduction of semiconductor physics, conductivity in an intrinsic	**8**	**CO1, CO2, CO3, CO4**

	semiconductor , mention of electron concentration in intrinsic semiconductor(Ne) and mention of Nh , expression for intrinsic carrier concentration ni from Law of mass action, expression for position of Fermi level in Intrinsic semiconductors , graphical discussion of variation of fermi level with temperature and concentration in intrinsic and extrinsic semiconductors, Hall Effect and expression for Hall coefficient in n and p type semiconductors(derivation) Problems **Extra Learning: Application of Hall effect**		
4	**Dielectric & Magnetic Properties** Dielectrics, types, polarization, types and temperature dependence of polarization, Polarizability, Internal field (Expression for One dimensional solid), Clausius-Mossotti equation (Derivation), Dielectric loss, Dielectric relaxation, frequency dependence of εr, Ferroelectrics – properties & applications -. Ferromagnetic Domain theory, B-H curve, Soft and hard magnetic materials, applications, Problems on dielectrics **Extra Learning: Ferroelectric RAM & Piezo Electric materials**	**8**	**CO1, CO2, CO3, CO4**
5	**Quantum Computing & Superconductivity:** Introduction to Quantum Computing, Moore's law and its end , bits, Qbits, representation of qubit by Bloch sphere, quantum superposition, quantum entanglement, classical and quantum information comparison, difference between classical & quantum computing, Quantum gates Introduction to Superconductors, Temperature dependence of resistivity, Meissner Effect, Critical Current, Types of Super Conductors, BCS theory(qualitative), Applications in Quantum Computing. **Extra Learning: High temperature superconductivity**	**8**	**CO1, CO2, CO3, CO4**

Learning Resources

1. Modern Physics by R Murugeshan, Kiruthiga Sivaprasath, S Chand Publishing, 18th ed. 2016
2. Concepts of Modern Physics, Arthur Beiser, 7th Edition, 2017, Tata McGraw Hill
3. Fundamentals of Quantum Computing by Venkateswaran Kasirajan, Springer, 2021,ISBN978-3-030-63688-3ISBN978-3-030-63689-0(eBook) https://doi.org/10.1007/978-3-030-63689-0
4. A Textbook of Solid State Physics, S.O. Pillai, 6th Edition, 2010, New Age International
5. Engineering Physics, D K Bhattacharya, poonam Tandon, Oxford university Press, 2015
6. Solid State Physics, C Kittel, 8th Edition, 2019, Wiley Indian Edition
7. Engineering Physics, B. K. Pandey and S. Chaturvedi,1st edition, 2012, Cengage Publication
8. https://www.youtube.com/watch?v=R2X0FXQuGOk : Quantum Information Syatems

Assessment Matrix
CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Internal Test (25Marks)	Assignment/Quiz/ alternate assessment (5 Marks)	Lab CIE (20 Marks)
Remember	5		20
Understand	10		
Apply	5	3	
Analyze	5	2	
Evaluate		-	
Create	-	-	

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (50)
Remember	10
Understand	20
Apply	20

APPLIED PHYSICS FOR ENGINEERS

(For EEE & ECE)

Course Code	**: 22PHY12/22**	**Credits**	**: 04**
L: T: P:S	**: 3:0:1:0**	**CIE Marks**	**: 50**
Exam Hours	**: 03**	**SEE Marks**	**: 50**

Course Outcomes: On completion of the course, student would be able to:

CO1	Acquire various scientific phenomena related to physics
CO2	Embrace the concepts of physics for various Engineering fields.
CO3	Apply the concepts of physics to explore solutions in Engineering and technology
CO4	Analyze and solve problems related to Physics

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PO 9	PO1 0	PO11	PO1 2
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-

COURSE SYLLABUS			
Module No.	**CONTENTS OF THE MODULE**	**Hours**	**Cos**
1	**Quantum Mechanics**: Wave-Particle dualism, de-Broglie hypothesis, phase velocity, group velocity, expression for de-Broglie wavelength from the concept of group velocity, Heisenberg's uncertainty principle, physical significance and application (non-existence of electron in nucleus), Wave function Properties, Physical significance, derivation of Time independent Schrödinger wave equation, eigen value and eigen function, Application of Schrödinger Equation (one dimensional potential well) Numerical problems. **Extra Learning: Application of Heisenberg's principle – Broadening of spectral lines, Application of Schrödinger Equation (free particle)**	**8**	**CO1, CO2, CO3, CO4**
2	**Lasers & Fiber Optics** Introduction, Interaction of radiation with matter, expression for energy density at thermal equilibrium in terms of Einstein's coefficient, conditions and requisites of Laser, characteristics of laser, Quantum Dot Laser and their applications, Problems. Principle and propagation of light in optical fibers, Numerical aperture and Acceptance Angle, Types of Optical fibers, Attenuation, application- point to point telecommunication network, Problems. **Extra Learning: Application of Lasers & Optical fiber endoscopy**	**8**	**CO1, CO2, CO3, CO4**
3	**Conductors & Semiconductors** Quantum free electron theory, Fermi factor, variation of Fermi factor with Energy at T = 0K, T> 0K, Density of states (qualitative), Problems based on fermi factor. Introduction of semiconductor physics, conductivity in an intrinsic semiconductor , mention of electron concentration in intrinsic	**8**	**CO1, CO2, CO3, CO4**

	semiconductor(Ne) and mention of Nh , expression for intrinsic carrier concentration ni from Law of mass action, expression for position of Fermi level in Intrinsic semiconductors , graphical discussion of variation of fermi level with temperature and concentration in intrinsic and extrinsic semiconductors, Hall Effect and expression for Hall coefficient in n and p type semiconductors(derivation) -applications of Hall effect, Problems **Extra Learning: Application of Hall effect**		
4	**Dielectric & Magnetic Properties** Dielectrics, types, polarization, types and temperature dependence of polarization, Polarizability, Internal field (Expression for One dimensional solid), Clausius-Mossotti equation (Derivation), Dielectric loss, Dielectric relaxation, frequency dependence of εr, Ferroelectrics – properties & applications -. Ferromagnetic Domain theory, B-H curve, Soft and hard magnetic materials, applications, Problems on dielectrics **Extra Learning: Ferroelectric RAM & Piezo Electric materials**	**8**	**CO1, CO2, CO3, CO4**
5	**Maxwell's equations & EM Waves** Fundamentals of vector calculus. Divergence and curl of electric field and magnetic field (static), Gauss' divergence theorem and Stokes' theorem. Description of laws of electrostatics, magnetism and Faraday's laws of EMI. Current density & equation of Continuity; displacement current (with derivation) Maxwell's equations in vacuum The wave equation in differential form in free space (Derivation of the equation using Maxwell's equations), Plane electromagnetic waves in vacuum, their transverse nature, Numerical problems. **Extra Learning: Application of Maxwell's Equation**	**8**	**CO1, CO2, CO3, CO4**

Learning Resources

1. Modern Physics by R Murugeshan, Kiruthiga Sivaprasath, S Chand Publishing, 18th ed. 2016
2. Concepts of Modern Physics, Arthur Beiser, 7th Edition, 2017, Tata McGrawHill
3. Introduction to Electrodynamics, David Griffith, 4th Edition, Cambridge University press 2017
4. A Textbook of Solid State Physics, S.O. Pillai, 6th Edition, 2010,New Age International
5. Engineering Physics, D K Bhattacharya, poonam Tandon, Oxford university Press, 2015
6. Solid State Physics, C Kittel, 8th Edition, 2019, Wiley Indian Edition
7. Engineering Physics, B. K. Pandey and S. Chaturvedi,1st edition, 2012, Cengage Publication
8. https://www.coursera.org/learn/vector-calculus-engineers

Assessment Matrix

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Internal Test (25Marks)	Assignment/Quiz/ alternate assessment (5 Marks)	Lab CIE (20 Marks)
Remember	5		20
Understand	10		
Apply	5	3	
Analyze	5	2	
Evaluate		-	
Create	-	-	

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (50)
Remember	10
Understand	20
Apply	20

APPLIED PHYSICS FOR ENGINEERS
(FOR MEE)

Course Code	**: 22PHY12/22**	**Credits**	**: 04**
L: T: P:S	**: 3:0:1:0**	**CIE Marks**	**: 50**
Exam Hours	**: 03**	**SEE Marks**	**: 50**

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Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PO 9	PO1 0	PO11	PO1 2
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-

COURSE SYLLABUS			
Module No.	**CONTENTS OF THE MODULE**	**Hours**	**Cos**
1	**Quantum Mechanics**: Wave-Particle dualism, de-Broglie hypothesis, phase velocity, group velocity, expression for de-Broglie wavelength from the concept of group velocity, Heisenberg's uncertainty principle, physical significance and application (non-existence of electron in nucleus), Wave function Properties, Physical significance, derivation of Time independent Schrödinger wave equation, eigen value and eigen function, Application of Schrödinger Equation (one dimensional potential well) Numerical problems. **Extra Learning: Application of Heisenberg's principle – Broadening of spectral lines, Application of Schrödinger Equation (free particle)**	**8**	**CO1, CO2, CO3, CO4**
2	**Lasers & Fiber Optics** Introduction, Interaction of radiation with matter, expression for energy density at thermal equilibrium in terms of Einstein's coefficient, conditions and requisites of Laser, characteristics of laser, Quantum Dot Laser and their applications, Problems. Principle and propagation of light in optical fibers, Numerical aperture and Acceptance Angle, Types of Optical fibers, Attenuation, application- point to point telecommunication network, Problems. **Extra Learning: Application of Lasers & Optical fiber endoscopy**	**8**	**CO1, CO2, CO3, CO4**
3	**Conductors & Semiconductors** Quantum free electron theory, Fermi factor, variation of Fermi factor with Energy at T = 0K, T> 0K, Density of states (qualitative), Problems based on fermi factor.		

	Introduction of semiconductor physics, conductivity in an intrinsic semiconductor , mention of electron concentration in intrinsic semiconductor(Ne) and mention of Nh , expression for intrinsic carrier concentration ni from Law of mass action, expression for position of Fermi level in Intrinsic semiconductors , graphical discussion of variation of fermi level with temperature and concentration in intrinsic and extrinsic semiconductors, Hall Effect and expression for Hall coefficient in n and p type semiconductors(derivation) -applications of Hall effect, Problems **Extra Learning: Application of Hall effect**	**8**	**CO1, CO2, CO3, CO4**
4	**Dielectric & Magnetic Properties** Dielectrics, types, polarization, types and temperature dependence of polarization, Polarizability, Internal field (Expression for One dimensional solid), Clausius-Mossotti equation (Derivation), Dielectric loss, Dielectric relaxation, frequency dependence of εr, Ferroelectrics – properties & applications -. Ferromagnetic Domain theory, B-H curve, Soft and hard magnetic materials, applications, Problems on dielectrics **Extra Learning: Ferroelectric RAM & Piezo Electric materials**	**8**	**CO1, CO2, CO3, CO4**
5	**Instrumentation Physics** Introduction to materials – Nanomaterials and composites. Introduction to characterization techniques, XRD- Bragg's Law, X-ray Diffractometer, Particle size determination using XRD, XPS – Principle, instrumentation and application, AFM - Principle, instrumentation and application, SEM – Principle, instrumentation, Application and advantages. Problems on XRD **Extra Learning: Transmission Electron Microscopy**	**8**	**CO1, CO2, CO3, CO4**

Learning Resources

1. Modern Physics by R Murugeshan, Kiruthiga Sivaprasath, S Chand Publishing, 18th ed. 2016
2. Concepts of Modern Physics, Arthur Beiser, 7th Edition, 2017, Tata McGrawHill
3. Handbook of Materials Characterization, Surender Kumar Sharma, ISBN 978-3-319- 92954-5 ISBN 978-3-319-92955-2 (eBook), 2019, Springer
4. A Textbook of Solid State Physics, S.O. Pillai, 6th Edition, 2010, New Age International
5. Engineering Physics, D K Bhattacharya, poonam Tandon, Oxford university Press, 2015
6. Solid State Physics, C Kittel, 8th Edition, 2019, Wiley Indian Edition
7. Engineering Physics, B. K. Pandey and S. Chaturvedi,1st edition, 2012, Cengage Publication
8. https://www.youtube.com/watch?v=nSuHuaNT8kE – Material Characterisation – Part 1
9. https://www.youtube.com/watch?v=TnT7vXpsn6E - Material Characterisation – Part 2

Assessment Matrix

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Internal Test (25Marks)	Assignment/Quiz/ alternate assessment (5 Marks)	Lab CIE (20 Marks)
Remember	5		20
Understand	10		
Apply	5	3	
Analyze	5	2	
Evaluate		-	
Create	-	-	

SEE- Semester End Examination (50 Marks)

Bloom's Category	SEE Marks (50)
Remember	10
Understand	20
Apply	20

APPLIED PHYSICS LAB FOR ENGINEERS
(COMMON FOR ALL THE BRANCHES)

xp. No	Experiments	Cos
1	Determination of Planck 's constant using LED	CO1, CO2, CO3, CO4
2	Stefan's Law: To verify Stefan's Law	
3	B – H Curve: To draw the B – H curve and to determine the coercivity and retentivity of the given ferromagnetic material	
4	Dielectric constant**:** To determine the dielectric constant of given dielectric by charge and discharge method	
5	Laser Diffraction: To determine the wavelength of Laser using grating	
6	Numerical Aperture: To determine the numerical aperture of Optical Fiber	
7	Fermi Energy: To determine the Fermi energy of copper.	
8	Zener Diode Characteristics: To study the V-I characteristics of Zener diode and the reverse Zener break down voltage	
9	Photodiode Characteristics: To study the V-I characteristics of photo diode for different light intensity in reverse bias condition	
10	Energy Gap: To find the energy gap of a given semiconductor.	
11	Hall Effect: To measure Hall Coefficient of materials.	
12	Resistivity: Four Probe method	
13	Particle Size Determination – Using LASER	

Assessment Matrix

CIE- Continuous Internal Evaluation (20 Marks)

Bloom's Category	Performance (day to day)	Internal test
Marks (out of 50)	**20**	**30**
Understand	05	06
Apply	08	10
Analyze	04	10
Evaluate	03	04

ENGINEERING SCIENCE COURSE (ESC)

DATA STRUCTURES USING C

Course Code	:**22CSE13/23**	**Credits**	**: 02**
L:T:P:S	**: 2:0:0:0**	**CIE Marks**	**: 50**
Exam Hours	**: 3**	**SEE Marks**	**: 50**

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

CO1	Understand the essentials of programming constructs
CO2	Apply the concepts of array and functions
CO3	Apply the concepts of pointers, structure and union
CO4	Analyze the operations of stack data structure
CO5	Analyze the operations of queue data structure
CO6	Investigate on the applications of linear data structures

Course Outcomes to Program Outcomes Articulation Matrix:

CO	PO 1	P O2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO1	3	3	-	-	-	-	-	-	-	-	-	3	3	3
CO2	3	3	-	-	3	-	-	-	2	-	-	3	3	3
CO3	3	3	-	-	3	-	-	-	2	-	-	3	3	3
CO4	3	-	2	2	3	-	-	-	2	-	-	3	3	3
CO5	3	3	-	-	3	-	-	-	-	-	-	3	3	3
CO6	3	3	2	2	-	-	-	-	-	-	-	-	3	3

Module No	Module Contents	Hours	Cos
1	**Programming Essentials**: Structure of a Program, Data Types, Operators and Expressions, Managing Input and Output operations, Decision Making, Branching and Looping statements.	**6**	**CO1**
2	**Arrays and Functions:** Array – Definition, Initialization, Declaration, One-dimensional String operations. **Functions:** Definition, Built-in and User-defined functions.	**7**	**CO2**
3	**Pointers, Structure and Union:** Pointers – Definition, Initialization, Pointer arithmetic's, Parameter passing methods - Call by value and Call by reference, Structure and Union.	**7**	**CO3**
4	**Stack Data Structure:** Definition, Representation and Working of Stack in Data Structures, **Basic operations on stack**: Push (), Pop (), Peek (), isfull (), isempty (), Implementation of stack using Arrays. **Applications of Stack:** Recursion, Fibonacci series.	**5**	**CO4, CO6**
5	**Queue Data Structure:** Definition, Representation, Primitive operations on Linear Queue, Array representation of queues, **Case studies on Queue data structure**.	**5**	**CO5, CO6**

Learning Resourses

1. C Programming - Learn to Code, Sisir Kumar Jena , 2021, CRC Press, Taylor & Francis Group, ISBN: 978-1-032-03625-0.
2. Data Structures Through C – 4th Edition, Yashavant Kanetkar, BPB Publications, March 2022, ISBN 978-93-5551-189-8.
3. Data Structures with C, SEYMOUR LIPSCHUTZ, Special Indian Edition, Thirteenth reprint 2015, McGraw Hill Education, ISBN: 9780070701984.
4. Data Structures – A Pseudocode Approach with C, Richard F Gilberg and Behrouz A Forouzan, Second edition, Fifth Indian Reprint 2015, Cengage Learning, ISBN: 9788131503140.
5. Data Structures using C, Aaron M. Tanenbaum, Yedidyah Langsam, Moshe J Augenstein, Thirteenth Impression 2014, Pearson Education, ISBN: 9789332549319.

CIE – Continuous Internal Evaluation: Theory (50 Marks)

Revised Bloom's Taxonomy (RBT)	Tests	Assignment	Quizzes
Marks (Out of 50)	**25**	**15**	**10**
L1: Remember	-	-	-
L2: Understand	5	-	-
L3: Apply	5	5	5
L4: Analyze	10	5	5
L5: Evaluate	5	5	-
L6: Create	-		-

SEE: Semester End Examination: Theory (50 Marks)

RBT Levels	Marks (Out of50)
L1: Remember	-
L2: Understand	10
L3: Apply	15
L4: Analyze	15
L5: Evaluate	10
L6: Create	-

DATA STRUCTURES USING C LAB

Course	: **22CSL13/ 23**	**Credits**	**: 01**
L:T:P:S	**: 0:0:1:0**	**CIE Marks**	**: 50**
Exam	**: 3**	**SEE Marks**	**: 50**

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

CO1	Apply the essential programming constructs to solve a problem
CO2	Implement various sorting procedures using suitable data structures
CO3	Identify appropriate structured data types and constructs for computation
CO4	Implement operations on linear data structures

Course Outcomes to Program Outcomes Articulation Matrix:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**
CO 1	3	3	3	-	3	-	-	-	3	3	-	3	3	-
CO 2	3	3	3	-	3	-	-	-	3	3	-	3	3	-
CO 3	3	3	3	-	3	-	-	-	3	3	-	3	3	-
CO 4	3	3	3	-	3	-	-	-	3	3	-	3	3	-

S.No	**List of Programs**	**Hours**	**Cos**
1 **2**	Write a program to find the reverse of an n-digit integer. Write a program to implement simple calculator using switch case statement.	**6**	CO1
3 **4** **5** **6**	Write a program to sort the numbers using Bubble sort. Write a program to sort the numbers using Merge sort. Write a program to perform binary search using recursive call. Write a program to swap two numbers using pointers.	**6**	CO2
7 **8**	Write a program to deploy the structures. Write a program to compute the sum, mean and standard deviation of all elements stored in an array of n real numbers.	**6**	CO3
9 **10**	Develop a program for stack that performs following primitive operations: push, pop, peek and display. Develop a program for linear queue that performs following primitive operations: enqueue, dequeue and display.	**6**	CO4

CIE – Continuous Internal Evaluation: Lab (50 Marks)

Revised Bloom's Taxonomy (RBT)	Weekly Evaluation	CIE -1	CIE -2
Marks (Out of 25)	**10**	**20**	**20**
L1: Remember	-	-	-
L2: Understand	-	-	-
L3: Apply	10	10	10
L4: Analyze	-	5	5
L5: Evaluate	-	5	5
L6: Create	-	-	-

SEE – Semester End Examination: LAB (50 Marks)

RBT Levels	Marks (Out of50)
L1: Remember	-
L2: Understand	10
L3: Apply	20
L4: Analyze	10
L5: Evaluate	10
L6: Create	-

COMPUTER AIDED ENGINEERING DRAWING

Course Code	**22CAD13/23**	**Credits**	**03**
L: T: P:S	**2:0:1:0**	**CIE Marks**	**50**
Exams Hours	**03**	**SEE Marks**	**50**

Course Outcomes: At the end of the Course, the student will be able to:

CO1	Draw and communicate the objects with definite shape and dimensions
CO2	Recognize and draw the shape and size of objects through different views
CO3	Develop the lateral surfaces of the object
CO4	Create the drawing views using CAD software
CO5	Identify the interdisciplinary engineering components or systems through its graphical representation

Mapping of Course Outcomes to Program Outcomes:

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

Ratings: 3 for high, 2 for substantial, 1 for low. To be followed in mapping.

Module No	Module Contents	Hrs	COs
1	**Introduction**: Significance of Engineering drawing, BIS Conventions, Lettering, Dimensioning, geometrical constructions and freehand practicing. Introduction to software, commands used for engineering drawing **Projections of Points**: Introduction, Definitions - Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants. **Projections of Straight Lines**: True and apparent lengths, True and apparent inclinations to reference planes (First quadrant only). **Projections of Plane Surfaces**: Introduction, projections of plane surfaces–triangle, square, rectangle, pentagon, hexagon and circle (First quadrant and change of position method only)	**10**	**CO1 CO@**
2	**Projections of Solids**: Introduction, Projections of prisms, pyramids, cylinders and cones in different positions.	**12**	**CO1 CO2 CO4**
3	**Orthographic Projections:** Conversion of pictorial views into orthographic projections of simple machine parts.	**6**	**CO2 CO4**
4	**Isometric Projections:** Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of cubes, right regular prisms, pyramids, cylinders, cones, spheres, hemispheres and combination	**7**	**CO1 CO2 CO3 CO4**

	of solids (Isometric projection of two simple solids). **Development of Lateral Surfaces of Solids:** Development of lateral surfaces of right regular prisms, cylinders, pyramids and cones with base on HP only. (Only for Demonstration)		
5	**Multi-disciplinary Applications and Practice**: Free hand sketching: True free hand, Guided Free hand, Roads, Buildings, Utensils, Hand tools & Furniture's etc. Drawing Simple Mechanisms: Bicycles, Tricycles, Gear trains, Ratchets, two-wheeler cart & Four-wheeler carts to dimensions Electrical Wiring and Lighting diagrams**:** Like Automatic fire alarm, call bell system, UPS system, Basic power distribution system using suitable software. Basic Building Drawings: Simple Electronic Circuit Drawings, practice on layers' concept. (For CIE Only)	**5**	**CO1** **CO2** **CO5**

LEARNING RESOURSES

1. Engineering Drawing, K. R. Gopala Krishna, Subhas Stores, Bangalore,2005. ISBN-13-9789383214235
2. Machine Drawing, K. R. Gopala Krishna, Subhas Stores, Bangalore,2005. ASIN : B074Y8HWKF
3. Engineering Drawing, N.D. Bhat & V.M. Panchal, 45 Edition, Charotar Publishing, Gujarat, 2005. ISBN-13-9788185594170
4. S.N. Lal, & T Madhusudan: Engineering Visualisation, 1st Edition, Cengage, Publication
5. French, Thomas E., Vierck, C. J. and Foster, R. J., Fundamental of Engineering Drawing & Graphics Technology, McGraw Hill Book Company (2005). ISBN-13-9780071004251
6. A Textbook of Engineering Graphics by K. Venugopal & Prabhu Raj, New Age International, 2009. ISBN-13-9788122424577
7. Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production- Luzadder Warren J., Duff John M.,Eastern Economy Edition, 2005-Prentice-Hall of India Pvt. Ltd., New Delhi. ISBN-13-9780134808499
8. Bhattacharya S. K., Electrical Engineering Drawing, New Age International publishers, second edition 1998, reprint 2005.
9. Chris Schroder, Printed Circuit Board Design using AutoCAD, Newnes, 1997.

Publications of Bureau of Indian Standards:

1. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
2. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
3. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

NPTEL/SWAYAM/ MOOC: https://nptel.ac.in/courses/112/103/112103019/

CIE (50 Marks – Theory)			
Bloom's Category	**Tests**	**Assignments**	**Sketch Book**
Marks	**25**	**15**	**10**
Remember	2	0	0
Understand	6	1	2
Apply	6	4	3
Analyze	6	4	2
Evaluate	2	4	2
Create	3	2	1

SEE (50 Marks – Theory/Lab)	
Bloom's Category	**Sketching/Computer display**
Remember	5
Understand	10
Apply	11
Analyze	11
Evaluate	8
Create	5

ENGINEERING SCIENCE COURSE I &II (ESC I&II)

Engineering Science Course A
(BASIC ELECTRONICS)

Course Code : 22ESC141/241 **Credits : 03**
L: T: P:S : 3:0:0:0 **CIE Marks : 50**
Exam Hours : 03 **SEE Marks : 50**

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Apply the principle of semiconductor device for real time applications
CO2	Analyze the different concepts of number systems for digital circuits
CO3	Construct combinational and sequential circuits using the basic logic gates
CO4	Articulate the principles and usage of Embedded systems
CO5	Utilize the knowledge of modulation techniques in relating the generations of cellular communication systems
CO6	Engage in independent learning as a member of a team, submit a report and use ICT for effective presentation of the study on assigned topics related to electronic systems

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	-	-	-
CO5	3	3	-	-	-	-	-	-	-	-	-	-
CO6	2	2	2	2	2	1	-	1	2	2	-	2

SYLLABUS

S.No	Contents of the Module	Hrs	COs
1	**Semiconductor Diodes and Applications:** P-N Junction diode – its principle, characteristics and parameters Applications: Half-Wave Rectifier, Full Wave Rectifier (Two Diode, Bridge Rectifier), Zener diode as Voltage regulator. Textbook 1: 1.6, 1.7, 2.2, 3.1, 3.2, 9.5 **Bipolar Junction Transistor:** BJT Operation, BJT Voltages and Currents, BJT as a switch, Common Emitter Characteristics, Numerical examples as applicable. Textbook 1: 4.1, 4.2, 4.4, 4.6	**8**	**CO1, CO6**
2	**MOSFET:** Introduction to MOSFET theory, Operation and characteristics of Enhancement MOSFET for n-channel, MOSFET as a switch. Comparison between BJT and MOSFET. Textbook 1: 9.5 **BJT as an Amplifier:** Biasing - DC load line, Need for biasing, Single stage CE amplifier using Voltage divider bias. Textbook 1: 5.1, 5.4, 6.4 (excluding h-parameter analysis) **Oscillator**: Barkhausen criterion, Conceptual discussion of Crystal controlled oscillator. Textbook 1: 16.1, 16.9	**8**	**CO1, CO6**
3	**Number Systems:** Introduction, Number Systems (Decimal, Binary, Hexadecimal, Octal), Conversion from one number system to other,		**CO2,**

	Complement of Binary Numbers (1's and 2's), Binary subtraction using 1's and 2's complement. **Digital Electronics:** Logic gates, NAND and NOR as universal gates, Boolean Algebra Theorems, De Morgan's theorem, Algebraic Simplification. Textbook 2: 1.2, 1.3, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4, 2.7	**8**	**CO3, CO6**
4	**Building blocks of a Digital system:** Combinational circuits **(**Half Adder, Full Adder), Sequential circuits (SR Latch using NAND gates, Flip-Flops [SR, JK, D, T]). Textbook 2: 4.3, 5.5, 6.2, 7.2 **Embedded Systems:** Definition of an Embedded System, Embedded systems vs General Purpose Systems, Application of Embedded Systems, Purpose of Embedded systems, Characteristics of Embedded systems. Reference book 1: 1.1, 1.2, 1.5, 1.6, 3.1	**8**	**CO3, CO4, CO6**
5	**Communication Systems:** Introduction to communication systems, Need for modulation, Principles of amplitude modulation, Introduction to angle modulation, FM and PM waveforms, Amplitude shift keying, Frequency shift keying, Phase shift keying. Textbook 3: 1.3, 1.4, 4.1, 4.2, 7.5, 9.3, 9.4, 9.5 1G, 2G cellular telephone systems – GSM, 3G and 4G, Simplified block diagram of a digital radio system. Textbook 3: 19.3, 20.2, 20.4, 20.9.2, 9.1	**8**	**CO5, CO6**

Learning Resourses

1. Electronic Devices and Circuits, David. A. Bell, 5th edition, 2008, Oxford University Press.
2. Digital Logic and Computer Design, M. Morris Mano, 5th edition, 2002, PHI.
3. Electronic communication systems, Wayne Tomasi, 5th edition, 2001, Pearson education.
4. Introduction to Embedded systems, Shibu K.V., 1st Edition, McGraw Hill Education, 2009.
5. Principles of Electronics, V. K. Mehta, 12th edition, 2020, S. Chand Publishing.
6. https://www.rfpage.com/evolution-of-wireless-technologies-1g-to-5g-in-mobile-communication/

Assessment Pattern

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests	Assignment	Quiz	Mini Project
Marks (out of 50)	**25**	**5**	**10**	**10**
Remember	10	-	5	-
Understand	10	-	5	-
Apply	5	5	-	-
Analyze	-	-	-	10
Evaluate	-	-	-	-
Create	-	-	-	-

SEE- Semester End Examination (50 Marks)

Bloom's Category	Marks (50)
Remember	10
Understand	20
Apply	15
Analyze	5
Evaluate	-
Create	

Engineering Science Course B
INTRODUCTION TO ELECTRICAL ENGINEERING

Course Code	**:22ESC142/242**	**Credits**	**:03**
L: T: P: S	**: 3:0:0:0**	**CIE Marks**	**:50**
Exam Hours	**:03**	**SEE Marks**	**:50**

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

CO1	Understand various sources of energy and power system structure
CO2	Examine the concepts of DC circuits, single phase and three phase AC circuits
CO3	Identify various types of electrical instruments suitable for specific measurement
CO4	Demonstrate the constructional features of electrical machines
CO5	Use the concepts of tariff and deferent safety measures of electrical appliances
CO6	Develop the residential wiring for controlling home appliances

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	3	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	-	-	-	-	2	-	-	-	-	-	-
CO4	3	2	3	-	-	2	-	-	-	-	-	-
CO5	2	2	2	-	-	2	2	-	-	-	-	-
CO6	2	-	3	-	-	2	1	-	-	-	-	-

Course Syllabus			
Module No	**Contents of the Module**	**Hours**	**COs**
1	**Power Generation:** Renewable and Non-Renewable energy resources - Hydel, Nuclear, Solar and wind power generation (Block Diagram approach)- Electrical power system structure- Single line diagram. **DC Circuits:** Ohm's Law and its limitations- KCL & KVL-series, parallel, series-parallel circuits-Simple Numericals.	8	CO1, CO2
2	**A.C.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)-Voltage and current relationship with phasor diagrams in R, L, and C Circuits-Concept of Impedance- Concept of power factor-Simple Numerical **Three Phase Circuits:** Three phase AC quantity, advantages, and limitations-star and delta connection-relationship between line and phase quantities.	8	CO2
3	**Measurement and Instrumentation:** Functional elements of measuring instruments – Types of measuring instruments – Standards, Errors, and calibration- Construction and working Principle of Permanent magnet moving coil and moving iron instruments, Single phase wattmeter and energy meter.	8	CO3, CO6

	Domestic Wiring: Requirements, Types of wiring: Two way and three-way control of lamp.		
4	**DC Generator:** Principle of operation-constructional details, types-induced emf expression. **DC Motor:** Principle of operation, back emf and its significance- Torque equation, types of motors. Applications of DC machines. **Transformers:** Necessity of transformer, principle of operation, construction of single-phase transformers, Types, EMF equation and losses in transformer.	8	CO4
5	**Energy conservation and load calculation:** Energy conservation and its necessity -Power rating and load calculations of domestic appliances -tariff and its types, 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. An over view of electric vehicles - block diagram approach.	8	CO5

Learning Resources:

1. Basic Electrical Engineering by D C Kulshreshtha, Tata McGraw Hill, First Edition 2019
2. Electrical Technology by E. Hughes, Pearson, 12th Edition, 2016
3. Basic Electrical and Electronics Engineering by Dr. Vinoth Kumar K, Dr. Saravanakumar R, Dr. Jegathesan V, Dr. Kowsalya M, Dr. Mahesh M, Wiley India Pvt. Ltd, Second Edition, 2022
4. Electrical and electronic measurements and instrumentation by A K Sawhney, Dhanpat Rai & Co. (P) Limited
5. Principles of Electrical Engineering and Electronics, V.K. Mehta, S Chand Publishing, 2019
6. Basic Electrical and Electronics Engineering, D P Kothari, I J Nagrath, Second Edition, McGraw Hill Publishers, 2019,
7. Basic Electrical and Electronics Engineering, S.K. Bhattacharya, Pearson Education, 2017,
8. A textbook of Electrical Technology by B.L. Theraja, S Chand Publication, 2014
9. https://youtu.be/VXo0p_1z3Uw
10. https://youtu.be/3TR_DS_7z2w

Assessment Pattern:

CIE- Continuous Internal Evaluation (50 Marks):

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks (Out of 50)	**25 Marks**	**15 Marks**	**10 Marks**
Remember	10	5	3
Understand	10	5	2
Apply	5	5	5
Analyze	-	-	-
Evaluate	-	-	-
Create	-	-	-

SEE- Semester End Examination (50 Marks):

Bloom's Taxonomy	Marks Theory (50)
Remember	20
Understand	20
Apply	10
Analyze	-
Evaluate	-
Create	-

Engineering Science Course C
BASIC MECHANICAL ENGINEERING

Course Code	**22ESC143/243**	**Credits**	**03**
L: T: P: S	**3:0:0:0**	**CIE Marks**	**50**
Exams Hours	**3 hrs**	**SEE Marks**	**50**

Course Outcomes: At the end of the Course, the student will be able to:

CO1	Apply concepts of engineering mechanics to analyze structural members subjected to various forces.
CO2	Understand Concepts of calculation of Centroid & Moment of Inertia useful in analyzing material behavior under loading.
CO3	Analyze the different types of IC engines and refrigeration systems and solve problems related to them.
CO4	Apply the concepts of advanced technology and visualize various ways to create the development of products with the aid of modern tools.
CO5	Understand the impact of various systems, processes and solutions of mechanical engineering in societal and Environmental context.
CO6	Apply the concepts of conventional and non-conventional energy systems to design and develop alternate source of energy production.

Mapping of Course Outcomes to Program Outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	3									
CO2	3	3										
CO3	3		3			1						
CO4	3		3		1					1		
CO5	3					1	1					1
CO6	3											

Syllabus

Mod #	**Module Contents**	**Hrs.**	**COs**
1	**Introduction to Engineering Mechanics:** Principle of superposition of forces, Composition of forces - Definition of Resultant; Composition of coplanar concurrent force system, Parallelogram law of forces, Resolution of forces. **Equilibrium of Non- Concurrent Force System:** Introduction to beams, Types of loads and supports, Support reactions, statically determinate beams with point load (normal and inclined) and uniformly distributed/varying loads, Numerical problems. **Practical session/Practical Case study:** •Visit to Mechanics of Materials Lab **Self - assessment:** •Study of different loads acting on Beams of buildings	**9**	**CO1**
2	**Centroid:** Centroid of line and area, Centroid of regular figures, Locating the centroid of triangle, semicircle, quadrant of a circle and sector of a circle using method of integration, Simple Numerical problems.	**9**	**CO2**

	Moment of Inertia: Second moment of area, polar moment of inertia, Radius of gyration, Perpendicular and Parallel axis theorems, Moment of Inertia of rectangular, circular and triangular areas from method of integration. **Practical session/Practical Case study:** •Visit to Mechanics of Materials Lab **Self - assessment:** •Calculating Centroid of irregular surfaces.		
3	**Introduction-** Various Energy demands in India. Solar Energy- Types of Solar Energy Utilization, Solar Energy application- Solar Water heater, Space heating of buildings, Solar cooking, Solar in Agriculture. **Wind Power:** Utilization of Wind power and hydel power for electric power generation, Installed capacity of hydel and Wind power in India. **Bio-diesel a future Technology**- Growth in Global Market, advantages, disadvantages, Jatropha biodiesel in India, Process involved in Modern Biodiesel production, Electrical Power generation from Bio-fuels. **Steam Formation and Application**: Formation of steam and thermodynamic properties of steam. Simple problems using steam tables. Application of steam in power generation industry, processing industries. **Practical session/Practical Case study**: •Solar deployment by MNRE •Visit to Roto-Dynamics Lab and understanding working of water turbines **Self - assessment:** •Survey on Globally implemented waste-to-energy plant and possibilities in India •Survey on Energy production from Gravity	**9**	**CO5, CO6**
4	Parts of IC Engines, Working of Four stroke petrol and four stroke diesel engine, Working of Two-stroke Engine. Microprocessor based Engine Management system, Battery Ignition system, Anti-lock braking system, Parking Assist systems, Automatic Suspension control, Electric vehicles- EV batteries and drive Motors, Hybrid vehicles and its types, Telematics. **Practical Case study/Practical Session:** •Assembly and disassembly of Engine components •Case study GM, Nissan, Ford, Nelco vehicles **Self- assessment:** •Mechatronics and its future •Mechatronics in Automotiv e application	**8**	**CO3, CO4**
5	**Introduction-** IC Engine Terminologies, Definition and Calculation on IP, BP, FP, SFC and various Efficiencies for IC Engine- Problems. Design of IC engine components- Bore and length of cylinder, thickness of cylinder head- Problems, Design considerations while designing Piston, Connecting rod and Crank shaft- Only Theory **HVAC&R-** Modern Refrigerants, Vapour Compression Refrigeration cycle, Domestic Refrigerator. Basic Air cycle, Summer and Winter Air conditioning systems, Psychrometric chart, Parameters to consider while calculating Cooling load and Heating load for building, Split AC unit. **Practical Session:** •Visit to Energy Conversion Lab- Understanding cut section of Engines, Explaining Calculating various engine parameters(demo) •Visit to Heat transfer Lab- Understanding VCR & AC cycle (demo) and Showing sample calculation for Room heating and cooling load calculation (demo).Self- assessment: Understand HVAC in Car	**9**	**CO3**

Learning Resources:

Module -1

1. S S Bhavikatti Elements of Civil Engineering and Mechanics, Fifth Edition, New Age International Pubhishers
   ISBN:978-81-224-3817-8

Module -2

1. B.K. Kolhapure Elements of Civil Engineering and Engineering Mechanics, EBPB Publishers 8th edition ASIN : B073RRM9X1

Module -3

1. G. D. Rai, Non-Conventional Energy Sources, Khanna Publishers, Fouth Edition- 2008, ISBN No. 81- 7409-073-8
2. Jan C.J. Bart, N Palmeri, Stefano Cavallaro, Biodiesel Science and Technology: From Soilto Oil, CRC Press- Wood head Publishing Limited, 2010, ISBN 978-1-4398-2730-7

Module-4

1. K. R. Gopalakrishna, Elements of Mechanical Engineering, Subhas Publications, Bangalore, 2017, ISBN- 13: 5551234091781
2. Tom Denton, Automobile Electrical and Electronic systems, ELSEVIER, 3rd edition, 2004, ISBN 0 7506 62190

Module-5

1. K. R. Gopalakrishna, Elements of Mechanical Engineering, Subhas Publications, Bangalore, 2017, ISBN- 13: 5551234091781
2. R S Khurmi and J K Gupta, A Text book Machine Design, EURASIA PUBLISHING HOUSE(PVT.) LTD., 2005
3. P K Ananthanarayanan, Basic Refrigeration and Air conditioning, Tata McGraw Hill Publication, 2005, ISBN 0-07-049500-9
4. Edward G Pita, Air conditioning principles and systems: an energy approach, Prentice Hall, 4th edition, ISBN 0-13-092872-

Assessment Pattern

Bloom's Category	Tests	Assignment	Quiz	Alternative Assessment
Marks	**25**	**10**	**05**	**10**
Remember	10			
Understand	10	3		
Apply	5	4	5	10
Analyze		3		

SEE (50 Marks – Theory)	
Bloom's Category	**Mark**
Remember	15
Understand	15
Apply	10
Analyze	10

PROGRAM LANGUAGE COURSE I&II (PLC I&II)

PROBLEM SOLVING USING PYTHON

Course Code: 22PLC151/251 **Credits: 3**
L: T: P: S : 2:0:1:0 **CIE Marks: 50**
Exam Hours: 03 **SEE Marks: 50**

Course Outcomes: On completion of the course, student would be able to**:**

CO1	Understand the fundamental concepts of Python and Apply the basic programming skillsof Python Language in problem-solving.
CO2	Implement Python programs using different datatypes, Control statements and loops.
CO3	Analyze different string manipulation functions and user-defined functions available in Python.
CO4	Apply List and Tuple concepts to design a Python program.
CO5	Apply set and dictionary concepts of Python Language in problem-solving
CO6	Create applications using Python programming language to solve real-world problems.

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
CO1	3	-	-	-	-	-	-	-	-	-	-	2	-	-
CO2	3	-	-	-	3	-	-	-	3	-	-	-	3	3
CO3	3	3	3	-	3	-	-	-	3	-	-	-	3	3
CO4	3	3	3	-	3	-	-	-	3	-	-	-	3	3
CO5	3	3	3	1	3	-	-	-	3	-	-	-	3	3
CO6	3	3	-	-	-	-	-	-	-	-	-	2	3	3

Module No.	CONTENTS OF THE MODULE	Hrs	COs
1	**Basics of Python:** Algorithm and Flowchart, Elements of Python: Keywords, Identifiers, Variables, Data Types, Features, Operators and Expression: AssignmentStatements, Numeric Expressions, Order of Evaluation, Operator Precedence, Type, Type Conversations, Input Output Statement, Comments in Python. **List of Programs:** 1. Write a Python Program to solve quadratic equations. 2. Write a program to find GCD and LCM of given numbers. 3. Write a Python Program to find factorial of a number.	**8**	**CO1**
2	**Loops and Control Statements:** If, elif, Nested if, for, nested for, while, continue, Break, Pass **Functions:** Advantage of Functions in Python, creating a Function, Function Calling, Return statement, Arguments in function, Pass by Object Reference, Built-in Function, Lambda Functions, Map, Filter, Reduce functions, Recursive functions **List of Programs:** 1. Write a Python Program to Print Pascal Triangles. 2. Write a user defined function to find the reverse of a number usingloop. 3. Write a Python function to find the sum of n natural numbersusing recursion.	**8**	**CO2**

3	**Strings and File Handling** **Strings:** Creating String in Python, Strings indexing and splitting, Reassigning Strings, Deleting the String, String Operators, Python String functions, slice operations. **File Handling:** Working with files, open, close, read ,write and append operations on text files, working with modules. **List of Programs:** 1. Write a Program to Accept a Hyphen Separated Sequence ofWords as Input and Print the Words in a Hyphen-Separated Sequence after Sorting them Alphabetically 2. Given a string in python, count number of uppercase letters, lowercase letters and spaces in a string and toggle case the given string (convert lowercase to uppercase and vice versa). 3. Write a Python Program to print the count of characters, words andlines in a user specified file.	**8**	**CO3**
4	**List and Tuple:** **List:** Creating a List, Characteristics of Lists, List indexing and splitting, Python List Operations, iterating a List, adding elements to thelist, Removing elements from the list, Python List Built-in functions, List Comprehension Sample Programs. **Tuple:** Creating a tuple, Tuple indexing , Negative Indexing, DeletingTuple, Basic Tuple operations, Python Tuple inbuilt functions, SamplePrograms, List vs. Tuple. **List of Programs:** 1. Write a Python Program to compute Sin(x) using Taylor series approximation given by Sin(x) = x - (x3/3!) + (x5/5!) - (x7/7!) + …….. 2. Write a program takes a list and prints the largest number andsecond largest element in the list. 3. Using List Comprehension print all the even and odd numbersbased on user-defined input.	**8**	**CO4**
5	**Set & Dictionary:** **Set:** Creating a set, adding/removing items to the set, Python SetOperations: Union, Intersection, Difference, Symmetric Difference, Set comparisons, Python Built-in set methods. **Dictionary:** Creating the dictionary, Properties of Keys and Values, Accessing the dictionary values, and adding dictionary values, IteratingDictionary, Built-in Dictionary functions, Applications of Python. **Assertion and Exception Handling:** Assertion usage in Python, Exception handling, try, except, raise, finally **List of Programs:** 1. Write a Program to Create a Dictionary with Key as First Character and Value as Words Starting with that Character basedon user specified input strings. 2. Implement switch like control structure using Dictionaries. 3. Write a Program to Map Two Lists into a Dictionary	**8**	**CO5** **CO6**

LEARNING RESOURSES

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist ", 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016.
2. Guido van Rossum and Fred L. Drake Jr, ―An Introduction to Python – Revised andupdated for Python 3.2, Network Theory Ltd., 2011.
3. John V Guttag, ―Introduction to Computation and Programming Using Python'', Revisedand expanded Edition, MIT Press , 2013
4. Robert Sedgewick, Kevin Wayne, Robert Dondero, ―Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.

CIE- Continuous Internal Evaluation (50Marks)

RevisedBloom's Taxonomy(RBT)	Tests (25 Marks)	Assignment (5 Marks)	Lab(20Marks)
Remember	5	2	5
Understand	5	2	5
Apply	5	1	5
Analyze	5	-	-
Evaluate	5	-	-
Create	-	-	-

SEE: Semester End Examination: Theory (50 Marks)

RBT Levels	Marks (Out of 50)
Remember	10
Understand	10
Apply	15
Analyze	10
Evaluate	5
Create	-

Introduction to C^{++} Programming

Course Code : 22PLC152/252 **Credit : 03**
L: T: P: S : 2:0:1:0 **CIE Marks : 50**
Exam Hours : 3 **SEE Marks : 50**

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Apply an object oriented approach to programming and identify potential benefits of object-oriented programming over other approaches.
CO2	Understand concepts of classes and objects and their significance in real world
CO3	Implement overloading concepts of function and operators
CO4	Implementing inheritance, polymorphism and object relationship in C++
CO5	Reuse the code and be able to design applications which are easier to debug, maintain and extend
CO6	Apply exception handling and gain efficient debugging skills

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	3	-	2	-	-	2	-	3
CO2	3	2	3	2	-	-	2	-	-	-	-	3
CO3	3	2	3	2	3	-	2	-	-	2	-	3
CO4	3	2	3	2	3	-	2	-	-	2	-	3
CO5	3	2	3	-	3	-	2	-	-	2	-	3
CO6	3	2	-	2	3	-	2	-	-	2	-	3

Module No.	Module Contents	Hours	COs
1.	**Introduction to Object-Oriented Programming:** Evolution of programming methodologies, Procedural Approach V/s Object-Oriented Approach. Principles of OOP: Encapsulation and Abstraction, Message Passing, Inheritance –Reusability, Extensibility, Polymorphism – Overloading, , Dynamic Binding **Comparison of C and C++:** Limitations of C, Introduction to C++, Structure of the C++ program, Added features of C++ over C – Storage Classes, Reference variables, Inline functions. **Review of Basic Language Constructs**: Data types – control structures – Arrays and Strings – User defined types – Functions and Pointers.	9	**CO1**
2	**Introduction to Objects and Classes** Defining the class, Defining Data members and member functions, Creating Objects of Class, Access Specifiers. Scope Resolution Operator, Friend Functions and Friend Classes, Static Members, this pointer, returning values using this pointer. Comparison of class with structure. **Constructors and Destructors** Purpose of Constructors and Destructors, Default Constructors, Constructors with &without parameters, Constructor Overloading, Copy Constructor. Invoking Constructors and Destructors. **Pointers in C++**Pointer declaration and Access, pointer and arrays, pointer to functions, memory management – new and delete.	9	**CO2**

3.	**Polymorphism:** Overloading Concepts Function Overloading: Functions with different sets of parameters, default and constant parameters. Operator Overloading: Rules for overloading Operators. Overloading unary operators, overloading binary operators, Overloading Comma, [], (), ->, new, delete Operators. Type Conversions	9	**CO3**
4.	**Inheritance:** Basic Concepts, Reusability & Extensibility. Defining derived classes, protected access specifiers in Base class – public, private & protected inheritance – constructors and destructors in derived classes – Types of Inheritances. Virtual base class. **Virtual Functions:** Normal member functions accessed with pointers, virtual member function access, late binding, pure virtual function, abstract classes	9	**CO4**
5.	**Templates** Generic Functions- A generic swap function, Functions with more than one Generic Type, Overloading a Function Template. Generic Classes – A stack generic class, Class template with more than one Generic Type, type name and template keywords, Template Restrictions, The power of Templates. **Exception Handling** Fundamentals of Exception Handling, Catching Class Types, Using Multiple catch statements, Catching All Exception, Restricting Exception, throw statement, Setting the Terminate and Unexpected Handlers, Uncaught exception, bad exception Classes, and Built-In Exceptions.	9	**CO5** **CO6**

Learning Resourses:

1. C++ How to Program, Paul Deitel, Harvey Deitel,Pearson Education Limited , 9thEdition, 2016.
2. Object Oriented Programming with C++, E Balagurusamy, , TMH, 6th Edition, 2013
3. C++ Primer Plus, Stephen Prata,Pearson Education Limited, 6th Edition, 2015.
4. C++ PROGRAMMING Today, Barbara Johnston, Pearson Education, 2nd Edition, 2015.

CIE- Continuous Internal Evaluation: Theory (50 Marks)

Bloom's Category	Tests	Assignments	Quizzes	Co-curricular Activities
Marks (out of 50)	**25**	**10**	**5**	**10**
Remember	5	-		-
Understand	5	5	-	-
Apply	5	-	5	5
Analyze	5	5	-	-
Evaluate	-	-	-	5
Create	5	-	-	-

SEE- Semester End Examination: Theory (50 Marks)

Blooms Category	Tests
Marks (out of 50)	
Remember	10
Understand	10
Apply	20
Analyze	5
Evaluate	-
Create	5

Introduction to Web Programming

Course Code : 22PLC253 | **Credits : 03**
L: T: P:S : 2:0:1:0 | **CIE Marks : 50**
Exam Hours : 3 | **SEE Marks : 50**

Course Outcomes: At the end of the Course, the Student will be able to

CO1	Apply the fundamental concepts of HTML for web page creation.
CO2	Evaluate the basic of web knowledge with CSS to create attractive web pages
CO3	Create dynamic web pages using Java script and XML
CO4	Apply XSLT concepts in web page designing
CO5	Design forms to support page navigation using PHP
CO6	Create data base to handle queries and manipulations using PHP with mySql

Mapping of Course Outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	3
CO2	3	3	3	2	-	-	-	2	-	-	-	-
CO3	3	3	3	2	-	-	-	2	-	-	-	-
CO4	3	3	3	2	-	-	-	2	-	-	-	-
CO5	3	3	3	2	-	-	-	2	-	-	-	-
CO6	3	3	3	2	-	-	-	-	-	-	-	-

Module No	Module Contents	Hours	COs
1	**Introduction:** Concept of WWW, Internet and WWW, Web browser, Features of Web 2.0 HTML: Basics of HTML, formatting and fonts, commenting code, color, hyperlink, lists, tables, images, forms, XHTML, Meta tags, Character entities, frames and frame sets. Style sheets: Need for CSS, introduction to CSS, basic syntax and structure, using CSS, background images, colors and properties,	**9**	**CO1**
2	**CSS:** Manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS, variables, functions, conditions, loops and repetition, Pop up boxes, Advance JavaScript: JavaScript and objects, JavaScript own objects, the DOM and web browser environments, Manipulation using DOM, forms and validations, DHTML: Combining HTML, CSS and JavaScript, Events and buttons	**9**	**CO2**
3	**XML**: Introduction to XML, uses of XML, simple XML, XML key components, DTD and Schemas, Using XML with application. Transforming XML using XSL and XSLT	**9**	**CO3**
4	**PHP:** Introduction and basic syntax of PHP, decision and looping with examples, PHP and HTML, Arrays, Functions, Browser control and detection, string, Form processing, Files, Advance Features: Cookies and Sessions, Object Oriented Programming with PHP	**9**	**CO4**
5	**PHP and MySQL**: Basic commands with PHP examples, Connection to server, creating database, selecting a database, listing database, listing table names, creating a table, inserting data, altering tables, queries, deleting database, deleting data and tables, PHP my admin and database bugs	**9**	**CO5 CO6**

Learning Resourses:

1. Herbert Schildt, Java™: The Complete Reference, McGraw-Hill, Tenth Edition,201
2. Cay S. Horstmann, Core Java® SE 9 for the Impatient, Addison Wesley, Second Edition, 2018
3. Cay S. Horstmann, Core Java™ Volume I—Fundamentals, Prentice Hall, 10th Edition,2015.
4. SAMS teach yourself Java – 2: 3rd Edition by Rogers Caden head and Leura Lemay Publishers, Pearson Education.
5. Ken Kousen, Modern Java Recipes, O'Reilly Media, Inc.,2017

CIE – Continuous Internal Evaluation: Theory (50 Marks)

Blooms Taxonomy	Tests	Assignments	Quizzes	Co- Curricular
Marks (Out of 50)	25	15	10	-
L1: Remember	2.5	-	-	-
L2: Understand	2.5	-	-	-
L3: Apply	5	5	5	-
L4: Analyze	5	5	5	-
L5: Evaluate	5	-	-	-
L6: Create	5	5	-	-

SEE – Semester End Examination: Theory (50 Marks)

Blooms Taxonomy	Marks (Out of50)
L1: Remember	5
L2: Understand	5
L3: Apply	10
L4: Analyze	10
L5: Evaluate	10
L6: Create	10

EMERGING TECHNOLOGY COURSES I&II (ETC I &II)

Emerging Technology course
ROBOTICS AND AUTOMATION

Course Code:	**22ETC151/251**	**Credits**	**03**
L: T: P: S:	**3:0:0:0**	**CIE Marks**	**50**
Exams Hours:	**3 Hrs**	**SEE Marks**	**50**

Course Outcomes: At the end of the Course, student will be able to

CO1	Understand the fundamental concepts of Robot anatomy
CO2	Analyze various control systems involved in robotic configuration
CO3	Implement the process of robot cell design and programming deployment
CO4	Understand industrial automation and assembly configuration
CO5	Demonstrate robotic utilization in various domains
CO6	Apply the current robotic technology adaptive to the industry

Mapping of Course Outcomes to Program Outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PS01**	**PSO2**
CO1	3	1	2		2							1		3
CO2	3	1	2		2							1		3
CO3	3	1	2		2							1		3
CO4	3	1	2		2							1		3
CO5	3	1	2		2							1		3
CO6	3	1	2		2							1		3

Mod. No	**Module Contents**	**Hr**	**COs**
1	**Fundamentals of Robotics** Robot anatomy and configuration, basic terminology- accuracy, repeatability, resolution, degree of freedom. Mechanisms and transmission, end effectors, Grippers-different methods, and their applications. Introduction to robot control systems.	**8**	**CO1**
2	**Drive Systems and Sensors in Robotics** Drive system- hydraulic, pneumatic, and electric systems. transducers and sensors in robots –tactile sensors, proximity and range sensors, robotic vision sensors, miscellaneous sensors, and areas of applicability	**8**	**CO2**
3	**Robotic cell design and programming** Robotic cell layout, work cell design and control, error detection and recovery, robot path control methods, robotic programming types, and languages, methods of robot programming, motion interpolation, capabilities and limitations of lead through methods	**8**	**CO3**
4	**Automation and assembly configurations** Part presentation method, assembly operations, assembly cell design, designing for robot assembly, inspection automation, and coding, operations of preparatory codes (G codes) and miscellaneous codes (M codes) part programming deployment and demonstration.	**8**	**CO4, CO6**
5	**Robot Application** Implementation of robots in industries – Machine loading/unloading.	**8**	**CO5, CO6**

	Processing operation, Assembly and Inspection, applications of robots in medical, space, underwater, humanoid robots, and micro robots. social issues and the future of robotics. Demonstration on:Pick and Place robots, line following robots, and 3-axis CNC.		

Learning Resources:

1. Groover. M.P. Industrial Robotics, technology, programming, and application Mc-Graw Hill 2012.
2. S. K. Saha, "Introduction to Robotics", Tata McGraw-Hill Publishing Company Ltd. (2008).
3. "Computer Numerically Controlled Machining handbook", James Madison, Industrial Press Inc., 1996, ISBN-978-0831130640
4. Fu, King Sun, Rafael C. Gonzalez, and CS George Lee. Robotics. IEEE Computer Society Press, 1993.
5. Klafter, Richard David, Thomas A. Chmielewski, and Michael Negin. "Integrated Approach to Robotic Engineering." (1993).
6. Asada, Haruhiko, and J-JE lotine. Robot analysis and control. John Wiley & Sons, 1991.
7. Craig, John J. "Introduction to Robotics." (2005).

Assessment Pattern

Continuous Internal Evaluation: CIE

Bloom's Category	Tests	Assignment	Quiz	Alternative Assessment
Marks	**25**	**10**	**05**	**10**
Remember	7.5			
Understand	7.5			
Apply	10	5	5	5
Analyze		5		5

Semester End Examination: SEE

Bloom's Category	Marks (50)
Remember	15
Understand	15
Apply	20

Emerging Technology course

INTRODUCTION TO ELECTRIC VEHICLES

Course Code	**: 22ETC152**	**Credits**	**:03**
L : T: P:S	**: 3:0:0:0**	**CIE Marks**	**:50**
Exam Hours	**:03**	**SEE Marks**	**:50**

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

CO1	Understand the historical perspective and basic terminology of Electric Vehicles (EV)
CO2	Classify the different performance parameters of EV
CO3	Use the different energy storage elements for various types of EV
CO4	Illustrate the performance of energy storage systems in electric vehicles.
CO5	Select appropriate Fuel Cell Technology for EVs
CO6	Demonstrate the overall building blocks of EV system

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	2	1	-	1	1	-	1
CO2	3	2	-	-	-	2	1	-	1	1	-	1
CO3	3	2	-	-	-	2	1	-	1	1	-	1
CO4	3	2	-	-	-	2	1	-	1	1	-	1
CO5	3	2	-	-	-	2	1	-	1	1	-	1
CO6	3	2	-	-	-	2	1	-	1	1	-	1

Course Syllabus			
Module No	**Contents of the Module**	**Hours**	**COs**
1	**Engineering philosophy of EV development** Introduction need of electric drive, Historical development Recent development, Development trends Engineering philosophy of EV concept, key EV technologies	8	CO1, CO2
2	**Basic terms of Electrical and EV parameters** Electrical terms- current AC and DC voltage, Power, conductors , insulators, resisters, relays, capacitors, solenoids, AC & DC motors & generators EV parameters, Weight and size parameters, Force parameters, Energy parameters, Performance parameters,	8	CO1, CO2
3	**Basics of a Battery-Operated Electric Vehicle (BOEV)** Advantages and disadvantages, Major components of BOEV, Comparison with IC engine vehicles, Flywheel energy storage ,Major parts, controller, Inverter/converter, Regenerative Braking, Driving. An EV-Starting Driving and Braking, Basic Diagnosis & Precautions, Self-diagnostics	8	CO3, CO4, CO6
4	**Energy Storage Technology:** Battery basics different types of batteries(lead-acid battery, Lithium/ Alkaline, Lithium ion Nickel Metal hydride), High discharge capacitors, Battery rating, Battery parameters, Battery discharging & charging characteristics, Battery chargers, Battery indicating methods and devices	8	CO3, CO4, CO6

5	**Fuel Cells** Fuel cell characteristics, fuel cell types-alkaline fuel cell, proton exchange membrane, direct methanol fuel cell, phosphoric acid fuel cell, molten carbonate fuel cell, solid oxide fuel cell, hydrogen storage systems, reformers, fuel cell EV	8	CO5 CO6

Learning Resources

1. MehrdadEhsani, Yimin Gao, sebastien E. Gay and Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, Boca Raton: CRC Press, 2018.
2. Iqbal Husain, Electric and Hybrid Vehicles: Design Fundamentals, Boca Raton: CRC Press,2011
3.TariqMuneer and Irene IllescasGarcía, "The automobile, In Electric Vehicles: Prospects and Challenges", Elsevier, 2017
4. AuliceScibioh M. and Viswanathan B., Fuel Cells Principles and Applications, India: University Press, 2009
5. James Larminie and John Loury, Electric Vehicle Technology-Explained, New York: John Wiley & Sons Ltd., 2012.
6.Husain, I. "Electric and Hybrid Vehicles" Boca Raton, CRC Press, 2020
7.Larminie, James, and John Lowry, "Electric Vehicle Technology Explained" John Wiley and Sons, 2022

Assessment Pattern:

CIE- Continuous Internal Evaluation (50 Marks):

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks (Out of 50)	**25 Marks**	**15 Marks**	**10 Marks**
Remember	5	-	3
Understand	10	5	5
Apply	5	5	2
Analyze	5	5	-
Evaluate	-	-	-
Create	-	-	-

SEE- Semester End Examination (50 Marks):

Bloom's Taxonomy	Marks Theory (50)
Remember	10
Understand	20
Apply	20
Analyze	-
Evaluate	-
Create	-

Emerging Technology course

INTRODUCTION TO INTERNET OF THINGS (IoT)

Course Code: 22ETC153/253 **Credits: 3**
L: T: P: S : 3:0:0:0 **CIE Marks: 50**
Exam Hours: 03 **SEE Marks: 50**

Course Outcomes: On completion of the course, student would be able to:

CO1	Describe the evolution of IoT, IoT networking components, and addressing strategies in IoT.
CO2	Classify various sensing devices and actuator types.
CO3	Demonstrate the processing in IoT.
CO4	Explain Associated IoT Technologies.
CO5	Understand the architecture of IoT Applications.
CO6	Analyze future trends in IoT.

Mapping of Course Outcomes to Program Outcomes:

	PO 1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
CO1	1	1	1	1	2	2	-	2	-	-	-	1	1	1
CO2	1	1	1	1	2	2	-	2	-	-	-	1	1	1
CO3	1	1	1	1	2	2	-	2	-	-	-	1	1	1
CO4	1	1	1	1	2	2	-	2	-	-	-	1	1	1
CO5	1	1	1	1	2	2	-	2	-	-	-	1	1	1
CO6	1	1	1	1	2	2	-	2	-	-	-	1	1	1

Module No	CONTENTS OF MODULE	Hrs	COs
1	**Basics of Networking:** Introduction, Network Types, Layered network models Emergence of IoT: Introduction, Evolution of IoT, Enabling IoT and the Complex Interdependence of Technologies, IoT Networking Components.	**8**	**CO1**
2	**IoT Sensing and Actuation:** Introduction, Sensors, Sensor Characteristics, Sensorial Deviations, Sensing Types, Sensing Considerations, Actuators, Actuator Types, Actuator Characteristics.	**8**	**CO2**
3	**IoT Processing Topologies and Types:** Data Format, Importance of Processing in IoT, Processing Topologies, IoT Device Design and Selection Considerations, Processing Offloading.	**8**	**CO3**
4	**ASSOCIATED IOT TECHNOLOGIES :** Cloud Computing: Introduction, Virtualization, Cloud Models, Service- Level Agreement in Cloud Computing, Cloud Implementation, Sensor- Cloud: Sensors-as-a-Service. **IOT CASE STUDIES** Agricultural IoT – Introduction and Case Studies	**8**	**CO4, CO5**
5	**IOT CASE STUDIES AND FUTURE TRENDS** **Vehicular IoT** – Introduction. **Healthcare IoT** – Introduction, Case Studies IoT Analytics – Introduction	**8**	**CO5, CO6**

Learning Resourses

1. Sudip Misra, Anandarup Mukherjee, Arijit Roy, "Introduction to IoT", Cambridge University Press 2021.
2. Satish Jain ,"Internet of Things and its Applications", BPB Publications (1 January 2020).
3. S. Misra, C. Roy, and A. Mukherjee, 2020. Introduction to Industrial Internet of Things and Industry 4.0. CRC Press.
4. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)",1st Edition, VPT, 2014.
5. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013.

CIE- Continuous Internal Evaluation (50Marks)

RBT Levels	Tests (25 Marks)	Assignment- 1 (7.5 Marks)	Assignment- 2 (7.5 Marks)	Quiz-1 (5Marks)	Quiz-2 (5 Marks)
L1: Remember	5	5	5	2.5	-
L2: Understand	5	5	5	2.5	2.5
L3: Apply	5	5	5	-	2.5
L4: Analyze	5	-	-	-	-
L5: Evaluate	5	-	-	-	-
L6: Create	-	-	-	-	-

SEE: Semester End Examination: Theory (50 Marks)

RBT Levels	**Marks (Out of 50)**
L1: Remember	10
L2: Understand	15
L3: Apply	10
L4: Analyze	10
L5: Evaluate	5
L6: Create	-

Emerging Technology course

INTRODUCTION TO DRONE TECHNOLOGY

Course Code : 22ETC154 **Credits : 03**
L:T:P:S : 3:0:0:0 **CIE Marks : 50**
Exam Hours : 03 **SEE Marks : 50**

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Understand drone concepts and terminology
CO2	Understand the regulations that are defined for usage of drones
CO3	Describe the steps for drone design
CO4	Understand the technical characteristics of drones
CO5	Describe the process for drone fabrication
CO6	Discuss the algorithm for drone programming

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-
CO5	3	3	2	-	2	-	-	-	-	-	-	-
CO6	2	2	2	2	2	-	-	-	2	2	-	2

SYLLABUS

S.No	Contents of Module	Hrs	COs
1	Overview and background. Definitions, history of UAV, classifications of UAV, Scale lift generation method, contemporary applications	**8**	**CO1**
2	Military/ Government/Civil/Ssocietal impact and future outlook, Operational considerations. Liability / legal issues, Insurance and ethical implications, Human factors	**8**	**CO2**
3	Introduction to Drone Technology, Drone design and fabrication, Drone programming, Drone flying and operation	**8**	**CO3**
4	Drone accessories, Drone maintenance, Safety and Regulations, Drone commercial applications	**8**	**CO4**
5	Case studies in the drone industry to show the potential for boosting entrepreneurial spirit, Drone technology and entrepreneurship, Drone Technology as a tool for social inclusion, Future of drones	**8**	**CO5, CO6**

Learning Resourses:

1. Theory, Design, and Applications of Unmanned Aerial Vehicles- by A. R. Jha, 2016
2. Handbook of Unmanned Aerial Vehicles- Editors: Valavanis, K., Vachtsevanos, George J., 2014

Assessment Pattern

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	**Tests**	**Assignment**	**Quiz**	**Co-curricular activities**
Marks (out of 50)	**25**	**5**	**10**	**10**
Remember	10	-	5	-
Understand	10	-	5	-
Apply	5	5	-	-
Analyze	-	-	-	10
Evaluate	-	-	-	-
Create	-	-	-	-

SEE- Semester End Examination (50 Marks)

Bloom's Category	**Tests**
Remember	10
Understand	20
Apply	15
Analyze	5
Evaluate	-
Create	-

Emerging Technology course

INTRODUCTION TO CYBER SECURITY

Course Code: 22ETC155/255 **Credits: 3**
L: T: P: S : 3:0:0:0 **CIE Marks: 50**
Exam Hours: 03 **SEE Marks: 50**

Course Outcomes: On completion of the course, student would be able to**:**

CO1	Understand the fundamental concepts and laws of cybercrime.
CO2	Familiarize cybercrime terminologies and perspectives.
CO3	Understand Cyber Offenses and Botnets.
CO4	Gain knowledge on tools and methods used in cybercrimes.
CO5	Understand the concepts of phishing techniques.
CO6	Familiarize with the concepts of Computer Forensics

Mapping of Course Outcomes to Program Outcomes:

	PO 1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
CO1	1	1	1	1	1	1	-	2	-	-	-	1	1	1
CO2	1	1	1	1	1	1	-	2	-	-	-	1	1	1
CO3	1	1	1	1	1	1	-	2	-	-	-	1	1	1
CO4	1	1	1	1	1	1	-	2	-	-	-	1	1	1
CO5	1	1	1	1	1	1	-	2	-	-	-	1	1	1
CO6	1	1	1	1	1	1	-	2	-	-	-	1	1	1

Module No	CONTENTS OF MODULE	Hrs	COs
1	**Introduction to Cybercrime:** Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals? Classifications of Cybercrimes, An Indian Perspective, Hacking and Indian Laws., Global Perspectives	8	CO1, CO2
2	**Cyber Offenses:** How Criminals Plan Them: Introduction, How criminals plan the attacks, Social Engineering, Cyber Stalking, Cybercafe & cybercrimes. Botnets: The fuel for cybercrime, Attack Vector.	8	CO3
3	**Tools and Methods used in Cybercrime:** Introduction, Proxy Servers, Phishing, Password Cracking, Key Loggers and Spyways, Virus and Worms, Trozen Horses and Backdoors, Steganography, DoS and DDOS attacks, Attacks on Wireless networks.	8	CO4
4	**Phishing and Identity Theft:** Introduction, methods of phishing, phishing, phishing techniques, spear phishing, types of phishing scams, phishing toolkits and spy phishing, counter measures, Identity Theft	8	CO5
	Understanding Computer Forensics: Introduction, Historical Background of Cyber forensics, Digital Forensics	8	CO6

5	Science, Need for Computer Forensics, Cyber Forensics and Digital Evidence, Digital Forensic Life cycle, Chain of Custody Concepts, network forensics.	8	

Learning Resourses

1. Sunit Belapure and Nina Godbole, "Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives", Wiley India Pvt Ltd, ISBN: 978-81- 265-21791,2011, First Edition (Reprinted 2018).
2. Anand Shinde , "Introduction to Cyber Security: Guide to the World of Cyber Security", Notion Press; 1st edition (5 February 2021).
3. Bernadette H Schell, Clemens Martin, "Cybercrime", ABC – CLIO Inc, California, 2004. "Understanding Forensics in IT ", NIIT Ltd, 2005.
4. Nelson Phillips and Enfinger Steuart, "Computer Forensics and Investigations", Cengage Learning, New Delhi, 2009.

CIE- Continuous Internal Evaluation (50Marks)

RBT LEVELS Marks (Out of50)	**Tests (25 Marks)**	**Assignment-1 (7.5 Marks)**	**Assignment- 2 (7.5 Marks)**	**Quiz-1 (5Marks)**	**Quiz-2 (5 Marks)**
L1:Remember	5	5	5	2.5	-
L2:Understand	5	5	5	2.5	2.5
L3: Apply	5	5	5	-	2.5
L4: Analyze	5	-	-	-	-
L5: Evaluate	5	-	-	-	-
L6: Create	-	-	-	-	-

SEE: Semester End Examination: Theory (50 Marks)

RBT Levels	**Marks (Out of 50)**
L1: Remember	10
L2: Understand	15
L3: Apply	10
L4: Analyze	10
L5: Evaluate	5
L6: Create	-

Emerging Technology course

INTRODUCTION TO NANOTECHNOLOGY

Course Code : 22ESC156 **Credits : 03**
L: T:P:S : 3:0:0:0 **CIE Marks : 50**
Exam Hours : 03 **SEE Marks : 50**

Course Outcomes: At the end of the Course, the Student will be able to:

CO1	Demonstrate the synthesis of nanoparticles by various techniques
CO2	Explain working of basic instruments used in characterization of nanoparticles
CO3	Classify the nanomaterials based on the dimensions
CO4	Discuss the usage of nanotechnology in energy storage and conversion
CO5	Assess the suitability of nanomaterials for various device applications
CO6	Discuss the application of nanotechnology to all engineering domains

Mapping of Course Outcomes to Program Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-
CO5	3	3	-	-	-	-	-	-	-	-	-	-
CO6	2	2	2	2	2	-	-	-	2	2	-	2

SYLLABUS

Sl no	Contents of Module	Hrs	COs
1	**Introduction to Nanomaterials** Nanotechnology, Frontier of future-an overview, Length Scales, Variation of physical properties from bulk to thin films to nanomaterials, Confinement of electron in 0D, 1D, 2D and 3D systems, Surface to Volume Ratio, Synthesis of Nanomaterials: Bottom-Up approach: Chemical Routes for Synthesis of nanomaterials-Sol-gel, Precipitation, Solution Combustion synthesis, Hydrothermal, SILAR, Chemical Bath Deposition. Top-Down approach- Ball milling technique, Sputtering, Laser Ablation	8	CO1
2	**Characterization of Nanomaterials** Basic principles and instrumentations of Electron Microscopy –Transmission Electron Microscope, Scanning Electron Microscope, Scanning Probes- Scanning Tunneling microscope, Atomic Force Microscope –different imaging modes, comparison of SEM and TEM, AFM and STM, AFM and SEM. Basic principles of working of X-ray diffraction, derivation of Debye-Scherrer equation, numericals on Debye Scherrer equation, Optical Spectroscopy-Instrumentation and application of IR, UV/VIS (Band gap measurement)	8	CO2
3	**Carbon Based Materials** Introduction, Synthesis, Properties (electrical, Electronic and Mechanical), and Applications of Graphene, SWCNT, MWCNT, Fullerenes and other Carbon Materials:	8	CO3

	Carbon nanocomposites, nanofibres, nanodiscs, nanodiamonds.		
4	**Nanotechnology in Energy storage and conversion** Solar cells: First generation, Second generation and third generation solar cells: Construction and working of Dye sensitized and Quantum dot sensitized solar cells. Batteries: Nanotechnology in Lithium ion battery- working, Requirements of anodic and cathodic materials, classification based on ion storage mechanisms, limitations of graphite anodes, Advances in Cathodic materials, Anodic materials, Separators Fuel Cells: Introduction, construction, working of fuel cells and nanotechnology in hydrogen storage and proton exchange membranes	**8**	**CO4**
5	**Applications of Nanotechnology** Nanotech Applications and Recent Breakthroughs: Introduction, Significant Impact of Nanotechnology and Nanomaterial, Medicine and Healthcare Applications, Biological and Biochemical Applications (Nano biotechnology), Electronic Applications (Nano electronics), Computing Applications (Nano computers), Chemical Applications (Nano chemistry), Optical Applications (Nano photonics), Agriculture and Food Applications, Recent Major Breakthroughs in Nanotechnology.	**8**	**CO5, CO6**

Learning Resourses

1. Nano Materials – A.K. Bandyopadhyay/ New Age Publishers, 2009
2. Nanocrystals: Synthesis, Properties and Applications – C.N.R. Rao, P. John Thomas and G. U. Kulkarni, Springer Series in Materials Science, 2007
3. Nano Essentials- T. Pradeep/TMH, 2007,Peter J. F. Harris, Carbon nanotube science: synthesis, properties, and applications,Cambridge University Press, 2011,
4. Introduction to Nanotechnology, C. P. Poole and F. J. Owens, Wiley, 2003
5. Understanding Nanotechnology, Scientific American, 2002
6. Nanotechnology, M. Ratner and D. Ratner, Prentice Hall, 2003
7. Nanotechnology, M. Wildon, K. Kannagara, G. Smith, M. Simmons and B. Raguse, CRC Press, 2002

Assessment Pattern

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	**Tests**	**Assignment**	**Quiz**	**Co-curricular activities**
Marks (out of 50)	**25**	**5**	**10**	**10**
Remember	10	-	5	-
Understand	10	-	5	-
Apply	5	5	-	-
Analyze	-	-	-	10
Evaluate	-	-	-	-
Create	-	-	-	-

SEE- Semester End Examination (50 Marks)

Bloom's Category	**Tests**
Remember	10
Understand	20
Apply	15
Analyze	5
Evaluate	-
Create	-

Emerging Technology course

RENEWABLE ENERGY SOURCES

Course Code	**:22ETC157**	**Credits**	**:03**
L : T: P:S	**: 3:0:0:0**	**CIE Marks**	**:50**
Exam Hours	**:03**	**SEE Marks**	**:50**

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

CO1	Discuss the importance and the need of different renewable energy sources
CO2	Understand the economic aspects of various renewable energy sources in national and Global level
CO3	Demonstrate the working and construction of diverse renewable energy source plants
CO4	Develop the knowledge on energy conversion techniques of different renewable energy sources
CO5	Understand the advantages and limitations of various renewable energy sources
CO6	Compare the applications of different renewable energy sources

Mapping of Course Outcomes to Program Outcomes:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	-	-	-	2	3	-	-	-	-	-
CO2	1	-	-	-	-	2	3	-	-	-	-	-
CO3	2	-	2	2	-	2	3	-	-	-	-	-
CO4	2	-	2	2	-	2	3	-	-	-	-	-
CO5	2	-	-	-	-	2	3	-	-	-	-	-
CO6	2	-	-	-	-	2	3	-	-	-	-	-

Course Syllabus

Module No	Contents of the Module	Hours	COs
1	**Introduction:** Renewable energy sources, non-renewable energy sources- Necessity and causes of energy Scarcity-Types-Advantages-Limitations-National and Global Scenarios-Economics of Renewable Energy Sources-Strategy of future energy requirements.	8	CO1, CO2
2	**Solar Energy:** Historical perspective of solar cell-photovoltaic Effect-Model and equivalent circuit of solar Cell-Parameters of solar Cell-Module-array-materials-series-parallel Connection-I-V and P-V Characteristics-Solar collectors-thermal energy storage systems -applications of solar PV-Street lighting-water pumping.	8	CO3, CO4, CO5, CO6
3	**Wind Energy:** Wind power-factors influencing wind and nature of wind-principle of wind energy conversion- types of wind- fundamentals of power generation In wind Turbine, classification of wind turbine-working of wind turbine- Advantages and disadvantages of wind mills-Applications of wind energy.	8	CO3, CO4, CO5, CO6
4	**Biomass:** Biomass as Renewable energy sources-biomass resources-types of biomass fuel-biomass transformation techniques: Hydrolysis, enzyme & acid hydrolysis, Anaerobic digestion-working of biogas plant-energy Forming –Pyrolysis-Applications.	8	CO3, CO4, CO5, CO6

5	**Tidal and Geothermal Energy systems** Tidal energy electrical conversion systems- Energy from tides, basic principle of tidal power-single basin and double basin tidal power plants-advantages- limitation and scope of tidal energy. Geothermal electrical energy conversion systems-estimation and nature of geothermal energy-geothermal sources and resources-advantages-disadvantages and applications of geothermal energy.	8	CO3, CO4, CO5, CO6

Learning Resourses:

1. Non-conventional Energy Sources, G D Rai -2017, Khanna Publishers, ISBN:978817409073, 9788174090737
2. Solar Photovoltaics: Fundamentals, Technologies and Applications, Chetan Singh Solanki,3rd Edition, Kindle Edition, 2015, PHI Learning, ISBN-10 9788120351110, ISBN-13 978-8120351110
3. Wind Power Technology, Joshua Earnest, Sthuthi' Rachel, 2019,PHI learning, ISBN-10 938802849X, ISBN-13 978-9388028493
4. Text book of Renewable energy-S C Bhatia, R.K Gupta-2019,Woodhead Publishing India inEnergy, ISBN-139788193644607, 978-8193644607
5. Renewable Energy Resources by John Twidell, Julie Alexander, 4th Edition, Routledge,2021,ISBN 9781032269252
6. Video lectures: https://www.digimat.in/nptel/courses/video/121106014/L02.html

Assessment Pattern:

CIE- Continuous Internal Evaluation (50 Marks):

Bloom's Taxonomy	Tests	Assignments	Quizzes
Marks (Out of 50)	**25 Marks**	**15 Marks**	**10 Marks**
Remember	10	5	3
Understand	10	5	5
Apply	5	5	2
Analyze	-	-	-
Evaluate	-	-	-
Create	-	-	-

SEE- Semester End Examination (50 Marks):

Bloom's Taxonomy	Marks Theory (50)
Remember	20
Understand	20
Apply	10
Analyze	-
Evaluate	-
Create	-

HUMANITIES AND ABILITY ENHANCEMENT COURSES

Communicative English

(Common to Physics and Chemistry cycles in the First semester)

Course code: 22ENG16 Credits:1
L:T:P:S : 1:0:0:0 CIE Marks:50
Exam Hours: SEE Marks:50

Course Outcomes: At the end of the Course, the student will be able to:

CO1	Recognise the grammatical structures in English and identify errors in sentences.
CO2	Demonstrate conversational skills using situational vocabulary.
CO3	Examine the importance of sub skills of listening for effective communication.
CO4	Analyse the importance of receptive and productive skills of communication.

Mapping of Course Outcomes to Program Outcomes:

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

Mod. no.	Module Contents	Hours	COs
1	**Error Detection I** Common Errors in English - Articles & Prepositions Common Errors in English - Noun Pronoun agreement **Activity:** Self-introduction - talking about self, ambition, hobbies, likes, dislikes, skills and achievements	3	CO1
2	**Error Detection II** Common Errors in English - Verbs Auxiliary Verbs Subject Verb Agreement **Activity:** Story telling	4	CO1 CO2
3	**Question Tags & Forms** Question forms with 5Ws and 1H Question forms and tags with Auxiliary Verbs Use of Do/ Don't and Does/ Doesn't **Activity:** Situational conversations and Role Play	5	CO1 CO2 CO4
4	**Listening Skills** Importance of listening for effective communication Traits of a good listener Listening to podcasts **Activity :** Review of TEDx talk video presentation (assignment)	4	CO2 CO3 CO4

5	**Presentation Skills** Idea generation Organising a speech - preparation, practice, delivery Extempore Speech Expressing opinions, agreeing & disagreeing Conversational Etiquettes Overcoming stage fear Body language **Activity :** Interview & presentation (for SEE)	8	CO1 CO3 CO4

Reference Books:

1. Grammar Practice Activities by Penny Ur, Cambridge University Press
2. Intermediate English Grammar by Raymond Murphy, Cambridge University Press
3. A Final Course of Grammar & Composition – PC Wren & H. Martin by S Chand.

Assessment Pattern:

CIE - Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests (25 Marks)	Student Presentation (25 Marks)
Remember	5	-
Understand	5	-
Apply	10	15
Analyse	5	10
Evaluate	-	-
Create	-	-

SEE – Semester End Examination (50 Marks)

Bloom's Category	Tests
Remember	10
Understand	10
Apply	20
Analyze	10
Evaluate	

Professional Writing Skills in English

(Common to Physics and Chemistry cycles in the second semester)

Course code: 22ENG26 Credits:1
L:T:P:S : 1:0:0:0 CIE Marks:50
Exam Hours: SEE Marks:50

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

CO1	Recall strategies to improve vocabulary.
CO2	Outline the different purposes and various styles of writing.
CO3	Apply the principles of 7 Cs of Communication to workplace correspondence.
CO4	Analyse text and infer information using the sub skills of reading.

Mapping of Course Outcomes to Program Outcomes:

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

Module No.	Module Contents	Hours	COs
1	**Vocabulary** Ways to Enhance Vocabulary Vocabulary in Context One-word substitution Antonyms & Synonyms **Activity:** Vocabulary enhancement activity	5	CO1 CO3 CO4
2	**7 Cs of Communication** **Types of Writing** Narrative, Descriptive, Persuasive, Analytical Writing **Activity:** Story writing	4	CO3 CO4
3	**Verbal Ability** Cohesive Devices Reading Comprehension Jumbled Paragraph Facts, Inference, Judgement Verbal Analogy **Activity:** Movie Review	5	CO2 CO3 CO4

4	**Business Writing I** Types of Business Writing General writing vs Business writing. Email Writing Types of Emails Statement of Purpose (SOP) **Activity:** Brochure Designing (assignment)	5	CO2 CO3 CO4
5	**Business Writing II** Report writing : Newsletter report, Survey report Cover Letter **Activity:** Resume Writing (assignment)	5	CO3 CO4

REFERENCE BOOKS:

1. Basic Business Communication, Flately & Lesikar, Tata Mc Graw Hil, 10th Edition.
2. Business Communication, P.D Chaturvedi & Mukesh Chaturvedi, Pearson Education.
3. The Skill of Communicating, Bill Scott & Helen Wilkie, Jacob Books.
4. Communication Skills: A Workbook. – Sanjay Kumar, Pushp Lata

Assessment Matrix

CIE - Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests	Movie Review Assignment	Brochure Designing
Marks (out of 50)	**20**	**15**	**15**
Remember		-	-
Understand	**5**	-	-
Apply	**10**	**10**	**5**
Analyse	**5**	**5**	-
Evaluate	-	-	-
Create	-	-	**10**

SEE- Semester End Examination (50 Marks)

Bloom's Category	Test
Remember	**10**
Understand	**10**
Apply	**20**
Analyze	**10**
Evaluate	-
Create	-

Indian Constitution and Professional Ethics

Course Code	**: 22CIP17**	**Credits**	**:01**
L : T: P:S	**: 1:0:0:0**	**CIE Marks**	**:50**
Exam Hours	**: 03**	**SEE Marks**	**:50**

Course Outcomes: On completion of the course, student would be able to:

CO1	Gain knowledge of Indian Constitution and be able to solve the legal and societal issues.
CO2	Analyse the powers and functions of the Union, State and Local Governments in detail.
CO3	Understand Electoral Process, Emergency provisions and Amendment procedure.
CO4	Acquire the knowledge of their Ethical Duties, Responsibilities and the decision making Ability.
CO5	Understand the cybercrimes and cyber laws for cyber safety measures.

Mapping of Course Outcomes to Program Outcomes:

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

Module No.	**CONTENTS OF THE MODULE**	**HourS**	**COS**
1	**INTRODUCTION TO CONSTITUTION OF INDIA** Introduction to Constitution of India. The making and salient features of the constitution. The necessity of the constitution. The Role of the Constituent Assembly- Preamble to Indian constitution. Fundamental rights and its restrictions and Limitations. Decided case studies. Directive principles of state policy. Fundamental Duties and its Scope and significance in Nation building.	**3**	**Co1**
2	**UNION EXECUTIVE and STATE EXECUTIVE** President, prime minister, parliament and supreme court of India. Judicial activism and judicial review. Important parliamentary terminology. Center-state relations. Attorney General of India, Comptroller and Auditor General of India. State Executive- Governor, Chief Minister, State Legislature. High Court and Subordinate Court. Advocate General of the State. Controller and Auditor General of State. Special Provisions (Articles 370.371,371J) for some States.	**3**	**CO2**
3	**Amendments and Procedure, Elections and Emergency Provisions:** Elections, Electoral Process, and Election Commission of India, Election Laws. Amendments – Types and Important Constitutional Amendments.Amendments-42,44,61,86,73,74,91,95,100,101,118. Emergency Provisions, types of Emergencies and its effects.	**3**	**CO3**

	special provisions: Special Provisions for SC and ST, OBC, Women, Children and Backward Classes.		
4	**ENGINEERING ETHICS:** Scope & aim of engineering ethics. Responsibility of engineers, Impediments to responsibility. Clash of ethics. Risk, safety and liability of Engineers. Trust and reliability in Engineering. IPR (Intellectual Property Right). Corporate Ethics.	**3**	**C04**
5	I**nternet Laws, Cyber Crimes and Cyber Laws:** Internet and Need for Cyber Laws, Modes of Regulation of Internet, Types of cyber terror capability, Net neutrality, Types and causes for Cyber Crimes, Cyber Crimes land mark judgements in India and the information Technology Act 2000, Cybercrimes and enforcement agencies.	**3**	**CO5**

Learning Resourses

1. Durga Das Basu: "Introduction to the constitution"19th/20th Edn., or 2008, Lexis Nexis; Twentieth edition (2011)
2. Shubham Singles, Charles E.Haries :Constitution of India and Professional Ethics. Latest Edition- 2018, Cengage Learning India Private Limited (2019
3. Cyber Security and Cyber Laws Alfred Basta and et al Cengage Learning India 2018
4. M.Govindarajan,Natarajan,V>S>Senthilkumar,,"Engineering Ethics",Prentice Hall India
5. Learning Private Limited (2013)
6. M.V.Pylee."An Introduction to Constitution of India".Vikas Publishing 2002.
7. Cyber Security and Cyber Laws Alfred Basta and et al Cengage Learning India 2018

Assessment Pattern

CIE- Continuous Internal Evaluation (50 Marks)

Bloom's Category	**Tests**	**Assignment**
Marks (out of 50)	**25**	**25**
Remember	10	
Understand	1o	
Apply	5	
Analyze		

SEE- Semester End Examination (50 Marks)

Bloom's Category	**SEE Marks (50)**
Remember	20
Understand	20
Apply	10

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ

(ಕನ್ನಡಿಗರಿಗಾಗಿ : for Kannadigas common to all branches)

Course Code :	22KSK17		Credits	:	01
L:T:P:S:	: 1:0:0		CIE Marks	:	25
Exam Hours	: 2		SEE Marks	:	25

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಅಧ್ಯಯನದ ಕಲಿಕಾಂಶಗಳು :

1) ವಿದ್ಯಾರ್ಥಿಗಳು ಕನ್ನಡ ವ್ಯಾಕರಣದ ಬಗ್ಗೆ ಹಾಗೂ ಭಾಷಾ ರಚನೆ ನಿಯಮಗಳನ್ನು ಅರ್ಥೈಸಿಕೊಳ್ಳುತ್ತಾರೆ.
2) ಕನ್ನಡ ಭಾಷಾ ಬರಹದಲ್ಲಿನ ದೋಷಗಳು, ನಿವಾರಣೆ ಮತ್ತು ಲೇಖನ ಚಿಹ್ನೆಗಳನ್ನು ಅರಿತುಕೊಳ್ಳುವರು.
3) ಸರ್ಕಾರಿ ಮತ್ತು ಅರೆಸರ್ಕಾರಿ ಪತ್ರ ವ್ಯವಹಾರದ ಬಗ್ಗೆ ತಿಳುವಳಿಕೆ ಪಡೆಯುವರು.
4) ಭಾಷಾಂತರ ಮತ್ತು ಪ್ರಬಂಧ ರಚನೆ ಬಗ್ಗೆ ಆಸಕ್ತಿ ವಹಿಸಿಕೊಳ್ಳುವರು.

CO-PO Mapping :

	P01	P02	P03	P04	P05	P06	P07	P08	P09	P10	P11	P12
C01										3		
C02										3		
C03										3		
C04										3		

ಪರಿವಿಡಿ (ಪಠ್ಯ ಪುಸ್ತಕದಲ್ಲಿರುವ ವಿಷಯಗಳ ಪಟ್ಟಿ)

ಭಾಗ–1 ಲೇಖನಗಳು : ಕನ್ನಡ ನಾಡು ನುಡಿ ಮತ್ತು ಸಂಸ್ಕೃತಿಗೆ ಸಂಬಂಧಿಸಿದ ಲೇಖನಗಳು
ಭಾಗ–2 ಕಾವ್ಯ ಭಾಗ (ಆಧುನಿಕ ಪೂರ್ವ)
ಭಾಗ–3 ಕಾವ್ಯ ಭಾಗ (ಆಧುನಿಕ)
ಭಾಗ–4 ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿ ಪರಿಚಯ ಕಥೆ ಮತ್ತು ಪ್ರವಾಸ ಕಥನ
ಭಾಗ–5 ವಿಜ್ಞಾನ ಮತ್ತು ತಂತ್ರಜ್ಞಾನ

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಪಠ್ಯ ಪುಸ್ತಕದ ಲೇಖಕರು :
ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ, ಪ್ರೋ.ವಿ. ಕೇಶವಮೂರ್ತಿ, ಪ್ರಕಟಣೆ : ಪ್ರಸಾರಾಂಗ. ವಿ.ತಾ.ವಿ. ಬೆಳಗಾವಿ

ಪರೀಕ್ಷೆಯ ವಿಧಾನ :

ನಿರಂತರ ಆಂತರೀಕ ಮೌಲ್ಯಮಾಪನ : (Continuous Internal Evaluation) : 25
ಸೆಮಿಸ್ಟರ್ ಎಂಡ್ ಪರೀಕ್ಷೆ : (Semester End Examination) : 25

Bloom's Category	CIE (25)	SEE (25)
Remember	12	12
Understand	13	13

Balakae Kannada (Kannada for use)

Course Code	:22KBK17/27	**Credits**	:01
L : T: P:S	: 1:0:0:0	**CIE Marks**	:50
Exam Hours	: 03	**SEE Marks**	:50

Course Outcome: On completion of the course student will be able to:

CO1	Understand Kannada Language
CO2	Communicate in Kannada Language
CO3	Read simple Kannada words
CO4	Pronounce Kannada words correctly

CO – PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO12
CO1	-	-	-	-	-	-	-	-	-	3	-	-
CO2	-	-	-	-	-	-	-	-	-	3	-	-
CO3	-	-	-	-	-	-	-	-	-	3	-	-
CO4	-	-	-	-	-	-	-	-	-	3	-	-

Module No.	CONTENTS OF THE MODULE	HourS	COS
1	Vyavaharika Kannada – Parichaya (Introducton to Vyavaharika Kannada)	**3**	**CO1**
2	Kannada Aksharamale haagu uchharane (Kannada Alphabets and Pronunciation)	**3**	**CO1**
3	Sambhashanegaagi Kananda Padagalu (Kannada Vocabulary for Communication)	**3**	**CO3**
4	Kannada in Conversations (Sambhashaneyalli Kannada)	**3**	**CO2**
5	Activities in Kannada. (Kannada Sambhashanegaagi Chatuvatikegalu	**3**	**CO3**

Learning Resourses

Vyavaharika Kannada by Dr. L. Thimmesh, Prof. V. Keshavamurthy, published by: VTU, Belagavi

Continuous Internal Evaluation & Semester End Examination: (50 marks h)

Blooms Category	CIE	SEE
L1	**25**	**25**
L2	**25**	**25**

INNOVATION AND DESIGN THINKING

Course Code: 22IDT18 **Credits: 01**
L: T: P: S: 1:0:0:0 **CIE marks: 50**
Exam Hours: 02 **SEE Marks: 50**

Course Outcomes: At the end of the Course, the student will be able to:

CO1	Understand various concepts and stages of design thinking
CO2	Understand collaborative thinking and prototyping
CO3	Get acquainted with the various tools used in design thinking
CO4	Implement design thinking in IT
CO5	Develop strategic innovation in Business Model Design
CO6	Study various stages involved in the conduction of Design thinking workshop

MAPPING OF CO VS PO

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3						3			3
CO2	3	3	3						3			3
CO3	3	3	3		1				3			3
CO4	3	3	3	2					3	2		3
CO5	3	3	3	2					3	2		3
CO6	3	3	3	2					3	2		3

Module	Contents of Module	Hrs	CO's
1	**Understanding Design thinking** Definition, Origin and features of Design Thinking, Design thinker in organization, Principles and stages of Design thinking. Design Shared model in team-based design. Theory and practice in Design thinking. Collaborative design thinking. Live examples of MVP or Prototyping	**05**	**CO1, CO2**
2	**Tools for Design Thinking** Visualization, Journey mapping, Value Chain Analysis, The mind map, Rapid Concept development, Assumption testing, Prototype, Co creation, Learning launches and Storytelling.	**05**	**CO3**
3	**Design Thinking in IT**		

	Business process modelling (BPM). Agile in Virtual collaboration environment. Scenario based Prototyping. Case studies on Design thinking.	**05**	**CO4**
4	**Design Thinking for Strategic Innovation** Strategic management and Innovation management, Types of Innovations, Features and Scope of strategic innovations, Design thinking and strategic innovation, Practices of integrating Design thinking in Strategic Innovation.	**05**	**CO5**
5	**Design Thinking Work shop** Focus, Need and stages of Design thinking workshop. Empathize, Design, Ideate, Prototype and Test	**05**	**CO6**

Learning Resourses

1. Christian Mueller-Roterberg, Handbook of Design Thinking - Tips & Tools for how to design thinking.
2. John.R.Karsnitz, Stephen O'Brien and John P. Hutchinson, "Engineering Design",Cengage learning (International edition) Second Edition, 2013.
3. Roger Martin, "The Design of Business: Why Design Thinking is the Next Competitive Advantage",Harvard Business Press, 2009.
4. Hasso Plattner, Christoph Meinel and Larry Leifer (eds), "Design Thinking: Understand – Improve - Apply", Springer, 2011
5. Yousef Haik and Tamer M.Shahin, "Engineering Design Process", CengageLearning, SecondEdition, 2011.
6. Book - Solving Problems with Design Thinking - Ten Stories of What Works (Columbia BusinessSchool Publishing) Hardcover – 20 Sep 2013 by Jeanne Liedtka (Author), Andrew King (Author), Kevin Bennett (Author).

CIE – Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests (15)	Assignment (10)	Seminar/Activity (25)
Remember, L1	3		5
Understand, L2	8		5
Apply, L3	4	5	8
Analyze, L4		5	7
Evaluate, L5			
Create, L6			

SEE – Semester End Examination (50 Marks)

Bloom's Category	Tests
Remember, L1	10
Understand, L2	25
Apply, L3	15
Analyze, L4	
Evaluate, L5	
Create, L6	

SCIENTIFIC FOUNDATION FOR HEALTH & YOGA

Course Code	**: 22SFH18/28**	**Credits**	**:01**
L: T: P: S	**: 1:0:0:0**	**CIE Marks**	**:50**
Exam Hours	**: 03**	**SEE Marks**	**:50**

Course Outcomes: At the end of the Course, the student will be able:

CO1	Understand Health and wellness (and its Beliefs)
CO2	Acquire Good Health & It's balance for positive mindset.
CO3	Inculcate and develop the healthy lifestyle habits for good health.
CO4	Create healthy and caring relationships
CO5	Adopt the innovative & positive methods to avoid risks from harmful habits.
CO6	Prevent harmful diseases for good health through positive mindset and yoga.

MAPPING OF CO VS PO

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1						3						
CO2						3						
CO3						3						
CO4						3						
CO5						3						
CO6						3						

Module no	**Contents of Module**	**Hrs**	**CO's**
1	**Good Health and It's balance for positive mind-set:** Health and Behaviour, Health beliefs and advertisements, Advantages of good health (Short term and long-term benefits), Health and Society, Health and family, Health and Personality - Profession. Health and behaviour, Disparities of health in different vulnerable groups. Health and psychology, Methods to improve good psychological health. Psychological disorders (Stress and Health - Stress management), Mindfulness for Spiritual and Intellectual health, Changing health habits for good health.	03	CO1, CO2
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 blindness, 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,	03	CO2, CO3
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	03	CO3, CO4

	instincts of life, Changing health behaviours through social engineering,		
4	**Avoiding risks and harmful habits:** Characteristics of health compromising behaviours, Recognizing and avoiding of addictions, how addiction develops and addictive behaviours, types of addictions, influencing factors for addictions, differences between addictive people and non-addictive people and their behaviour with society, Effects and health hazards from addictions.	03	CO5
5	**Preventing and fighting against diseases for good health:** Process of infections and reasons for it, 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, Practicing yoga for good health.	03	CO6

Learning Resourses

1. **Health Psychology** (Second edition) by Charles Abraham, Mark Conner, Fiona Jones and DarylO' Connor– Published by Routledge 711 Third Avenue, New York, NY10017.
2. **Health Psychology-A Textbook,** FOURTH EDITION by Jane Ogden Mc Graw Hill Education (India) Private Limited- Open University Press
3. **HEALTH PSYCHOLOGY (Ninth Edition)** by SHELLEYE. TAYLOR- University of California, Los Angeles, Mc Graw Hill Education (India) Private Limited- Open University Press
4. **Scientific Foundations of Health (Health & Welness)-General Books** publishedfor university and colleges references by popular authors and published by the reputed publisher.
5. **SWAYAM / NPTEL/ MOOCS/ Web links/ Internet sources /YouTube videos** and other materials / notes

CIE – Continuous Internal Evaluation (50 Marks)

Bloom's Category	Tests (25)	Assignment (15)	Seminar (10)
Remember, L1	5		
Understand, L2	15		
Apply, L3	5	8	5
Analyze, L4		7	5
Evaluate, L5			
Create, L6			

SEE – Semester End Examination (50 Marks)

Bloom's Category	Tests
Remember, L1	10
Understand, L2	30
Apply, L3	10
Analyze, L4	
Evaluate, L5	
Create, L6	