

**Academic Program: UG**  
**Academic Year 2022-23**  
**Syllabus**  
(Under NEP 2020)  
**I & II Semester B.E.**  
**Stream : Mechanical Engineering**  
**Branch: Mechanical Engineering**  
**Chemical Engineering**



**SHRI DHARMASTHALA MANJUNATHESHWARA COLLEGE OF  
ENGINEERING & TECHNOLOGY,**

**DHARWAD – 580 002**

**(An Autonomous Institute approved by AICTE & Affiliated to VTU, Belagavi)**

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**SDM College of Engineering & Technology, Dharwad**

It is certified that the scheme and syllabus for I & II semester of UG program in Mechanical Engineering stream is recommended by Board of Studies of Mechanical Engineering Department and Chemical engineering Department, approved by the Academic Council, SDM College of Engineering & Technology, Dharwad. This scheme and syllabus will be in force from the academic year 2022-23 till further revision.

Principal

Chairman BoS & HoD

SDM College of Engineering & Technology, Dharwad

Department of Mechanical Engineering

### **College**

#### **Vision:**

To develop competent professionals with human values.

#### **Mission:**

1. To have contextually relevant Curricula.
2. To promote effective Teaching Learning Practices supported by Modern Educational Tools and Techniques.
3. To enhance Research Culture.
4. To involve Industrial Expertise for connecting classroom content to real life situations.
5. To inculcate Ethics and impart soft-skills leading to overall Personality Development.

#### **SDMCET- Quality Policy**

- In its quest to be a role model institution, committed to meet or exceed the utmost interest of all the stake holders.

#### **SDMCET- Core Values**

- Competency
- Commitment
- Equity
- Team work and
- Trust

## **Department**

### **Vision:**

To establish a synergetic Mechanical Engineering program anchored in fundamentals and relevant state of the art technologies, thereby enabling the students to achieve all round development for careers in industry and for higher learning, being responsible to society and environment.

### **Mission:**

1. To establish a curricula & syllabi consisting of robust core courses with emphasis on imparting fundamental principles of mechanical engineering coupled with adaptive and relevant electives catering to the cutting edge technologies.
2. To promote interactive teaching practices using modern educational tools & techniques to attain synergy in teaching, research and industrial practices.
3. To imbibe industrial expertise for connecting class room learning to real life situation.
4. To impart soft skills and professional ethics enabling students to achieve an all-round personality development, making them responsive to societal needs and environmental concerns.

### **Programme Educational Objectives (PEOs):**

1. Graduates will be successful in industry, research and higher learning.
2. Graduates will formulate, analyze and solve engineering problems.
3. Graduates will work in teams to address industrial and socially relevant problems / projects.
4. Graduates exhibit awareness and commitment to lifelong learning & practice professional ethics.

Program Outcomes (POs)

**Engineering Graduates will be able to:**

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

#### **Program Specific Outcomes (PSOs)**

13. **Industrial interactions:** Enhance knowledge of mechanical engineering with industrial practices and standards by exposure to industries.
14. **Role of economics and costing:** Learn the concepts of economics and costing to provide effective solutions to mechanical engineering problems.

## SDMCET: Syllabus

### I Semester B.E.

SDM College of Engineering & Technology, Dharwad  
**Scheme of Teaching and Examinations-2022**  
 Outcome-Based Education (OBE) and Choice Based Credit System (CBCS)  
 (Effective from the academic year 2022-23)

**I Semester (Mechanical Engineering Stream) Branch: Mechanical Engineering and Chemical Engineering** **(For Physics Group)**

Sl. No	Course and course code		Course title	TD/PSB	Teaching Hours/Week				Examination				credits
					Theory Lecture	Tutorial	Practical / Drawin	SDA	Duration in hours	CIE Marks	SEE Marks	Total Marks	
1	ASC(IC)	22MATM11	Mathematics-I for MES	Maths	2	2	2	0	03	50	50	100	04
2	ASC(IC)	22PHYM12	Physics for MES	PHY	2	2	2	0	03	50	50	100	04
3	ESC	22CED13	Computer-Aided Engineering Drawing	Mechanical	2	0	2	0	03	50	50	100	03
4	ESC-I	22ESC145	Introduction to C Programming	Mechanical Engg. Dept.	2	0	2	0	03	50	50	100	03
5	ETC-I	22ETC15E	Renewable Energy Sources	Mechanical Engineering Dept	3	0	0	0	03	50	50	100	03
6	AEC	22ENG16	Communicative English	Humanities	1	0	0	0	01	50	50	100	01
7	HSMC	22KSK17/ 22KBK17	Sanskrutika Kannada/ Balake Kannada	Humanities	1	0	0	0	01	50	50	100	01
8	AEC/SDC	22IDT18	Innovation and Design Thinking	Mechanical Engineering Dept	1	0	0	0	01	50	50	100	01
<b>TOTAL</b>										<b>400</b>	<b>400</b>	<b>800</b>	<b>20</b>

**SDA**-Skill Development Activities, **TD/PSB**- Teaching Department / Paper Setting Board, **ASC**-Applied Science Course, **ESC**- Engineering Science Courses, **ETC**- Emerging Technology Course, **AEC**- Ability Enhancement Course, **HSMS**-Humanity and Social Science and management Course, **SDC**- Skill Development Course, **CIE**-Continuous Internal Evaluation, **SEE**- Semester End Examination, **IC** - Integrated Course (Theory Course Integrated with Practical Course)

**CIE and SEE Evaluation  
(from 2022-23 batch)**

CIE for Non integrated Courses

With LTP 3-0-0 and 4-0-0 or 2-2-0/3-2-0

- Two tests + One Improvement test  
20+20+20 each of one hour duration

Two higher scores from three tests are taken representing 40 marks

QP pattern: 3 questions- Q.3 is compulsory and one question to be answered from Q.1 and Q.2, each question can be with maximum of two sub divisions

CTA: Minimum two components such as assignments, quiz, seminar, written assignment, any technical activity related to course etc. each of 5 marks. Total CTA marks- 10

CIE= 40(from tests)+10(from CTA) = 50 marks

SEE: Exam will be conducted for 100 marks with 3 hours duration and scaled down to 50 marks. Five modules with built in choice. Each question can be with maximum of three sub divisions.

**CIE and SEE Evaluation**

CIE for Integrated Courses

With LTP 2-0-2 and 3-0-2 and 2-2-2

Theory CIE component:

- Two tests + One Improvement test  
20+20+20 each of one hour duration

Two higher scores from three tests are taken representing 40 marks

QP pattern: Continue the existing (3 questions- Q.3 is compulsory and one question to be answered from Q.1 and Q.2, each question can be with maximum of two sub divisions)

Practical CIE component (CTA): Laboratory component. 5 marks for conduction, regularity, involvement, journal etc. Lab Test -5 marks. A test as per the schedule announced will be conducted at the end for 50 marks and scaled down to 5 marks. If the performance is not satisfactory in laboratory the student shall be detained and required to reregister for the course as a whole whenever offered next.

CIE= 40(from tests)+10(from CTA i.e. lab component) = 50 marks

SEE: Exam will be conducted for 100 marks with 3 hours duration and scaled down to 50 marks. Five modules with built in choice. Each question can be with maximum of three sub divisions. The questions shall be asked to test practical understanding for maximum of 30 marks.



## SDMCET: Syllabus

### **CIE for AEC/HSMS Courses With LTP 1-0-0 for 1 Credit**

- CIE for 1 credit AEC/HSMS Courses with LTP 1-0-0
- Two tests + One Improvement test
- 20+20+20 each of one hour duration
- QP pattern for IA: MCQ 15 questions
- Two higher scores from three tests are taken representing 40 marks
- CTA: Minimum two components such as assignments, quiz, seminar, written assignment, any learning activity related to the course etc. each of 5 marks.
- CIE= 40(from tests)+10(from CTA)= 50 marks
- SEE: Exam will be conducted for 50marks with 1 hour duration. There will be 50 MCQs. The question paper will contain 10 MCQ questions from each module.

## SDMCET: Syllabus

### II Semester B.E.

SDM College of Engineering & Technology, Dharwad  
**Scheme of Teaching and Examinations-2022**  
 Outcome-Based Education (OBE) and Choice Based Credit System (CBCS)  
 (Effective from the academic year 2022-23)

#### II Semester (Mechanical Engineering Stream) Branch: Mechanical Engineering and Chemical Engineering (For Chemistry Group)

Sl. No	Course and Course Code		Course Title	TD/PSB	Teaching Hours/Week					Examination				Credits
					Theory Lecture	Tutorial	Practical / Drawing	SDA	Duration in hours	CIE Marks	SEE Marks	Total Marks		
					L	T	P	S						
1	ASC(IC)	22MATM21	Mathematics II for MES	Maths	2	2	2	0	03	50	50	100	04	
2	ASC(IC)	22CHEE22	Chemistry for MES	Chemistry	2	2	2	0	03	50	50	100	04	
3	ESC	22EME23	Elements of Mechanical Engineering	Mech Engg. dept	2	0	2	0	03	50	50	100	03	
4	ESC-II	22ESC243	Introduction to Electronics Engineering	Electronics Engineering Dept	3	0	0	0	03	50	50	100	03	
5	PLC-II	22PLC25B	Introduction to Python Programming	Mech Engg Dept	2	0	2	0	03	50	50	100	03	
6	AEC	22PWS26	Professional Writing Skills in English	Humanities	1	0	0	0	01	50	50	100	01	
7	HSMS	22ICO27	Indian Constitution	Humanities	1	0	0	0	01	50	50	100	01	
8	AEC/SDC	22SFH28	Scientific Foundations for Health	Chemical Dept	1	0	0	0	01	50	50	100	01	
<b>TOTAL</b>										<b>400</b>	<b>400</b>	<b>800</b>	<b>20</b>	

**SDA**-Skill Development Activities, **TD/PSB**- Teaching Department / Paper Setting Board, **ASC**-Applied Science Course, **ESC**- Engineering Science Courses, **ETC**- Emerging Technology Course, **AEC**- Ability Enhancement Course, **HSMS**-Humanity and Social Science and management Course, **SDC**- Skill Development Course, **CIE** -Continuous Internal Evaluation, **SEE**- Semester End Examination, **IC** - Integrated Course (Theory Course Integrated with Practical Course)

**CIE and SEE Evaluation  
(from 2022-23 batch)**

CIE for Non integrated Courses

With LTP 3-0-0 and 4-0-0 or 2-2-0/3-2-0

- Two tests + One Improvement test

20+20+20 each of one hour duration

Two higher scores from three tests are taken representing 40 marks

QP pattern: 3 questions- Q.3 is compulsory and one question to be answered from Q.1 and Q.2, each question can be with maximum of two sub divisions

CTA: Minimum two components such as assignments, quiz, seminar, written assignment, any technical activity related to course etc. each of 5 marks. Total CTA marks- 10

CIE= 40(from tests)+10(from CTA) = 50 marks

SEE: Exam will be conducted for 100 marks with 3 hours duration and scaled down to 50 marks. Five modules with built in choice. Each question can be with maximum of three sub divisions.

**CIE and SEE Evaluation**

CIE for Integrated Courses

With LTP 2-0-2 and 3-0-2 and 2-2-2

Theory CIE component:

- Two tests + One Improvement test

20+20+20 each of one hour duration

Two higher scores from three tests are taken representing 40 marks

QP pattern: Continue the existing (3 questions- Q.3 is compulsory and one question to be answered from Q.1 and Q.2, each question can be with maximum of two sub divisions)

Practical CIE component (CTA): Laboratory component. 5 marks for conduction, regularity, involvement, journal etc. Lab Test -5 marks. A test as per the schedule announced will be conducted at the end for 50 marks and scaled down to 5 marks. If the performance is not satisfactory in laboratory the student shall be detained and required to reregister for the course as a whole whenever offered next.

CIE= 40(from tests)+10(from CTA i.e. lab component) = 50 marks

## SDMCET: Syllabus

SEE: Exam will be conducted for 100 marks with 3 hours duration and scaled down to 50 marks. Five modules with built in choice. Each question can be with maximum of three sub divisions. The questions shall be asked to test practical understanding for maximum of 30 marks.

### **CIE for AEC/HSMS Courses With LTP 1-0-0 for 1 Credit**

- CIE for 1 credit AEC/HSMS Courses with LTP 1-0-0
- Two tests + One Improvement test
- 20+20+20 each of one hour duration
- QP pattern for IA: MCQ 15 questions
- Two higher scores from three tests are taken representing 40 marks
- CTA: Minimum two components such as assignments, quiz, seminar, written assignment , any learning activity related to the course etc. each of 5 marks.
- CIE= 40(from tests)+10(from CTA)= 50 marks
- SEE: Exam will be conducted for 50marks with 1 hour duration. There will be 50 MCQs. The question paper will contain 10 MCQ questions from each module.

<b>22MATM11</b>	<b>Mathematics-I for MES</b>	<b>(2:2:2:0) 4</b>
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**Contact Hours:40**

**Course Learning Objectives (CLOs):**

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

**Course outcomes (COs):**

<b>Description of the Course Outcome:</b> At the end of the course the student will be able to:		<b>Mapping to Pos (1-12)/ PSOs (1,2)</b>		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
<b>CO-1</b>	Apply the knowledge of calculus to solve problems related to polar curves.	--	--	1
<b>CO-2</b>	Learn the notion of partial differentiation to compute rate of change of multivariate functions.	--	--	1
<b>CO-3</b>	Analyze the solution of linear and non-linear ordinary differential equations.	--	2	--
<b>CO-4</b>	make use of matrix theory for solving for system of linear equations and compute eigenvalues and eigenvectors	--	--	1
<b>CO-5</b>	familiarize with modern mathematical tools namely MATHEMATICA/ MATLAB/ PYTHON /SCILAB	--	2	--

POs/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14
<b>Mapping Level</b>	1	2	--	---	--	--	--	--	--	--	--	--	--	--

**Course Contents:**

**Unit – I**

**Introduction to polar coordinates and curvature relating to mechanical engineering.**

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

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

**Applications:** Applied Mechanics, Strength of Materials, Elasticity.

**08 Hrs**

### Unit – II

**Introduction to series expansion and partial differentiation in the field of Mechanical engineering applications.**

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

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

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

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

**08 Hrs**

### Unit – III

**Introduction to first-order ordinary differential equations pertaining to the applications for mechanical engineering.**

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

Orthogonal trajectories, Newton's law of cooling.

**Nonlinear differential equations:** Introduction to general and singular solutions, solvable for p only, Clairaut's equations, reducible to Clairaut's equations - Problems.

**Self-Study:** Applications of ODEs: L-R circuits. Solvable for x and y.

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

**08 Hrs**

### Unit – IV

**Importance of higher-order ordinary differential equations in Mechanical Engineering applications.**

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

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

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

**08 Hrs**

### Unit - V

**Introduction of linear algebra related to Mechanical Engineering applications.**

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

**Self-Study:** Solution of a system of equations by Gauss-Jacobi iterative method. Inverse of a square matrix by Cayley- Hamilton theorem. **08 Hrs**

**Text Book:**

1. **B. S. Grewal:** "Higher Engineering Mathematics", Khanna publishers, 44<sup>th</sup> Ed., 2021.
2. **E. Kreyszig:** "Advanced Engineering Mathematics", John Wiley & Sons, 10<sup>th</sup> Ed., 2018.

**Reference Books:**

1. **V. Ramana:** "Higher Engineering Mathematics" McGraw-Hill Education, 11<sup>th</sup> Ed., 2017
2. **Srimanta Pal & Subodh C. Bhunia:** "Engineering Mathematics" Oxford University Press, 3<sup>rd</sup> Ed., 2016.
3. **N.P Bali and Manish Goyal:** "A textbook of Engineering Mathematics" LaxmiPublications, 10<sup>th</sup> Ed., 2022.
4. **C. Ray Wylie, Louis C. Barrett:** "Advanced Engineering Mathematics" McGraw – HillBook Co., Newyork, 6<sup>th</sup> Ed., 2017.
5. **Gupta C.B, Sing S.R and Mukesh Kumar:** "Engineering Mathematic for Semester I andII", Mc-Graw Hill Education (India) Pvt. Ltd 2015.
6. **H. K. Dass and Er. Rajnish Verma:** "Higher Engineering Mathematics" S. ChandPublication, 3<sup>rd</sup> Ed., 2014.
7. **James Stewart:** "Calculus" Cengage Publications, 7<sup>th</sup> Ed., 2019.
8. **David C Lay:** "Linear Algebra and its Applications", Pearson Publishers, 4<sup>th</sup> Ed., 2018.
9. **Gareth Williams:** "Linear Algebra with applications", Jones Bartlett Publishers Inc., 6<sup>th</sup>Ed., 2017.

**22PHYM12**

**Physics for Mechanical Engineering Stream**

**(2:2:2:0) 4**

**Contact Hours:40**

**Course Learning Objectives (CLOs):**

- To understand the types of oscillation, shock waves & their generation, and applications.
- To study the elastic properties of materials and failures of engineering materials.
- To understand the fundamentals of thermoelectric materials and devices and their application.
- To understand the Concepts in Low-temperature phenomena and generation of low temperature.
- To study the various relevant material characterization techniques.

**Course outcomes (COs):**

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to Pos (1-12)/ PSOs (1,2)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
<b>CO-1</b>	<b>Elucidate</b> the concepts in oscillations, waves, elasticity and material failures	1	2,5,12	--
<b>CO-2</b>	Discuss the fundamentals of Thermoelectric materials and their application	1	2,12	--
<b>CO-3</b>	Summarize the low-temperature phenomena and generation of low temperature	1	2,12	--
<b>CO-4</b>	Explain the various material characterization techniques	1	2,12	--
<b>CO-5</b>	Practice working in groups to conduct experiments in physics and perform precise and honest measurements	1,8,9	2,5,12	3

POs/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14
<b>Mapping Level</b>	3	2	1	--	2	--	--	3	3	--	--	2	--	--

**Course Contents:**

**Unit – I**

**Oscillations and Shock waves:**

**Oscillations:** Simple Harmonic motion (SHM), differential equation for SHM (No derivation), Springs: Stiffness Factor and its Physical Significance, series and parallel combination of springs (Derivation), Types of spring and their applications.



Theory of damped oscillations (Qualitative), Types of damping (Graphical Approach). Engineering applications of damped oscillations, Theory of forced oscillations (Qualitative), resonance, sharpness of resonance. **Shock waves:** Mach number and Mach Angle, Mach Regimes, definition and characteristics of Shock waves, Construction and working of Reddy shock tube, Applications of Shock Waves. Numerical problems.

**Pre-requisites: Basics of Oscillations**

**Self-learning: Simple Harmonic motion, differential equation for SHM 08 Hrs**  
**Unit – II**

**Elasticity:**

Stress-Strain Curve, Stress hardening and softening. Elastic Moduli, Poisson's ratio and its limiting values. Relation between  $Y$ ,  $n$  and  $\sigma$  (with derivation), Beams, bending moment and derivation of expression, Cantilever and I section girder and their Engineering Applications, Elastic materials (qualitative). Failures of engineering materials - ductile fracture, brittle fracture, stress concentration, fatigue and factors affecting fatigue (only qualitative explanation). Numerical problems.

**Pre-requisites: Elasticity, Stress & Strain**

**Self-learning: Stress-Strain Curve 08 Hrs**  
**Unit – III**

**Thermoelectric materials and devices:**

Thermo emf and thermo current, Seebeck effect, Peltier effect, Seebeck and Peltier coefficients, figure of merit (Mention Expression), laws of thermoelectricity. Expression for thermo emf in terms of  $T_1$  and  $T_2$ , Thermo couples, thermopile, Construction and Working of Thermoelectric generators (TEG) and Thermoelectric coolers (TEC), low, mid and high-temperature thermoelectric materials, Applications: Exhaust of Automobiles, Refrigerator, Space Program (RTG). Numerical Problems.

**Pre-requisites: Basics of Electrical conductivity**

**Self-learning: Thermo emf and thermo current 08 Hrs**  
**Unit – IV**

**Cryogenics:**

Production of low temperature - Joule Thomson effect (Derivation with 3 cases), Porous plug experiment with theory, Thermodynamical analysis of Joule Thomson effect, Liquefaction of Oxygen by cascade process, Lindey's air liquefier, Liquefaction of Helium and its properties, Platinum Resistance Thermometer, Applications of cryogenics, in aerospace, Tribology and food processing(qualitative). Numerical problems.

**Pre-requisites: Basics of Heat and Thermodynamics**

**Self-learning: Joule Thomson effect 08 Hrs**

**Unit - V****Material Characterization and Instrumentation Techniques:**

Introduction to nanomaterials: Nanomaterials and nanocomposites. Principle, construction and working of X-ray Diffractometer, crystallite size determination by Scherrer equation. Principle, construction, working and applications of Atomic Force Microscopy (AFM). X-ray photoelectron spectroscopy (XPS), Scanning electron microscopy (SEM), Transmission electron microscopy (TEM). Numerical problems.

**Pre-requisites: Principle and working of Optical Microscope**

**Self-learning: X-Ray Diffractometer**

**Laboratory Component:**

**08 Hrs**

Any Ten Experiments have to be completed from the list of experiments

Note: The experiments have to be classified into

- a) Exercise
- b) Demonstration
- c) Structured Inquiry
- d) Open Ended

Based on convenience classify the following experiments into the above categories. Select at least one simulation /spreadsheet activity.

**List of Experiments:**

1. Uniform Bending
2.  $n$  by Torsional Pendulum
3. Forced Mechanical Oscillations and Resonance
4. Series & Parallel Resonance
5. Fermi Energy of Conductor
6. Resistivity by Four Probe Method
7. Spring Constant
8. Single Cantilever
9.  $I$  by Torsional pendulum
10. Laser Diffraction
11. Ultrasonic Interferometer
12. Newton's Rings
13. GNU Step Interactive Simulations
14. Study of motion using spread Sheets
15. Application of Statistic using Spread Sheets
16. PHET Interactive

**Reference Books:**

1. Vibrations and Waves (MIT introductory Physics Series), A P French, CBS, 2003 Edition

2. Timoshenko, S. and Goodier J.N. "Theory of Elasticity", 2nd Edition, McGraw Hill Book Co, 2001.
3. Sadhu Singh, "Theory of Elasticity", Khanna Publishers, 1997
4. Mechanical Properties of Engineered Materials By Wole Soboyejo, CRC Press; 1st edition, 2002
5. Heat & Thermodynamics and Statistical Physics (XVIII-Edition) – Singhal, Agarwal & Satyaprakash – Pragat Prakashan, Meerut, 2006.
6. Heat and Thermodynamics (I-Edition) – D.S.Mathur - S. Chand & Company Ltd., New-Delhi, 1991
7. Heat and Thermodynamics, Brijlal & Subramanyam, S. Chand & Company Ltd., New-Delhi
8. Physics of Cryogenics by Bahman Zohuri, Elsevier, 2018
9. Materials Characterization Techniques-Sam Zhang, Lin Li, Ashok Kumar, CRC Press, First Edition, 2008.
10. Characterization of Materials- Mitra P.K . Prentice Hall India Learning Private Limited.
11. Nanoscience and Nanotechnology: Fundamentals to Frontiers – M.S.Ramachandra Rao & Shubra Singh, Wiley India Pvt Ltd.
12. Nano Composite Materials-Synthesis, Properties and Applications, J. Parameswaranpillai, N.Hameed, T.Kurian, Y. Yu, CRC Press.
13. Shock waves made simple by Chintoo S Kumar, K Takayama and K P J Reddy: Willey India Pvt. Ltd, Delhi, 2014

<b>22CED13</b>	<b>Computer-Aided Engineering Drawing</b>	<b>(2:0:2:0) 3</b>
<b>Contact Hours: 40</b>		

**Course Learning Objectives (CLOs):**

- To understand the basic principles and conventions of engineering drawing
- To use drawing as a communication mode
- To generate pictorial views using CAD software
- To understand the development of surfaces
- To visualize engineering components

**Course outcomes (COs):**

<b>Description of the Course Outcome:</b> At the end of the course the student will be able to:		<b>Mapping to Pos (1-12)/ PSOs (1,2)</b>		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
<b>CO-1</b>	Draw and communicate the objects with definite shape and dimensions	1,5,10	2,12	6,8,9
<b>CO-2</b>	Recognize and Draw the shape and size of objects through different views	1,5,10	2,12	6,8,9
<b>CO-3</b>	Develop the lateral surfaces of the object	1,5,10	2,12	6,8,9
<b>CO-4</b>	Create a Drawing views using CAD software.	1,2,5,10	--	6,7,9,12
<b>CO-5</b>	Identify the interdisciplinary engineering components or systems through its graphical representation.	1,5,10	2,12	9

POs/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14
<b>Mapping Level</b>	3	2.6	--	--	3	1	1	1	1	3	--	1.7	--	--

**Course Contents:**

**Unit - I**

**Introduction: for CIE only**

Significance of Engineering drawing, BIS Conventions of Engineering Drawing, Free hand sketching of engineering drawing, Scales. Introduction to Computer Aided Drafting software, Co-ordinate system and reference planes HP, VP, RPP & LPP of 2D/3D environment. Selection of drawing sheet size and scale. Commands and creation of Lines, coordinate points, axes, polylines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet and curves.

**Orthographic Projections of Points, Lines and Planes:**

Introduction to Orthographic projections: Orthographic projections of points in 1<sup>st</sup> and 3<sup>rd</sup> quadrants. Orthographic projections of lines (Placed in First quadrant only).

Orthographic projections of planes viz triangle, square, rectangle, pentagon, hexagon, and circular laminae (Placed in First quadrant only using change of position method).

**Application on projections of Lines & Planes (For CIE only) 12 Hrs**

### **Unit - II**

#### **Orthographic Projection of Solids:**

Orthographic projection of right regular solids (**Solids Resting on HP only**): Prisms & Pyramids (triangle, square, rectangle, pentagon, hexagon), Cylinders, Cones, Cubes & tetrahedrons.

**Projections of Frustum of cone and pyramids (For practice only, not for CIE and SEE). 08 Hrs**

### **Unit - III**

#### **Isometric Projections:**

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

#### **Conversion of simple isometric drawings into orthographic views.**

Problems on applications of Isometric projections of simple objects / engineering components.

**Introduction to drawing views using 3D environment (For CIE only). 08 Hrs**

### **Unit - IV**

#### **Development of Lateral Surfaces of Solids:**

Development of lateral surfaces of right regular prisms, cylinders, pyramids and cones resting with base on HP only. Development of lateral surfaces of their frustums and truncations. Problems on applications of development of lateral surfaces like funnels and trays.

**Problems on applications of development of lateral surfaces of transition pieces connecting circular duct and rectangular duct (For CIE Only) 06 Hrs**

### **Unit - V**

#### **Multidisciplinary Applications & Practice (For CIE Only):**

**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 etc

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

**Basic Building Drawing;** Like, Architectural floor plan, basic foundation drawing, steel structures- Frames, bridges, trusses using Auto CAD or suitable software,

**Electronics Engineering Drawings-** Like, Simple Electronics Circuit Drawings, practice on layers concept. **Graphs & Charts:** Like, Column chart, Pie chart, Line charts, Gantt charts, etc. using Microsoft Excel or any suitable software. **06 Hrs**

**Text Book:**

1. S.N. Lal, & T Madhusudhan: Engineering Visulisation, 1<sup>st</sup> Edition, Cengage, Publication
2. Parthasarathy N. S., Vela Murali, Engineering Drawing, Oxford University Press, 2015.

**Reference Books:**

1. Bhattacharya S. K., Electrical Engineering Drawing, New Age International publishers, second edition 1998, reprint 2005.
2. Chris Schroder, Printed Circuit Board Design using AutoCAD, Newnes, 1997.
3. K S Sai Ram Design of steel structures, , Third Edition by Pearson
4. Nainan p kurian Design of foundation systems, Narosa publications
5. A S Pabla, Electrical power distribution, 6th edition, Tata Mcgraw hill
6. Bhatt, N.D., Engineering Drawing: Plane and Solid Geometry, 53<sup>rd</sup> edition, Charotar Publishing House Pvt. Limited, 2019.
7. K. R. Gopalakrishna, & Sudhir Gopalakrishna: Textbook of Computer Aided Engineering Drawing, 39<sup>th</sup> Edition, Subash Stores, Bangalore, 2017

**22ESC145**

**Introduction to C Programming**

**(2:0:2:0) 3**

**Contact Hours:40**

**Course Learning Objectives (CLOs):**

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

**Course outcomes (COs):**

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to Pos (1-12)/ PSOs (1,2)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
<b>CO-1</b>	Elucidate the basic architecture and functionalities of a computer and also recognize the hardware parts	--	1	2,3,4
<b>CO-2</b>	Apply programming constructs of C language to solve the realworld problem	--	1,5	2,3,4
<b>CO-3</b>	Explore user-defined data structures like arrays in implementing solutions to problems like searching and sorting	1,5	2,3	4
<b>CO-4</b>	Explore user-defined data structures like structures, unions and pointers in implementing solutions	1,5	2,3	4
<b>CO-5</b>	Design and Develop Solutions to problems using modular programming constructs using functions	5	2,3	4

POs/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14
<b>Mapping Level</b>	2.6	1.6	1.6	1	2.8	--	--	--	--	--	--	--	--	--

**Course Contents:**

**Unit - I**

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

**Unit - II**

Operators in C, Type conversion and typecasting.

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

**Textbook: Chapter 9.15-9.16, 10.1-10.6**

**06 Hrs****Unit - III**

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

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

**Textbook: Chapter 11.1-11.13, 12.1-12.6**

**06 Hrs****Unit - IV**

Two dimensional arrays, operations on two-dimensional arrays, two-dimensional arrays to functions, multidimensional arrays.

**Applications of arrays and introduction to strings:** Applications of arrays, case study with sorting techniques.

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

**Textbook: Chapter 12.7-12.12**

**06 Hrs****Unit - V**

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

**Pointers:** Understanding the Computers Memory, Introduction to Pointers, Declaring Pointer Variables

**Structures:** Introduction to structures

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

**06 Hrs****List of Exercises**

1. C Program to find Mechanical Energy of a particle using  $E = mgh + \frac{1}{2}mv^2$ .
2. C Program to convert Kilometers into Meters and Centimeters.
3. C Program To Check the Given Character is Lowercase or Uppercase or Special Character.
4. Program to balance the given Chemical Equation values x, y, p, q of a simple chemical equation of the type: The task is to find the values of constants b<sub>1</sub>, b<sub>2</sub>, b<sub>3</sub> such that the equation is balanced on both sides and it must be the reduced form.



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

**Text Book:**

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

**Reference Books:**

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

**22ETS15E**

**Renewable Energy Sources**

**(3:0:0:0) 3**

**Contact Hours: 40**

**Course Learning Objectives (CLOs):**

- To understand energy scenario, energy sources and their utilization.
- To explore society's present needs and future energy demands.
- To Study the principles of renewable energy conversion systems.
- To exposed to energy conservation methods.

**Course outcomes (COs):**

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to Pos (1-12)/ PSOs (1,2)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
<b>CO-1</b>	Describe the environmental aspects of renewable energy resources. In Comparison with various conventional energy systems, their prospects and limitations.	1	--	7
<b>CO-2</b>	Describe the use of solar energy and the various components used in the energy production with respect to applications like-heating, cooling, desalination, power generation.	--	1	2,7
<b>CO-3</b>	Understand the conversion principles of wind and tidal energy	1	--	2,7
<b>CO-4</b>	Understand the concept of biomass energy resources and green energy.	--	1	2
<b>CO-5</b>	Acquire the basic knowledge of ocean thermal energy conversion and hydrogen energy.	1	--	2

POs/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14
<b>Mapping Level</b>	2.6	1	--	--	--	--	1	--	--	--	--	--	--	--

**Course Contents:**

**Unit - I**

**Introduction:** Principles of renewable energy; energy and sustainable development, fundamentals and social implications. worldwide renewable energy availability, renewable energy availability in India, brief descriptions on solar

energy, wind energy, tidal energy, wave energy, ocean thermal energy, biomass energy, geothermal energy, oil shale. Introduction to Internet of energy (IOE). **08 Hrs**

### **Unit - II**

**Solar Energy:** Fundamentals; Solar Radiation; Estimation of solar radiation on horizontal and inclined surfaces; Solar radiation Measurements- Pyrheliometers, Pyrometer, Sunshine Recorder. Solar Thermal systems: Flat plate collector; Solar distillation; Solar pond electric power plant.

**Solar electric power generation-** Principle of Solar cell, Photovoltaic system for electric power generation, advantages, Disadvantages and applications of solar photovoltaic system. **08 Hrs**

### **Unit - III**

**Wind Energy:** Properties of wind, availability of wind energy in India, wind velocity and power from wind; major problems associated with wind power, Basic components of wind energy conversion system (WECS); Classification of WECS- Horizontal axis- single, double and muliblade system. Vertical axis- Savonius and darrieus types.

**Biomass Energy:** Introduction; Photosynthesis Process; Biofuels; Biomass Resources; Biomass conversion technologies-fixed dome; Urban waste to energy conversion; Biomass gasification (Downdraft). **08 Hrs**

### **Unit - IV**

**Tidal Power:** Tides and waves as energy suppliers and their mechanics; fundamental characteristics of tidal power, harnessing tidal energy, advantages and limitations.

**Ocean Thermal Energy Conversion:** Principle of working, OTEC power stations in the world, problems associated with OTEC. **08 Hrs**

### **Unit - V**

**Green Energy:** Introduction, Fuel cells: Classification of fuel cells – H<sub>2</sub>; Operating principles, Zero energy Concepts. Benefits of hydrogen energy, hydrogen production technologies (electrolysis method only), hydrogen energy storage, applications of hydrogen energy, problem associated with hydrogen energy. **08 Hrs**

#### **Text Book:**

1. Nonconventional Energy sources, G D Rai, Khanna Publication, Fourth Edition,
2. Energy Technology, S.Rao and Dr. B.B. Parulekar, Khanna Publication. Solar energy, Subhas P Sukhatme, Tata McGraw Hill, 2<sup>nd</sup> Edition, 1996.

#### **Reference Books:**

1. Principles of Energy conversion, A. W. Culp Jr., McGraw Hill, 1996
2. Non-Convention Energy Resources, Shobh Nath Singh, Pearson, 2018

<b>22ENG16</b>	<b>Communicative English</b>	<b>(1:0:0:0) 1</b>
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**Contact Hours:15**

**Course Learning Objectives (CLOs):**

- To know about Fundamentals of Communicative English and Communication Skills in general.
- To train to identify the nuances of phonetics, intonation and enhance pronunciation skills for better Communication skills.
- To impart basic English grammar and essentials of important language skills.
- To enhance with English vocabulary and language proficiency for better communication skills.
- To learn about Techniques of Information Transfer through presentation.

**Course outcomes (COs):**

<b>Description of the Course Outcome:</b> At the end of the course the student will be able to:		<b>Mapping to Pos (1-12)/ PSOs (1,2)</b>		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
<b>CO-1</b>	Understand and apply the Fundamentals of Communication Skills in their communication skills.	--	10	--
<b>CO-2</b>	Identify the nuances of phonetics, intonation and enhance pronunciation skills	--	10	--
<b>CO-3</b>	To impart basic English grammar and essentials of language skills as per present requirement.	10	--	--
<b>CO-4</b>	Understand and use all types of English vocabulary and language proficiency.	--	10	--
<b>CO-5</b>	Adopt the Techniques of Information Transfer through presentation.	10	--	--

POs/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14
<b>Mapping Level</b>	--	--	--	--	--	--	--	--	--	2.4	--	--	--	--

**Course Contents:**

**Unit – I**

Introduction to Communicative English: Communicative English, Fundamentals of Communicative English, Process of Communication, Barriers to Effective Communicative English, Different styles and levels in Communicative English. Interpersonal and Intrapersonal Communication Skills.

**03 Hrs**

**Unit – II**

Introduction to Phonetics: Phonetic Transcription, English Pronunciation, Pronunciation Guidelines to consonants and vowels, Sounds Mispronounced, Silent and Nonsilent Letters, Syllables and Structure. Word Accent, Stress Shift and Intonation, Spelling Rules and Words often Misspelt. Common Errors in Pronunciation.

**03 Hrs****Unit – III**

Basic English Communicative Grammar and Vocabulary PART - I: Grammar: Basic English Grammar and Parts of Speech, Articles and Preposition. Question Tags, One Word Substitutes, Strong and Weak forms of words, Introduction to Vocabulary, All Types of Vocabulary – Exercises on it.

**03 Hrs****Unit – IV**

Basic English Communicative Grammar and Vocabulary PART - II: Words formation - Prefixes and Suffixes, Contractions and Abbreviations. Word Pairs (Minimal Pairs) – Exercises, Tense and Types of tenses, The Sequence of Tenses (Rules in use of Tenses) and Exercises on it.

**03 Hrs****Unit - V**

Communication Skills for Employment: Information Transfer: Oral Presentation and its Practice. Difference between Extempore/Public Speaking, Communication Guidelines. Mother Tongue Influence (MTI), Various Techniques for Neutralization of Mother Tongue Influence. Reading and Listening Comprehensions – Exercises.

**03 Hrs****Text Book:**

1. Communication Skills by Sanjay Kumar & Pushp Lata, Oxford University Press India Pvt Ltd - 2019.
2. A Textbook of English Language Communication Skills, (ISBN-978-81-955465-2-7), Published by Infinite Learning Solutions, Bengaluru - 2022.

**Reference Books:**

1. Technical Communication by Gajendra Singh Chauhan and Et al, (ISBN-978-93-5350-050-4), Cengage learning India Pvt Limited [Latest Revised Edition] - 2019.
2. English for Engineers by N.P.Sudharshana and C.Savitha, Cambridge University Press – 2018.
3. English Language Communication Skills – Lab Manual cum Workbook, Cengage learning India Pvt Limited [Latest Revised Edition] – (ISBN-978-93-86668-45-5), 2019.
4. A Course in Technical English – D Praveen Sam, KN Shoba, Cambridge University Press – 2020.
5. Practical English Usage by Michael Swan, Oxford University Press – 2016.

**22KSK17/  
22KBK17**

**Sanskritika Kannada / Balake Kannada**

**(1:0:0:0) 1**

**Contact Hours: 15**

**ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ - ಕನ್ನಡ ಬಲ್ಲ ಮತ್ತು ಕನ್ನಡ ಮಾತೃಭಾಷೆಯ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ನಿಗದಿಪಡಿಸಿದ ಪಠ್ಯಕ್ರಮ**

Course Title:	ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ		
Course Code:	22KSK17	CIE Marks	50
Course Type (Theory/Practical /Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	1:0:0:0	Exam Hours	01 Theory
Total Hours of Pedagogy	15 hours	Credits	01
<p><b>Course objectives : ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಪಠ್ಯ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು:</b> The course (22KSK17/27) will enable the students,</p> <ol style="list-style-type: none"> <li>1. ಪದವಿ ವಿದ್ಯಾರ್ಥಿಗಳಾಗಿರುವುದರಿಂದ ಕನ್ನಡ ಭಾಷೆ, ಸಾಹಿತ್ಯ ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.</li> <li>2. ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಪ್ರಧಾನ ಭಾಗವಾದ ಆಧುನಿಕಪೂರ್ವ ಮತ್ತು ಆಧುನಿಕ ಕಾವ್ಯಗಳನ್ನು ಪರಿಚಯಿಸುವುದು.</li> <li>3. ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯ ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ಅರಿವು ಹಾಗೂ ಆಸಕ್ತಿಯನ್ನು ಮೂಡಿಸುವುದು.</li> <li>4. ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯವನ್ನು ಹಾಗೂ ಅವರುಗಳ ಸಾಧಿಸಿದ ವಿಷಯಗಳನ್ನು ಪರಿಚಯಿಸುವುದು.</li> <li>5. ಸಾಂಸ್ಕೃತಿಕ, ಜನಪದ ಹಾಗೂ ಪ್ರವಾಸ ಕಥನಗಳ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.</li> </ol>			
<p><b>ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವ್ಯವಸ್ಥೆ (Teaching-Learning Process - General Instructions) :</b> These are sample Strategies, which teacher can use to accelerate the attainment of the course outcomes.</p> <ol style="list-style-type: none"> <li>1. ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡವನ್ನು ಬೋಧಿಸಲು ತರಗತಿಯಲ್ಲಿ ಶಿಕ್ಷಕರು ಪ್ರಸ್ತುತ ಪುಸ್ತಕ ಆಧಾರಿಸಿ ಬ್ಯಾಕ್ ಬೋರ್ಡ್ ವಿಧಾನವನ್ನು ಅನುಸರಿಸುವುದು. ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ತಯಾರಿಸಲು ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಪ್ರೇರೇಪಿಸುವುದು ಮತ್ತು ತರಗತಿಯಲ್ಲಿ ಅವುಗಳನ್ನು ಚರ್ಚಿಸಲು ಅವಕಾಶ ಮಾಡಿಕೊಡುವುದು.</li> <li>2. ಇತ್ತೀಚಿನ ತಂತ್ರಜ್ಞಾನದ ಅನುಕೂಲಗಳನ್ನು ಬಳಸಿಕೊಳ್ಳುವುದು - ಅಂದರೆ ಕವಿ-ಕಾವ್ಯ ಪರಿಚಯದಲ್ಲಿ ಕವಿಗಳ ಚಿತ್ರಣ ಮತ್ತು ಲೇಖನಗಳು ಮತ್ತು ಕಥೆ ಕಾವ್ಯಗಳ ಮೂಲ ಅಂಶಗಳಿಗೆ ಸಂಬಂಧಪಟ್ಟ ಧ್ವನಿ ಚಿತ್ರಗಳು, ಸಂಭಾಷಣೆಗಳು, ಈಗಾಗಲೇ ಇತರ ವಿಮರ್ಶಕರು ಬರೆದಿರುವ ವಿಮರ್ಶಾತ್ಮಕ ವಿಷಯಗಳನ್ನು ಟಿಪ್ಪಣಿ, ಡಿಜಿಟಲ್ ಮಾಧ್ಯಮಗಳ ಮುಖಾಂತರ ವಿಶ್ಲೇಷಿಸುವುದು.</li> <li>3. ನವೀನ ಮಾದರಿಯ ಸಾಹಿತ್ಯ ಬೋಧನೆಗೆ ಸಂಬಂಧಪಟ್ಟ ವಿಧಾನಗಳನ್ನು ಶಿಕ್ಷಕರು ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಅನುಕೂಲವಾಗುವ ರೀತಿಯಲ್ಲಿ ಅಳವಡಿಸಿಕೊಳ್ಳಬಹುದು.</li> </ol>			
<b>ಘಟಕ -1 ಕನ್ನಡ ಸಂಸ್ಕೃತಿ ಮತ್ತು ಭಾಷೆ ಕುರಿತಾದ ಲೇಖನಗಳು (03 hours of pedagogy)</b>			
<ol style="list-style-type: none"> <li>1. ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ - ಹಂಪ ನಾಗರಾಜಯ್ಯ</li> <li>2. ಕರ್ನಾಟಕದ ಐತಿಹಾಸಿಕ ಚರಿತ್ರೆ - ಜಿ. ವೆಂಕಟಸುಬ್ಬಯ್ಯ</li> <li>3. ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕನ್ನಡ - ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ ಮತ್ತು ಪ್ರೊ. ವಿ. ಕೇಶವಮೂರ್ತಿ</li> </ol>			
<b>ಘಟಕ - 2 ಆಧುನಿಕ ಪೂರ್ವದ ಕಾವ್ಯ ಭಾಗ (03 hours of pedagogy)</b>			
<ol style="list-style-type: none"> <li>1. ವಚನಗಳು : ಬಸವಣ್ಣ, ಅಕ್ಕಮಹಾದೇವಿ, ಅಲ್ಲಮಪ್ರಭು, ಆಯ್ಯಕ್ಕಿ ಮಾರಯ್ಯ, ಜೇಡರದಾಸಿಮಯ್ಯ, ಆಯ್ಯಕ್ಕಿ ಲಕ್ಕಮ್ಮ.</li> <li>2. ಕೀರ್ತನೆಗಳು : ಅದರಿದೇನು ಫಲ ಇದರಿದೇನು ಫಲ - ಪುರಂದರದಾಸರು ತಲ್ಲಣಿಸಿದಿರು ಕಂಡ್ಕೆ ತಾಳು ಮನವೇ - ಕನಕದಾಸರು</li> <li>3. ತತ್ವಪದಗಳು : ಸಾವಿರ ಕೊಡಗಳ ಸುಟ್ಟು - ಶಿಶುನಾಥ ಶರೀಫ</li> </ol>			
<b>ಘಟಕ -3 ಆಧುನಿಕ ಕಾವ್ಯಭಾಗ (03 hours of pedagogy)</b>			
<ol style="list-style-type: none"> <li>1. ಡಿವಿಜಿ ರವರ ಮಂಕುತಿಮ್ಮನ ಕಗದಿಂದ ಅಯ್ಯ ಕೆಲವು ಭಾಗಗಳು</li> <li>2. ಕುರುಡು ಕಾಂಚಾಣ : ದಾ.ರಾ. ಬೇಂದ್ರೆ</li> <li>3. ಹೊಸಬಾಳಿನ ಗೀತೆ : ಕುವೆಂಪು</li> </ol>			
<b>ಘಟಕ - 4 ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯ (03 hours of pedagogy)</b>			
<ol style="list-style-type: none"> <li>1. ಡಾ. ಸರ್. ಎಂ. ವಿಶ್ವೇಶ್ವರಯ್ಯ : ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹಾಸ - ಎ. ಎನ್. ಮೂರ್ತಿರಾವ್</li> <li>2. ಕರಕುಶಲ ಕಲೆಗಳು ಮತ್ತು ಪರಂಪರೆಯ ವಿಜ್ಞಾನ : ಕರಿಗೌಡ ಬೀಚನಹಳ್ಳಿ</li> </ol>			
<b>ಘಟಕ - 5 ಸಾಂಸ್ಕೃತಿಕ, ಜನಪದ ಕಥೆ ಮತ್ತು ಪ್ರವಾಸ ಕಥನ (03 hours of pedagogy)</b>			
<ol style="list-style-type: none"> <li>1. ಯುಗಾದಿ : ವಸುಧೇಂದ್ರ</li> <li>2. ಮೆಗಾನೆ ಎಂಬ ಗಿರಿಜನ ಪರ್ವತ : ಹಿ.ಚಿ. ಬೋರಲಿಂಗಯ್ಯ</li> </ol>			

**University Prescribed Textbook :**

**ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ**

ಡಾ. ಹಿ.ಚಿ.ಬೋರಲಿಂಗಯ್ಯ ಮತ್ತು ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ,  
ಪ್ರಕಟಣೆ : ಪ್ರಸಾರಾಂಗ,  
ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ.

- ವಿಶೇಷ ಸೂಚನೆ : 1. ಮೇಲಿನ ಪಠ್ಯಕ್ರಮಕ್ಕೆ ಸೀಮಿತವಾಗಿ ಅಂತಿಮ ಪರೀಕ್ಷೆಯ ಪ್ರಶ್ನೆಪತ್ರಿಕೆ ಇರುತ್ತದೆ.  
2. ಮೇಲಿನ ಪಠ್ಯಕ್ರಮವನ್ನು ಹೊರತುಪಡಿಸಿದ ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಪಠ್ಯಪುಸ್ತಕದಲ್ಲಿನ ಉಳಿದ ಪದ್ಯ & ಗದ್ಯ ಭಾಗ ಹಾಗೂ ಇತರ ಲೇಖನಗಳನ್ನು ಹೆಚ್ಚುವರಿ ಪೂರಕ ಓದಿಗಾಗಿ ಬಳಸಿಕೊಳ್ಳಬಹುದು. ಅಂತಿಮ ಪರೀಕ್ಷೆಯಲ್ಲಿ ಈ ಪಾಠಗಳಿಂದ ಪ್ರಶ್ನೆಗಳನ್ನು ಕೇಳಲಾಗುವುದಿಲ್ಲ.

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3. ಹೆಚ್ಚಿನ ಮಾಹಿತಿ ಮತ್ತು ವಿವರಣೆಗಳಿಗೆ ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ (9900832331) ಇವರನ್ನು ಸಂಪರ್ಕಿಸಿ.
4. ಮಾದರಿ ಪ್ರಶ್ನೆಪತ್ರಿಕೆ, ಕೋರ್ಸ್ ಆಯ್ಕೆ ಮಾಹಿತಿ, ಅಧ್ಯಯನ ಸಾಮಗ್ರಿ & ಬಹು ಆಯ್ಕೆ ಮಾದರಿಯ ಪ್ರಶ್ನೆಗಳ ಕೈಪಿಡಿಗಾಗಿ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವೆಬ್ ಸೈಟ್ ನೋಡುವುದು.

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

- ✓ Contents related activities (Activity-based discussions)
- ✓ For active participation of students instruct the students to prepare Flowcharts and Handouts
- ✓ Organising Group wise discussions Connecting to placement activities
- ✓ Quizzes and Discussions, Seminars and assignments.

**ಬಳಕೆ ಕನ್ನಡ - baLake Kannada (Kannada for Usage)**

Course Title:	ಬಳಕೆ ಕನ್ನಡ		
Course Code:	<b>22KBK17</b>	CIE Marks	50
Course Type (Theory/Practical /Integrated)	Theory	SEE Marks	50
		Total Marks	100
Teaching Hours/Week (L:T:P: S)	1:0:0:0	Exam Hours	01 Theory
Total Hours of Pedagogy	15 hours	Credits	01

**Course objectives : ಬಳಕೆ ಕನ್ನಡ ಪಠ್ಯ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು:**

The course (22KBK17) will enable the students,

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

**ಬೋಧನೆ ಮತ್ತು ಕಲಿಕಾ ವ್ಯವಸ್ಥೆ (Teaching-Learning Process - General Instructions) :**

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

1. ಬಳಕೆ ಕನ್ನಡವನ್ನು ತರಗತಿಯಲ್ಲಿ ಶಿಕ್ಷಕರು ಬೋಧಿಸಲು ವಿಟಿಯು ಸೂಚಿಸಿರುವ ಪಠ್ಯಪುಸ್ತಕವನ್ನು ಉಪಯೋಗಿಸಬೇಕು.
2. ಪ್ರಮುಖ ಅಂಶಗಳ ಚಾರ್ಟ್ ಗಳನ್ನು ತಯಾರಿಸಲು ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಉತ್ತೇಜಿಸುವುದು ಮತ್ತು ತರಗತಿಯಲ್ಲಿ ಅವುಗಳನ್ನು ಚರ್ಚಿಸಲು ಅವಕಾಶ ಮಾಡಿಕೊಡುವುದು.
3. ಪ್ರತಿ ವಿದ್ಯಾರ್ಥಿ ಪುಸ್ತಕವನ್ನು ತರಗತಿಯಲ್ಲಿ ಬಳಸುವಂತೆ ನೋಡಿಕೊಳ್ಳುವುದು ಮತ್ತು ಪ್ರತಿ ಪಾಠ ಮತ್ತು ಪ್ರವಚನಗಳ ಮೂಲ ಅಂಶಗಳಿಗೆ ಸಂಬಂಧಪಟ್ಟಂತೆ ಪೂರಕ ಚಟುವಟಿಕೆಗಳಿಗೆ ತೊಡಗಿಸತಕ್ಕದ್ದು.
4. ಡಿಜಿಟಲ್ ತಂತ್ರಜ್ಞಾನದ ಮುಖಾಂತರ ಇತ್ತೀಚೆಗೆ ಡಿಜಿಟಲೀಕರಣ ಗೊಂಡಿರುವ ಭಾಷೆ ಕಲಿಕೆಯ ವಿಧಾನಗಳನ್ನು ಪಿಪಿಟಿ ಮತ್ತು ದೃಶ್ಯ ಮಾಧ್ಯಮದ ಮುಖಾಂತರ ಚರ್ಚಿಸಲು ಕ್ರಮಕೈಗೊಳ್ಳುವುದು. ಇದರಿಂದ ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ತರಗತಿಯಲ್ಲಿ ಹೆಚ್ಚು ಏಕಾಗ್ರತೆಯಿಂದ ಪಾಠ ಕೇಳಲು ಮತ್ತು ಅಧ್ಯಯನದಲ್ಲಿ ತೊಡಗಲು ಅನುಕೂಲವಾಗುತ್ತದೆ.
5. ಭಾಷಾಕಲಿಕೆಯ ಪ್ರಯೋಗಾಲಯದ ಮುಖಾಂತರ ಬಹುಬೇಗ ಕನ್ನಡ ಭಾಷೆಯನ್ನು ಕಲಿಯಲು ಅನುಕೂಲವಾಗುವಂತೆ ಕಾರ್ಯಚಟುವಟಿಕೆಗಳನ್ನು ಮತ್ತು ಕ್ರಿಯಾ ಯೋಜನೆಗಳನ್ನು ರೂಪಿಸುವುದು.

**Module - 1**

(03 hours of pedagogy)

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



<b>Module - 2</b>	<b>(03 hours of pedagogy)</b>
<ol style="list-style-type: none"> <li>1. ನಾಮಪದಗಳ ಸಂಬಂಧಾರ್ಥಕ ರೂಪಗಳು, ಸಂದೇಹಾಸ್ಪದ ಪ್ರಶ್ನೆಗಳು ಮತ್ತು ಸಂಬಂಧವಾಚಕ ನಾಮಪದಗಳು - Possessive forms of nouns, dubitive question and Relative nouns</li> <li>2. ಗುಣ, ಪರಿಮಾಣ ಮತ್ತು ವರ್ಣಬಣ್ಣ ವಿಶೇಷಣಗಳು, ಸಂಖ್ಯಾವಾಚಕಗಳು Qualitative, Quantitative and Colour Adjectives, Numerals</li> <li>3. ಕಾರಕ ರೂಪಗಳು ಮತ್ತು ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯಗಳು -ಸಪ್ತಮಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯ - (ಅ, ಅದು, ಅವು, ಅಲ್ಲಿ) -Predictive Forms, Locative Case</li> </ol>	
<b>Module - 3</b>	<b>(03 hours of pedagogy)</b>
<ol style="list-style-type: none"> <li>1. ಚತುರ್ಥಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯದ ಬಳಕೆ ಮತ್ತು ಸಂಖ್ಯಾವಾಚಕಗಳು - Dative Cases, and Numerals</li> <li>2. ಸಂಖ್ಯಾಗುಣವಾಚಕಗಳು ಮತ್ತು ಬಹುವಚನ ನಾಮರೂಪಗಳು -Ordinal numerals and Plural markers</li> <li>3. ನ್ಯೂನ/ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾಪದಗಳು &amp; ವರ್ಣ ಗುಣವಾಚಕಗಳು -Defective/Negative Verbs &amp; Colour Adjectives</li> </ol>	
<b>Module- 4</b>	<b>(03 hours of pedagogy)</b>
<ol style="list-style-type: none"> <li>1. ಅಪ್ಪಣೆ / ಒಪ್ಪಿಗೆ, ನಿರ್ದೇಶನ, ಪ್ರೋತ್ಸಾಹ ಮತ್ತು ಒತ್ತಾಯ ಆರ್ಥರೂಪ ಪದಗಳು ಮತ್ತು ವಾಕ್ಯಗಳು Permission, Commands, encouraging and Urging words (Imperative words and sentences)</li> <li>2. ಸಾಮಾನ್ಯ ಸಂಭಾಷಣೆಗಳಲ್ಲಿ ದ್ವಿತೀಯ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯಗಳು ಮತ್ತು ಸಂಭವನೀಯ ಪ್ರಕಾರಗಳು Accusative Cases and Potential Forms used in General Communication</li> <li>3. "ಇರು ಮತ್ತು ಇರಲ್ಲ" ಸಹಾಯಕ ಕ್ರಿಯಾಪದಗಳು, ಸಂಭಾವ್ಯಸೂಚಕ ಮತ್ತು ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾ ಪದಗಳು - Helping Verbs "iru and iralla", Corresponding Future and Negation Verbs</li> <li>4. ಹೋಲಿಕೆ (ತರತಮ), ಸಂಬಂಧ ಸೂಚಕ, ವಸ್ತು ಸೂಚಕ ಪ್ರತ್ಯಯಗಳು ಮತ್ತು ನಿಷೇಧಾರ್ಥಕ ಪದಗಳ ಬಳಕೆ- Comparitive, Relationship, Identification and Negation Words</li> </ol>	
<b>Module - 5</b>	<b>(03 hours of pedagogy)</b>
<ol style="list-style-type: none"> <li>1. ಕಾಲ ಮತ್ತು ಸಮಯದ ಹಾಗೂ ಕ್ರಿಯಾಪದಗಳ ವಿವಿಧ ಪ್ರಕಾರಗಳು -Different types of Tense, Time and Verbs</li> <li>2. ದ್, -ತ್, -ತು, - ಇತು, - ಆಗಿ, - ಅಲ್ಲ, - ಗ್, -ಕ್, ಇದೆ, ಕ್ರಿಯಾ ಪ್ರತ್ಯಯಗಳೊಂದಿಗೆ ಭೂತ, ಭವಿಷ್ಯತ್ ಮತ್ತು ವರ್ತಮಾನ ಕಾಲ ವಾಕ್ಯ ರಚನೆ - Formation of Past, Future and Present Tense Sentences with Verb Forms</li> <li>3. Kannada Vocabulary List :ಸಂಭಾಷಣೆಯಲ್ಲಿ ದಿನೋಪಯೋಗಿ ಕನ್ನಡ ಪದಗಳು -Kannada Words in Conversation</li> </ol>	

**Course outcome (Course Skill Set) ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ / ಬಳಕೆ ಕನ್ನಡ ಪಠ್ಯ**

ಕಲಿಕೆಯಿಂದ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಆಗುವ ಅನುಕೂಲಗಳು ಮತ್ತು ಫಲಿತಾಂಶಗಳು:

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

C01	To Create the awareness regarding the necessity of learning local language for comfortable and healthy life.
C02	To enable learners to Listen and understand the Kannada language properly.
C03	To speak, read and write Kannada language as per requirement.
C04	To train the learners for correct and polite conversation.
C05	To know about Karnataka state and its language, literature and General information about this state.

**University Prescribed Textbook :**

**ಬಳಕೆ ಕನ್ನಡ**

ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ

ಪ್ರಕಟಣೆ : ಪ್ರಸಾರಾಂಗ,

ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ.

**ಸೂಚನೆ :**

- ವಿಶೇಷ ಸೂಚನೆ : 1. ಮೇಲಿನ ಪಠ್ಯಕ್ರಮಕ್ಕೆ ಸೀಮಿತವಾಗಿ ಅಂತಿಮ ಪರೀಕ್ಷೆಯ ಪ್ರಶ್ನೆಪತ್ರಿಕೆ ಇರುತ್ತದೆ.  
 2. ಮೇಲಿನ ಪಠ್ಯಕ್ರಮವನ್ನು ಹೊರತುಪಡಿಸಿದ ಬಳಕೆ ಕನ್ನಡ ಪಠ್ಯಪುಸ್ತಕದಲ್ಲಿನ ಉಳಿದ ಭಾಗಗಳನ್ನು ಹೆಚ್ಚುವರಿ ಪೂರಕ ಓದಿಗಾಗಿ ಬಳಸಿಕೊಳ್ಳಬಹುದು. ಅಂತಿಮ ಪರೀಕ್ಷೆಯಲ್ಲಿ ಈ ಪಾಠಗಳಿಂದ ಪ್ರಶ್ನೆಗಳನ್ನು ಕೇಳಲಾಗುವುದಿಲ್ಲ.

3. ಹೆಚ್ಚಿನ ಮಾಹಿತಿ ಮತ್ತು ವಿವರಣೆಗಳಿಗೆ ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ (9900832331) ಇವರನ್ನು ಸಂಪರ್ಕಿಸಿ.  
 4. ಮಾದರಿ ಪ್ರಶ್ನೆಪತ್ರಿಕೆ, ಕೋರ್ಸ್ ಆಯ್ಕೆ ಮಾಹಿತಿ, ಅಧ್ಯಯನ ಸಾಮಗ್ರಿ & ಬಹು ಆಯ್ಕೆ ಮಾದರಿಯ ಪ್ರಶ್ನೆಗಳ ಕೈಪಿಡಿಗಾಗಿ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವೆಬ್ ಸೈಟ್ ನೋಡುವುದು.

**Activity Based Learning (Suggested Activities in Class)/ Practical Based learning**

- ✓ Contents related activities (Activity-based discussions)
- ✓ For active participation of students instruct the students to prepare Flowcharts and Handouts
- ✓ Organising Group wise discussions Connecting to placement activities
- ✓ Quizzes and Discussions.
- ✓ Seminars and assignments.

**COs and POs Mapping (Samskritika Kannada/ Balake Kannada):**

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

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

POs/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Mapping Level	--	--	--	--	--	3	--	--	--	1	--	---	--	--

<b>21IDT18</b>	<b>Innovation and Design Thinking</b>	<b>(1:0:0:0) 1</b>
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**Contact Hours:15**

**Course Learning Objectives (CLOs):**

- To explain the concept of design thinking for product and service development
- To explain the fundamental concept of innovation and design thinking
- To discuss the methods of implementing design thinking in the real world

**Course outcomes (COs):**

<b>Description of the Course Outcome:</b> At the end of the course the student will be able to:		<b>Mapping to Pos (1-12)/ PSOs (1,2)</b>		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
<b>CO-1</b>	Appreciate various design process procedure	--	3	--
<b>CO-2</b>	Generate and develop design ideas through different technique	--	2	--
<b>CO-3</b>	Identify the significance of reverse Engineering to Understand products	--	--	4
<b>CO-4</b>	Draw technical drawing for design ideas	--	5,10	--

POs/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14
<b>Mapping Level</b>	--	2	2	1	2	--	--	--	--	2	--	---	--	--

**Course Contents:**

**Unit - I**

**PROCESS OF DESIGN**

**Understanding Design thinking**

Shared model in team-based design – Theory and practice in Design thinking – Explore presentation signers across globe – MVP or Prototyping **03 Hrs**

**Unit - II**

**Tools for Design Thinking**

Real-Time design interaction capture and analysis – Enabling efficient collaboration in digital space – Empathy for design – Collaboration in distributed Design. **03 Hrs**

**Unit - III**

**Design Thinking in IT**

Design Thinking to Business Process modelling – Agile in Virtual collaboration environment – Scenario based Prototyping. **03 Hrs**

**Unit - IV**

**DT For strategic innovations**

Growth – Storytelling representation – Strategic Foresight - Change – Sense Making - Maintenance Relevance – Value redefinition - Extreme Competition – experience design - Standardization – Humanization - Creative Culture – Rapid prototyping, Strategy, and Organization – Business Model design. **03 Hrs**

**Unit - V**

Design thinking workshop

Design Thinking Workshop Empathize, Design, Ideate, Prototype and Test. **03 Hrs**

**Text Book:**

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

**Reference Books:**

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

<b>22MATM21</b>	<b>Mathematics-II for MES</b>	<b>(2:2:2:0) 4</b>
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**Contact Hours:40**

**Course Learning Objectives (CLOs):**

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

**Course outcomes (COs):**

<b>Description of the Course Outcome:</b> At the end of the course the student will be able to:		<b>Mapping to Pos (1-12)/ PSOs (1,2)</b>		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
<b>CO-1</b>	Apply the knowledge of multiple integrals to compute area and volume.	--	--	1
<b>CO-2</b>	Understand the applications of vector calculus refer to solenoidal, irrotational vectors, line	--	--	1
<b>CO-3</b>	Demonstrate partial differential equations and their solutions for physical interpretations.	--	--	1
<b>CO-4</b>	Apply the knowledge of numerical methods in solving physical and engineering phenomena.	--	--	1
<b>CO-5</b>	Get familiarize with modern mathematical tools namely Mathematica / MatLab / Python / Scilab	--	--	1

POs/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14
<b>Mapping Level</b>	1	--	--	--	--	--	--	--	--	--	--	--	--	--

**Course Contents:**

**Unit – I**

**Introduction to Integral Calculus in Mechanical Engineering applications.**

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

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

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

**Applications:** Applications to mathematical quantities (Area, Surface area, Volume), Analysis of probabilistic models. **08 Hrs**

### Unit – II

**Introduction to Vector Calculus in Mechanical Engineering applications.**

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

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

**Self-Study:** Volume integral and Gauss divergence theorem.

**Applications:** Heat and mass transfer, oil refinery problems, environmental engineering, velocity and acceleration of moving particles, analysis of streamlines.

**08 Hrs**

### Unit – III

**Importance of partial differential equations for Mechanical Engineering application.** Formation of PDE's by elimination of arbitrary constants and functions. Solution of non-homogeneous PDE by direct integration. Homogeneous PDEs involving derivatives with respect to one independent variable only. Solution of Lagrange's linear PDE. Derivation of one-dimensional heat equation and wave equation.

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

**Applications:** Vibration of a rod/membrane.

**08 Hrs**

### Unit – IV

**Importance of numerical methods for discrete data in the field of Mechanical Engineering.** Solution of algebraic and transcendental equations: Regula-Falsi and Newton-Raphson methods (only formulae). Problems.

Finite differences, Interpolation using Newton's forward and backward difference formulae, Newton's divided difference formula and Lagrange's interpolation formula (All formulae without proof). Problems.

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

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

**Applications:** Finding approximate solutions to solve mechanical engineering problems involving numerical data. **08 Hrs**

### Unit - V

**Introduction to various numerical techniques for handling Mechanical**

**Engineering applications.**

**Numerical Solution of Ordinary Differential Equations (ODEs):**

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

**Self-Study:** Adam-Bashforth method.

**Applications:** Finding approximate solutions to solve mechanical engineering problems. **08 Hrs**

**Text Book:**

1. **B. S. Grewal:** "Higher Engineering Mathematics", Khanna publishers, 44<sup>th</sup> Ed., 2021.
2. **E. Kreyszig:** "Advanced Engineering Mathematics", John Wiley & Sons, 10<sup>th</sup> Ed., 2018.

**Reference Books:**

1. **V. Ramana:** "Higher Engineering Mathematics" McGraw-Hill Education, 11<sup>th</sup> Ed., 2017
2. **Srimanta Pal & Subodh C. Bhunia:** "Engineering Mathematics" Oxford University Press, 3<sup>rd</sup> Ed., 2016.
3. **N.P Bali and Manish Goyal:** "A textbook of Engineering Mathematics" LaxmiPublications, 10<sup>th</sup> Ed., 2022.
4. **C. Ray Wylie, Louis C. Barrett:** "Advanced Engineering Mathematics" McGraw – HillBook Co., Newyork, 6<sup>th</sup> Ed., 2017.
5. **Gupta C.B, Sing S.R and Mukesh Kumar:** "Engineering Mathematic for Semester I andII", Mc-Graw Hill Education (India) Pvt. Ltd 2015.
6. **H. K. Dass and Er. Rajnish Verma:** "Higher Engineering Mathematics" S. ChandPublication, 3<sup>rd</sup> Ed., 2014.
7. **James Stewart:** "Calculus" Cengage Publications, 7<sup>th</sup> Ed., 2019.
8. **David C Lay:** "Linear Algebra and its Applications", Pearson Publishers, 4<sup>th</sup> Ed., 2018.
9. **Gareth Williams:** "Linear Algebra with applications", Jones Bartlett Publishers Inc., 6<sup>th</sup>Ed., 2017.

**22CHEM22**

**Chemistry for MES**

**(2:2:2:0) 4**

**Contact Hours:40**

**Course Learning Objectives (CLOs):**

- To enable students to acquire knowledge on principles of chemistry for engineering applications.
- To develop an intuitive understanding of chemistry by emphasizing the related branches of engineering.
- To provide students with a solid foundation in analytical reasoning required to solve societal problems.

**Course outcomes (COs):**

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to Pos (1-12)/ PSOs (1,2)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
<b>CO-1</b>	Identify the terms and processes involved in scientific and engineering applications	1	--	2,3,7
<b>CO-2</b>	Explain the phenomena of chemistry to describe the methods of engineering processes	1	--	2,3,7
<b>CO-3</b>	Solve the problems in chemistry that are pertinent in engineering applications	1	--	2,3,7
<b>CO-4</b>	Apply the basic concepts of chemistry to explain the chemical properties and processes	1	--	2,3,7
<b>CO-5</b>	Analyze properties and processes associated with chemical substances in multidisciplinary situations	1	--	2,3,7

POs/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14
<b>Mapping Level</b>	3	1	1	--	--	--	1	--	--	--	--	--	--	--

**Course Contents:**

**Unit – I**

**Fuels:** Introduction, calorific value, determination of calorific value using bomb calorimeter, numerical problems on GCV and NCV.

**Green fuels:** Introduction, power alcohol, synthesis and applications of biodiesel.



**High energy fuels:** Production of hydrogen by electrolysis of water and its advantages. **Energy devices:** Introduction, construction, working, and applications of Photovoltaic cells, Li-ion battery and methanol-oxygen fuel cell.

**Self-learning:** Plastic recycling to fuels and its monomers or other useful products.

**08 Hrs**

### Unit – II

**Corrosion:** Introduction, electrochemical theory of corrosion, types of corrosion differential metal, differential aeration (waterline and pitting), stress corrosion (caustic embrittlement).

**Corrosion control:** Metal coating-galvanization, surface conversion coating-anodization and cathodic protection-sacrificial anode method. Corrosion testing by weight loss method. Corrosion penetration rate (CPR)-numerical problems.

**Metal finishing:** Introduction, technological importance. Electroplating: Introduction,

NOTE: Wherever the contact hours are not sufficient, tutorial hours can be converted to theory hours.

Electroplating of chromium (hard and decorative). Electroless plating: Introduction, electroless plating of nickel.

Self-learning: Factors affecting the rate of corrosion, factors influencing the nature and quality of electrodeposit (Current density, concentration of metal ion, pH and temperature).

**08 Hrs**

### Unit – III

**Polymers:** Introduction, methods of polymerization (Condensation and Free radical),

molecular weight; number average and weight average, numerical problems. Synthesis, properties and industrial applications of polyvinylchloride (PVC) and polystyrene.

**Fibers:** Introduction, synthesis, properties and industrial applications of Kevlar and Polyester.

**Plastics:** Introduction, synthesis, properties and industrial applications of poly (methyl methacrylate) (PMMA) and 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.

**Self-learning:** Biodegradable polymer: Introduction, synthesis, properties and applications of polylactic acid (PLA).

**08 Hrs**

### Unit – IV

**Phase rule:** Introduction, Definition of terms: phase, components, degree of freedom, phase rule equation. Phase diagram: Two component-lead-silver system.

**Analytical techniques:** Introduction, principle, instrumentation of potentiometric sensors; its application in the estimation of iron, Optical sensors (colorimetry); its

application in the estimation of the copper, pH-sensor (Glass electrode); its application in the determination of pH of beverages.

**Self-learning:** Determination of viscosity of biofuel and its correlation with temperature. **08 Hrs**

### Unit - V

**Alloys:** Introduction, classification, composition, properties and applications of Stainless Steel, Solders, Brass and Alnico.

**Ceramics:** Introduction, classification based on chemical composition, properties and applications of perovskites (CaTiO<sub>3</sub>).

**Nanochemistry:** Introduction, size-dependent properties of nanomaterial (surface area, catalytical and thermal), synthesis of nanoparticles by sol-gel, and co-precipitation method. **Nanomaterials:** Introduction, properties and engineering applications of carbon nanotubes and graphene.

**Self-learning: Abrasives:** Introduction, classification, properties and applications of silicon carbide (carborundum). **08 Hrs**

### PRACTICAL MODULE

#### **A – Demonstration (any two) offline/virtual:**

- A1. Synthesis of polyurethane
- A2. Preparation of urea formaldehyde resin
- A3. Synthesis of iron oxide nanoparticles
- A4. Determination of acid value of biofuel

#### **B – Exercise (compulsorily any 4 to be conducted):**

- B1. Conductometric estimation of acid mixture
- B2. Potentiometric estimation of FAS using K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>
- B3. Determination of pK<sub>a</sub> of vinegar using pH sensor (Glass electrode)
- B4. Determination of rate of corrosion of mild steel by weight loss method
- B5. Estimation of total hardness of water by EDTA method

#### **C – Structured Enquiry (compulsorily any 4 to be conducted):**

- C1. Estimation of Copper present in electroplating effluent by optical sensor (colorimetry)
- C2. Determination of Viscosity coefficient of lubricant (Ostwald's viscometer)
- C3. Estimation of iron in TMT bar by diphenyl amine/external indicator method
- C4. Estimation of Sodium present in soil/effluent sample using flame photometry
- C5. Determination of Chemical Oxygen Demand (COD) of industrial waste water sample

#### **D – Open Ended Experiments (any two):**

- D1. Estimation of percentage of iron in steel
- D2. Electroplating of desired metal on substrate
- D3. Synthesis of biodiesel
- D4. Synthesis of Aluminium Oxide nano particle

**Reference Books:**

1. Wiley Engineering Chemistry, Wiley India Pvt. Ltd. New Delhi, 2013- 2<sup>nd</sup> Edition.
2. Engineering Chemistry, Satyaprakash & Manisha Agrawal, Khanna Book Publishing, Delhi
3. A Text Book of Engg. Chemistry, Shashi Chawla, Dhanpat Rai & Co. (P) Ltd.
4. Essentials of Physical Chemistry, Bahl&Tuli, S.Chand Publishing
5. Applied Chemistry, Sunita Rattan, Kataria 5. Engineering Chemistry, Baskar, Wiley
6. Engineering Chemistry – I, D. Grouv Krishana, Vikas Publishing
7. A Text book of Engineering Chemistry, SS Dara & Dr. SS Umare, S Chand & Company Ltd., 12<sup>th</sup> Edition, 2011.
8. A Text Book of Engineering Chemistry, R.V. Gadag and Nityananda Shetty, I. K. International Publishing house. 2<sup>nd</sup> Edition, 2016.
9. Text Book of Polymer Science, F.W. Billmeyer, John Wiley & Sons, 4<sup>th</sup> Edition, 1999.
10. Nanotechnology A Chemical Approach to Nanomaterials, G.A. Ozin & A.C. Arsenault, RSC Publishing, 2005.
11. Corrosion Engineering, M. G. Fontana, N. D. Greene, McGraw Hill Publications, New York, 3<sup>rd</sup> Edition, 1996.
12. Linden's Handbook of Batteries, Kirby W. Beard, Fifth Edition, McGraw Hill, 2019.
13. OLED Display Fundamentals and Applications, Takatoshi Tsujimura, Wiley–Blackwell, 2012
14. Supercapacitors: Materials, Systems, and Applications, Max Lu, Francois Beguin, Elzbieta Frackowiak, Wiley-VCH; 1st edition, 2013.
15. "Handbook on Electroplating with Manufacture of Electrochemicals", ASIA PACIFIC BUSINESS PRESS Inc., 2017. Dr. H. Panda,
16. Expanding the Vision of Sensor Materials. National Research Council 1995, Washington, DC: The National Academies Press. doi: 10.17226/4782.
17. Engineering Chemistry, Edited by Dr. Mahesh B and Dr. Roopashree B, Sunstar Publisher Bengaluru, ISBN 978-93-85155-70-3, 2022
18. High Performance Metallic Materials for Cost Sensitive Applications, F. H. Froes, et al. John Wiley & Sons, 2010
19. Instrumental Methods of Analysis, Dr. K. R. Mahadik and Dr. L. Sathiyarayanan, Nirali Prakashan, 2020
20. Principles of Instrumental Analysis, Douglas A. Skoog, F. James Holler, Stanley R. Crouch Seventh Edition, Cengage Learning, 2020
21. Polymer Science, V R Gowariker, N V Viswanathan, Jayadev, Sreedhar, Newage Int. Publishers, 4<sup>th</sup> Edition, 2021

22. Engineering Chemistry, P C Jain & Monica Jain, Dhanpat Rai Publication, 2015-16<sup>th</sup> Edition.
23. Nanostructured materials and nanotechnology, Hari Singh, Nalwa, academic press, 1<sup>st</sup> Edition. 2002.
24. Nanotechnology Principles and Practices, Sulabha K Kulkarni, Capital Publishing Company, 3<sup>rd</sup> Edition 2014
25. Principles of nanotechnology, Phanikumar, Scitech publications, 2<sup>nd</sup> Edition, 2010.
26. Chemistry for Engineering Students, B. S. Jai Prakash, R. Venugopal, Sivakumaraiah & Pushp Iyengar., Subash Publications, 5<sup>th</sup> Edition, 2014
27. "Engineering Chemistry", O. G. Palanna, Tata McGraw Hill Education Pvt. Ltd. New Delhi, Fourth Reprint, 2015.
28. Chemistry of Engineering materials, Malini S, K S Anantha Raju, CBS publishers Pvt Ltd.,
29. Laboratory Manual Engg. Chemistry, Anupma Rajput, Dhanpat Rai & Co.

<b>22EME23</b>	<b>Elements of Mechanical Engineering</b>	<b>(2:2:0:0) 3</b>
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**Contact Hours:40**

**Course Learning Objectives (CLOs):**

- Acquire a basic understanding about scope of mechanical engineering, fundamentals about steam and non-conventional energy sources.
- Acquire a basic knowledge about conventional and advanced manufacturing processes.
- Acquiring a basic understanding about IC engines, propulsive devices and air-conditioner.
- Acquiring a basic knowledge about power transmission and joining processes.
- Acquiring a basic insight into future mobility and mechatronics and robotics.

**Course outcomes (COs):**

<b>Description of the Course Outcome:</b> At the end of the course the student will be able to:		<b>Mapping to Pos (1-12)/ PSOs (1,2)</b>		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
<b>CO-1</b>	Explain the role of mechanical engineering in industry and society, fundamentals of steam and non-conventional energy sources	1	2	6,7,10,12
<b>CO-2</b>	Describe different conventional and advanced machining processes, IC engines, propulsive devices, air-conditioning, refrigeration.	1	2	6,7,10,12
<b>CO-3</b>	Explain different gear drives, gear trains, aspects of future mobility and fundamentals of robotics	1	2	6,7,10,12
<b>CO-4</b>	Determine the condition of steam and its energy, performance parameters of IC engines, velocity ratio and power transmitted through power transmission systems.	1,2	--	6,7,12

POs/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Mapping Level	3	2.6	--	--	--	1	1	--	--	1	--	1	--	--

**Course Contents:**

**Unit - I**

**Introduction to Mechanical Engineering** (Overview only): Role of Mechanical Engineering in Industries and Society- Emerging Trends and Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors.

**Steam Formation and Application:**

Modes of heat transfer, Steam formation, Types of steam, Steam properties and applications of steam (simple numerical problems).

**Energy Sources and Power Plants:**

Basic working principles of Hydel power plant, Thermal power plant, nuclear power plant, Solar power plant, Tidal power plant and Wind power plant. **08 Hrs**

**Unit - II**

**Machine Tool Operations:**

**Lathe:** Principle of working of a center lathe, lathe operations: Turning, facing, knurling, thread cutting, taper turning by swivelling the compound rest,

**Drilling Machine:** Working of simple drilling machine, drilling operations: drilling, boring, reaming, tapping, counter sinking, counter boring,

**Milling Machine:** Working and types of milling machine, milling operations: plane milling, end milling and slot milling.

(No sketches of machine tools, sketches to be used only for explaining the operations).

**Introduction to Advanced Manufacturing Systems:** Introduction, components of CNC, advantages and applications of CNC, 3D printing. **08 Hrs**

**Unit - III**

**Introduction to IC Engines:** Components and working principles, 4-Stroke Petrol and Diesel engines, Application of IC Engines, performance of IC engines (Simple numerical).

**Introduction to Refrigeration and Air Conditioning:** Principle of refrigeration, Refrigerants and their desirable properties. Working principle of VCR refrigeration system, working principle of room air conditioner & Applications of air Conditioners.

**08 Hrs**

**Unit - IV**

**Mechanical Power Transmission:**

**Gear Drives:** Types - spur, helical, bevel, worm and rack and pinion, velocity ratio, simple and compound gear trains (simple numerical problems)

**Belt Drives:** Introduction, Types of belt drives (Flat and V-Belt Drive), length of the belt and tensions ratio (simple numerical problems)

**Joining Processes:** Soldering, Brazing and Welding, Definitions, classification of welding process, Arc welding, Gas welding, (types of flames), TIG welding, MIG welding and Fusion welding. **08 Hrs**

**Unit - V**

**Insight into future mobility technology;** Electric and Hybrid Vehicles, Components of Electric and Hybrid Vehicles. Advantages and disadvantages of Electric Vehicles (EVs) and Hybrid vehicles.

**Introduction to Mechatronics and Robotics:** open-loop and closed-loop mechatronic systems. Joints & links, Robot anatomy, Applications of Robots in material handling, processing and assembly and inspection **08 Hrs**

**Laboratory Component:**

Any Eight Experiments have to be completed from the list of experiments

Note: The experiments have to be classified into

- a) Exercise
- b) Demonstration
- c) Structured Inquiry

**List of Experiments:**

1. Mechatronic experiments (03)
2. Welding / Brazing of metal parts.
3. Drilling and punching operation
4. Development of lateral surface
5. I.C.E assembly/disassembly (02)
6. Demonstration on the lathe.
7. Demonstration on milling.
8. Demonstration on CNC machine.

**Text Book:**

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

**Reference Books:**

1. An Introduction to Mechanical Engineering, Jonathan Wickert and Kemper Lewis, Third Edition, 2012
2. Manufacturing Technology- Foundry, Forming and Welding, P.N.Rao Tata McGraw Hill 3rdEd., 2003.
3. Robotics, Appu Kuttan KK K. International Pvt Ltd, volume 1

**22ESC243**

**Introduction to Electronics Engineering**

**(3:0:0:0) 3**

**Contact Hours:40**

**Course Learning Objectives (CLOs):**

- To prepare students with fundamental knowledge/ overview in the field of Electronics and Communication Engineering.
- To equip students with a basic foundation in electronic engineering required for comprehending the operation and application of electronic circuits, logic design, embedded systems, and communication systems.
- Professionalism & Learning Environment: To inculcate in first-year engineering students an ethical and professional attitude by providing an academic environment inclusive of effective communication, teamwork, ability to relate engineering issues to a broader social context, and life-long learning needed for a successful professional career.

**Course outcomes (COs):**

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to Pos (1-12)/ PSOs (1,2)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
<b>CO-1</b>	<b>Develop</b> the basic knowledge on construction and operation of rectifiers and amplifiers.	-	3	1
<b>CO-2</b>	<b>Apply</b> the acquired knowledge to construct small scale circuits consisting of oscillators and operational amplifiers.	-	1	-
<b>CO-3</b>	<b>Develop</b> the competence knowledge to construct basic digital circuit by making use of basic gates and its function.	-	1	3
<b>CO-4</b>	<b>Apply</b> the acquired knowledge to construct small scale embedded circuits.	-	1	12
<b>CO-5</b>	<b>Study</b> the conceptual blocks of basic communication system and <b>acquire</b> the knowledge of analog and digital communication schemes.	-	1	12

POs/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14
<b>Mapping Level</b>	1.7	--	0.7	--	--	--	--	--	--	--	--	--	--	--



**Course Contents:**

**Unit – I**

**Power Supplies** –Block diagram, Half-wave rectifier, Full-wave rectifiers and filters, Voltage regulators, Output resistance and voltage regulation, Voltage multipliers.

**Amplifiers** – CE amplifier with and without feedback, Multi-stage amplifier; BJT as a switch: Cut-off and saturation modes. (Text 1) **08 Hrs**

**Unit – II**

**Oscillators** – Barkhausen criterion, sinusoidal and non-sinusoidal scillators, Ladder network oscillator, Wein bridge oscillator, Multivibrators, Single-stage astable oscillator, Crystal controlled oscillators (Only Concepts, working, and waveforms. No mathematical derivations)

**Operational amplifiers** - Ideal op-amp; characteristics of ideal and practical op-amp; Practical op-amp circuits: Inverting and non-inverting amplifiers, voltage follower, summer, subtractor, integrator, differentiator. (Text 1) **08 Hrs**

**Unit – III**

**Boolean Algebra and Logic Circuits:** Binary numbers, Number Base Conversion, octal & Hexa Decimal Numbers, Complements, Basic definitions, Axiomatic Definition of Boolean Algebra, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Other Logic Operations, Digital Logic Gates (Text 2: 1.2, 1.3, 1.4, 1.5,2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7)

**Combinational logic:** Introduction, Design procedure, Adders- Half adder, Full adder (Text 2:4.1,4.2, 4.3) **08 Hrs**

**Unit – IV**

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

**Sensors and Interfacing** – Instrumentation and control systems, Transducers, Sensors, Actuators, LED, 7-Segment LED Display. (Text 1)

**08 Hrs**

**Unit - V**

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

**Digital Modulation Schemes:** Advantages of digital communication over analog communication, ASK, FSK, PSK, Radio signal transmission Multiple access techniques. (Text 3) **08 Hrs**

**Reference Books:**

1. Mike Tooley, 'Electronic Circuits, Fundamentals & Applications', 4th Edition, Elsevier, 2015. DOI <https://doi.org/10.4324/9781315737980>.  
[eBookISBN9781315737980](https://doi.org/10.4324/9781315737980)
2. Digital Logic and Computer Design, M. Morris Mano, PHI Learning, 2008 ISBN-978-81-203-0417-84.
3. D P Kothari, I J Nagrath, 'Basic Electronics', 2<sup>nd</sup> edition, McGraw Hill Education (India), Private Limited, 2018.

<b>22PLC25B</b>	<b>Introduction to Python Programming</b>	<b>(2:0:2:0) 3</b>
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**Contact Hours:40**

**Course Learning Objectives (CLOs):**

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

**Course outcomes (COs):**

<b>Description of the Course Outcome:</b> At the end of the course the student will be able to:		<b>Mapping to Pos (1-12)/ PSOs (1,2)</b>		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
<b>CO-1</b>	Demonstrate proficiency in handling loops and creation of functions.	--	1	2
<b>CO-2</b>	Identify the methods to create and manipulate lists, tuples and dictionaries.	1	2	--
<b>CO-3</b>	Develop programs for string processing and file organization	--	5	3
<b>CO-4</b>	Interpret the concepts of Object-Oriented Programming as used in Python.	2	3	--

POs/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14
<b>Mapping Level</b>	2.7	2.5	1.7	--	2	--	--	--	--	--	--	--	--	--

**Course Contents:**

**Unit - I**

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

The global Statement, Exception Handling, A Short Program: Guess the Number

**Textbook 1: Chapters 1 – 3**

**08 Hrs**

**Unit - II**

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

**Dictionaries and Structuring Data:** The Dictionary Data Type, Pretty Printing, Using Data

Structures to Model Real-World Things,

**Textbook 1: Chapters 4 – 5**

**08 Hrs**

**Unit - III**

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

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

**Textbook 1: Chapters 6 , 8**

**08 Hrs**

**Unit - IV**

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

**Debugging:** Raising Exceptions, Getting the Traceback as a String, Assertions, Logging, IDLE's Debugger.

**Textbook 1: Chapters 9-10**

**08 Hrs**

**Unit - V**

**Classes and objects:** Programmer-defined types, Attributes, Rectangles, Instances as return values, Objects are mutable, Copying,

**Classes and functions:** Time, Pure functions, Modifiers, Prototyping versus planning,

**Classes and methods:** Object-oriented features, Printing objects, Another example, A more complicated example, Theinit method, The\_str method, Operator overloading, Type-based dispatch, Polymorphism, Interface and implementation,

**Textbook 2: Chapters 15 – 17**

**08 Hrs**

**Text Book:**

1. Al Sweigart, "**Automate the Boring Stuff with Python**", 1<sup>st</sup> Edition, No Starch Press, 2015. (Available under CC-BY-NC-SA license at <https://automatetheboringstuff.com/>) (Chapters 1 to 18, except 12) for lambda functions use this link: <https://www.learnbyexample.org/python-lambda-function/>
2. Allen B. Downey, "**Think Python: How to Think Like a Computer Scientist**", 2<sup>nd</sup> Edition, Green Tea Press, 2015. (Available under CC-BY-NC license at <http://greenteapress.com/thinkpython2/thinkpython2.pdf>) (Chapters 13, 15, 16, 17, 18) (Download pdf/html files from the above link)
  - <https://www.learnbyexample.org/python/>
  - <https://www.learnpython.org/>
  - <https://pythontutor.com/visualize.html#mode=edit>

<b>22PWS26</b>	<b>Professional Writing Skills in English</b>	<b>(1:0:0:0) 1</b>
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**Contact Hours:15**

**Course Learning Objectives (CLOs):**

- To Identify the Common Errors in Writing and Speaking of English.
- To Achieve better Technical writing and Presentation skills for employment.
- To read Technical proposals properly and make them to write good technical reports.
- To Acquire Employment and Workplace communication skills
- To learn about Techniques of Information Transfer through presentation in different level.

**Course outcomes (COs):**

<b>Description of the Course Outcome:</b> At the end of the course the student will be able to:		<b>Mapping to Pos (1-12)/ PSOs (1,2)</b>		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
<b>CO-1</b>	To understand and identify the Common Errors in Writing and Speaking.	--	10	--
<b>CO-2</b>	To Achieve better Technical writing and Presentation skills.	--	10	--
<b>CO-3</b>	To read Technical proposals properly and make them to Write good technical reports.	10	--	--
<b>CO-4</b>	Acquire Employment and Workplace communication skills.	--	10	--
<b>CO-5</b>	To learn about Techniques of Information Transfer through presentation in different level.	10	--	--

POs/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14
<b>Mapping Level</b>	--	--	--	--	--	--	--	--	--	2.4	--	--	--	--

**Course Contents:**

**Unit – I**

Identifying Common Errors in Writing and Speaking English: Common errors identification in parts of speech, Use of verbs and phrasal verbs, Auxiliary verbs and their forms, Subject Verb Agreement (Concord Rules), Common errors in Subject-verb agreement, Sequence of Tenses and errors identification in Tenses. Words Confused/Misused.

**03 Hrs**

**Unit – II**

Nature and Style of sensible writing: Organizing Principles of Paragraphs in Documents, Writing Introduction and Conclusion, Importance of Proper Punctuation, Precise writing and Techniques in Essay writing, Sentence arrangements and Corrections activities. Misplaced modifiers, Contractions, Collocations, Word Order, Errors due to the Confusion of words.

**03 Hrs****Unit – III**

Technical Reading and Writing Practices: Technical writing process, Introduction to Technical Reports writing, Significance of Reports, Types of Reports. Introduction to Technical Proposals Writing, Types of Technical Proposals, Characteristics of Technical Proposals. Scientific Writing Process. Grammar – Voices and Reported Speech, Spotting Error & Sentence Improvement, Cloze Test and Theme Detection Exercises.

**03 Hrs****Unit – IV**

Professional Communication for Employment: Listening Comprehension, Types of Listening, Listening Barriers, Improving Listening Skills. Reading Comprehension, Tips for effective reading. Job Applications, Types of official/employment/business Letters, Resume vs. Bio Data, Profile, CV. Writing effective resume for employment, Emails, Blog Writing and Memos.

**03 Hrs****Unit – V**

Professional Communication at Workplace: Group Discussion and Professional Interviews, Characteristics and Strategies of a GD and PI's, Intra and Interpersonal Communication Skills at workplace, Non-Verbal Communication Skills and its importance in GD and Interview. Presentation skills and Formal Presentations by Students, Strategies of Presentation Skills.

**03 Hrs****Text Book:**

1. "Professional Writing Skills in English" published by Fillip Learning – Education (ILS), Bangalore – 2022.
2. "Functional English" (As per AICTE 2018 Model Curriculum) (ISBN-978-93-5350-047-4) Cengage learning India Pvt Limited [Latest Edition 2019].

**Reference Books:**

1. English for Engineers by N.P. Sudharshana and C.Savitha, Cambridge University Press – 2018.

2. Communication by Gajendra Singh Chauhan and Et al, (ISBN-978-93-5350-050-4), Cengage learning India Pvt Limited [Latest Revised Edition] - 2019.
3. Technical Communication – Principles and Practice, Third Edition by Meenakshi Raman and Sangeetha Sharma, Oxford University Press 2017.
4. High School English Grammar & Composition by Wren and Martin, S Chandh & Company Ltd – 2015.
5. Effective Technical Communication – Second Edition by M Ashraf Rizvi, McGraw Hill Education (India) Private



<b>22ICO27</b>	<b>Indian Constitution</b>	<b>(1:0:0:0) 1</b>
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**Contact Hours: 15**

**Course Learning Objectives (CLOs):**

The course INDIAN CONSTITUTION (22ICO17 / 27) will enable the students,

- To know about the basic structure of Indian Constitution.
- To know the Fundamental Rights (FR's), DPSP's and Fundamental Duties (FD's) of our constitution.
- To know about our Union Government, political structure & codes, procedures.
- To know the State Executive & Elections system of India.
- To learn the Amendments and Emergency Provisions, other important provisions given by the constitution.

**Course outcomes (COs):**

<b>Description of the Course Outcome:</b> At the end of the course the student will be able to:		<b>Mapping to Pos (1-12)/ PSOs (1,2)</b>		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
<b>CO-1</b>	Analyse the basic structure of Indian Constitution.	8	--	6,7
<b>CO-2</b>	Remember their Fundamental Rights, DPSP's and Fundamental Duties (FD's) of our constitution.	8	--	6,7
<b>CO-3</b>	know about our Union Government, political structure & codes, procedures.	8	--	6,7
<b>CO-4</b>	Understand our State Executive & Elections system of India.	8	--	6,7
<b>CO-5</b>	Remember the Amendments and Emergency Provisions, other important provisions given by the constitution.	8	--	6,7

POs/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14
<b>Mapping Level</b>	--	--	--	--	--	2.5	2.9	3.3	--	--	--	--	--	--

**Course Contents:**

**Unit – I**

Indian Constitution: Necessity of the Constitution, Societies before and after the Constitution adoption. Introduction to the Indian constitution, Making of the Constitution, Role of the Constituent Assembly. **03 Hrs**

**Unit – II**

Salient features of India Constitution. Preamble of Indian Constitution & Key concepts of the Preamble. Fundamental Rights (FR's) and its Restriction and limitations in different Complex Situations. building. **03 Hrs**

**Unit – III**

Directive Principles of State Policy (DPSP's) and its present relevance in Indian society. Fundamental Duties and its Scope and significance in Nation, Union Executive: Parliamentary System, Union Executive – President, Prime Minister, Union Cabinet. **03 Hrs**

**Unit – IV**

Parliament - LS and RS, Parliamentary Committees, Important Parliamentary Terminologies. Judicial System of India, Supreme Court of India and other Courts, Judicial Reviews and Judicial Activism. **03 Hrs**

**Unit - V**

State Executive and Governor, CM, State Cabinet, Legislature - VS & VP, Election Commission, Elections & Electoral Process. Amendment to Constitution, and Important Constitutional Amendments till today. Emergency Provisions. **03 Hrs**

**Text Book:**

1. "Constitution of India" (for Competitive Exams) - Published by Naidhruva Edutech Learning Solutions, Bengaluru. – 2022.
2. "Introduction to the Constitution of India", (Students Edition.) by Durga Das Basu (DD Basu): Prentice –Hall, 2008.

**Reference Books:**

1. "Constitution of India, Professional Ethics and Human Rights" by Shubham Singles, Charles E. Haries, and et al: published by Cengage Learning India, Latest Edition – 2019.
2. "The Constitution of India" by Merunandan K B: published by Merugu Publication, Second Edition, Bengaluru.
3. "Samvidhana Odu" - for Students & Youths by Justice HN Nagamohan Dhas, Sahayana, kerekon.
4. M. Govindarajan, S.Natarajan, V.S.Senthilkumar, "Engineering Ethics", Prentice –Hall, 2004.

<b>22SFH28</b>	<b>Scientific Foundations of Health</b>	<b>(1-0-0) 1</b>
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**Contact Hours: 15**

**Course Learning Objective (CLO):**

1. To introduce the understanding of health and healthy lifestyles to meet the requirements of good and wellbeing of the life.

**Course Outcomes (COs):**

<b>Description of the Course Outcome:</b> At the end of the course the student will be able to		<b>Mapping to POs (1-12)</b>		
		<b>Substantial Level (3)</b>	<b>Moderate Level (2)</b>	<b>Slight Level (1)</b>
<b>CO-1</b>	To know about Health and wellness (and its Beliefs) & It's balance for positive mindset.	1	--	--
<b>CO-2</b>	To Build the healthy lifestyles for good health for their better future.	--	7	6
<b>CO-3</b>	To Create a Healthy and caring relationships to meet the requirements of good/social/positive life.	--	6	7
<b>CO-4</b>	To learn about Avoiding risks and harmful habits in their campus and outside the campus for their bright future	7	6	--
<b>CO-5</b>	To Prevent and fight against harmful diseases for good health through positive mindset	--	6, 7	12

POs/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	13	14
<b>Mapping Level</b>	3	-	-	-	-	1.75	2	-	-	-	-	1	--	--

**Course content:**

**Unit-I**

**Good Health & It's balance for positive mindset:** Health -Importance of Health, Influencing factors of Health, Health beliefs, Advantages of good

health, Health & Behavior, Health & Society, Health & family, Health & Personality, Psychological disorders-Methods to improve good psychological health, Changing health habits for good health. **03 Hrs.**

### **Unit-II**

**Building of healthy lifestyles for better future:** Developing healthy diet for good health, Food & health, Nutritional guidelines for good health, Obesity & overweight disorders and its management, Eating disorders, Fitness components for health, Wellness and physical function, How to avoid exercise injuries **03 Hrs.**

### **Unit-III**

**Creation of Healthy and caring relationships:** Building communication skills, Friends and friendship - Education, the value of relationship and communication skills, Relationships for Better or worsening of life, understanding of basic instincts of life (more than a biology), Changing health behaviors through social engineering **03 Hrs.**

### **Unit-IV**

**Avoiding risks and harmful habits:** Characteristics of health-compromising behaviors, Recognizing and avoiding of addictions, How addiction develops, Types of addictions, influencing factors of addictions, Differences between addictive people and nonaddictive people & their behaviors. Effects of addictions Such as..., how to recovery from addictions. **03 Hrs.**

### **Unit-V**

**Preventing & fighting against diseases for good health:** How to protect from different types of infections, How to reduce risks for good health, Reducing risks & coping with chronic conditions, Management of chronic illness for Quality of life, Health & Wellness of youth: a challenge for upcoming future, Measuring of health & wealth status. **03 Hrs.**

### **Reference Books**

- 1) Dr. L Thimmesha, Scientific Foundations of Health – Study Material Prepared, Published in VTU - University Website.
- 2) Scientific Foundations of Health, (ISBN-978-81-955465-6-5) published by Infinite Learning Solutions, Bangalore – 2022.
- 3) Jane Ogden, Health Psychology – 4/e McGraw Hill Education (India) Private Limited - Open University Press.
- 4) Charles Abraham, Mark Conner, Fiona Jones and Daryl O'Connor, Health Psychology, 2/e Published by Routledge 711 Third Avenue, New York, NY 10017.

- 5) Shelley E. Taylor, Health Psychology, 9/e , McGraw Hill Education (India) Private Limited, University of California, Los Angeles - Open University Press