

Academic Program: UG
Academic Year 2026-27
Syllabus
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 2026-27 till further revision.

Chairman BoS & HoD

Principal

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)

- PO1: Engineering Knowledge:** Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.
- PO2: Problem Analysis:** Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
- PO3: Design/Development of Solutions:** Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)
- PO4: Conduct Investigations of Complex Problems:** Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).
- PO5: Engineering Tool Usage:** Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)
- PO6: The Engineer and The World:** Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).
- PO7: Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
- PO8: Individual and Collaborative Team work:** Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
- PO9: Communication:** Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences
- PO10: Project Management and Finance:** Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO11: Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

Knowledge and Attitude Profile (WK)

WK1: A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.

WK2: Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.

WK3: A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.

WK4: Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.

WK5: Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.

WK6: Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.

WK7: Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.

WK8: Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.

WK9: Ethics, inclusive behaviour and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

Sustainable Development Goals

- SDG1:** No Poverty
- SDG2:** Zero Hunger
- SDG3:** Good Health and Well-being
- SDG4:** Quality Education
- SDG5:** Gender Equality
- SDG6:** Clean Water and Sanitation
- SDG7:** Affordable and Clean Energy
- SDG8:** Decent Work and Economic Growth
- SDG9:** Industry, Innovation, and Infrastructure
- SDG10:** Reduced Inequalities
- SDG11:** Sustainable Cities and Communities
- SDG12:** Responsible Consumption and Production
- SDG13:** Climate Action
- SDG14:** Life Below Water
- SDG15:** Life on Land
- SDG16:** Peace, Justice, and Strong Institutions
- SDG17:** Partnerships for the Goals

SDMCET: Syllabus

SDM College of Engineering and Technology, Dharwad

B.E. in Mechanical Engineering,

Scheme of Teaching and Examinations 2026-27

Outcome-Based Education (OBE) and Choice-Based Credit System (CBCS) (Effective from the academic year 2026-27)

I SEMESTER (Physics Cycle)

Sl. No	Course	Course Code	Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching & Learning Scheme					Examination				Credits
					CI		LI	TW & SL	TH/S	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	SL						
1	ASC (IC)	26UMATME11	Mathematics-I for ME Stream	Mathematics	42	0	28	50	120	3	50	100	100	4
2	ASC (IC)	26UPHYME12	Physics for ME Stream	Physics	42	0	28	50	120	3	50	100	100	4
3	ESC	26UCED13	Computer-Aided Engineering Drawing	ME	28	0	28	34	90	3	50	100	100	3
4	ESC-I	26UESC144	Introduction to C Programming	ME	42	0	0	48	90	3	50	100	100	3
5	ETC	26UETC151	Introduction to AI and its application	ME	42	0	0	48	90	3	50	100	100	3
6	HSMC	26UENG16	Communicative English	Humanities	14	0	0	16	30	1	50	50	100	1
7	HSMC	26UKSK17/ 26UKBK17	Samskrutika Kannada / Balake Kannada	Humanities	14	0	0	16	30	1	50	50	100	1
8	AEC	26UIDT18	Innovation and Design Thinking	ME	14	0	0	16	30	1	50	50	100	1
Total									600				800	20
9	AICTE Activity Points (Students have to earn 100 Activity points between 1-8 semester)				Compulsory requirement for the award of the Degree									

TH/S- Total Hours per Semester, TW & SL- Term Work & Self Learning

SDM College of Engineering and Technology, Dharwad B.E. in Mechanical Engineering, Scheme of Teaching and Examinations 2026-27 Outcome- Based Education (OBE) and Choice-Based Credit System(CBCS) (Effective from the academic year 2026-27)														
II SEMESTER (Chemistry Cycle)														
Sl. No	Course	Course Code	Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching & Learning Scheme				Examination					Credits
					CI		LI	TW & SL	TH/S	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	SL						
1	ASC (IC)	26UMATME21	Mathematics- II for ME Stream	Mathematics	42	0	28	50	120	3	50	100	100	4
2	ASC (IC)	26UCHEME22	Chemistry for ME Stream	Chemistry	42	0	28	50	120	3	50	100	100	4
3	ESC	26UEME23	Elements of Mechanical Engineering	ME	42	0	0	48	90	3	50	100	100	3
4	ESC-II	26UESC243	Introduction to Electronics and Communication Engineering	ECE	42	0	0	48	90	3	50	100	100	3
5	PLC (IC)	26UPLC251	Introduction to Python Programming	ME	28	0	28	34	90	3	50	100	100	3
6	HSMC	26UPWS26	Professional Writing Skills in English	Humanities	14	0	0	16	30	1	50	50	100	1
7	HSMC	26UICO27	Indian Constitution	Humanities	14	0	0	16	30	1	50	50	100	1
8	AEC	26UBEC28	Biology for Engineers	ME	14	0	0	16	30	1	50	50	100	1
Total									600				800	20
9	AICTE Activity Points (Students have to earn 100 Activity points between 1-8 semester)					Compulsory requirement for the award of the Degree								

TH/S- Total Hours per Semester, TW & SL- Term Work & Self Learning, CI- Course Instructions, LI-Laboratory Instructions.

26UMATME11	Mathematics-I for ME Stream	(42-0-28-50)4
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Total Hours:120

Course Learning Objectives (CLOs):

This course focuses following learning perspectives:

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

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs(1-11)		
		Substantia I Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Apply the knowledge of calculus to solve problems related to polar curves.	--	--	1,2,11
CO-2	Solve the partial differentiation to compute rate of change of multivariate functions.	--	1,2,11	-
CO-3	Analyze the solution of linear and non-linear ordinary differential equations.	--	1,2,11	-
CO-4	Apply the matrix theory for solving system of linear equations and compute Eigen values and eigen vectors	--	--	1,2,11
CO-5	Implement solutions for various mathematical problems using python.	--	5	1,2,11

POs	1	2	3	4	5	6	7	8	9	10	11
Mapping Level	1.4	1.4	-	-	2	-	-	-	-	-	1.4

Pre-requisites: Knowledge of fundamentals of calculus.

Course Contents:

Unit-I:**Polar Curves and Curvature**

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. **8Hrs.**

Unit-II**Series Expansion and Multivariable Calculus**

Statement and problems on Taylor's and Maclaurin's series expansion for one variable 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. **9Hrs**

Unit-III**Ordinary Differential Equations (ODEs) of first order**

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, Law of natural growth and decay. **8Hrs**

Unit-IV**Linear Algebra 1**

Elementary row transformation of a matrix, Row echelon form and Rank of a matrix. Consistency and solution of a system of linear equations-Gauss-elimination method, Gauss-Seidel method. Application to traffic flow. **9Hrs**

Unit-V**Linear Algebra 2**

Eigen values and Eigenvectors, Rayleigh's power method to find the dominant Eigen value and Eigen vector. Model matrix, Diagonalization of the matrix, inverse of a matrix by Cayley-Hamilton theorem **8Hrs**

List of Laboratory experiments (2hours/week, 14 lab sessions)

- 1) Introduction, Basics of Python.
- 2) Programming Structure in Python.
- 3) 2 D plots for Cartesian.
- 4) 2D plots for polar curves.
- 5) Finding angle between polar curves.
- 6) Finding Radius of curvature Expansion of Taylor's.
- 7) Expansion of Maclaurin's series.
- 8) Finding partial derivatives Finding Jacobian.
- 9) Solution of first order and higher order ordinary differential equations.
- 10) Plotting solutions of ODE.
- 11) Finding rank, reduced echelon form.
- 12) Solving system of linear equations using Gauss elimination method.
- 13) Solving system of linear equations using Gauss-Seidel method.
- 14) Determine Eigen values and Eigen vectors.

Suggested software's: Mathematica/ MATLAB/ Python/ Scilab

Software used: Python

Reference Books:

- 1) B.S.Grewal: "Higher Engineering Mathematics", Khanna publishers, 44th Ed., 2021.
- 2) E. Kreyszig: "Advanced Engineering Mathematics", John Wiley & Sons, 10th Ed., 2018.
- 3) N.P Bali and Manish Goyal: "A text book of Engineering Mathematics" Laxmi Publications, 10th Ed., 2022.

26UPHYME12**Physics for ME Stream****(42-0-28-50) 4****Total Hours: 120****Course Learning Objectives (CLOs):**

- Physics for Mechanical stream course designed to deliver the optimum knowledge of the concepts of applied physics highly relevant to the mechanical engineering students.
- Content explores the fundamental theories; experimental demonstrations and their applications applied to oscillations and waves and its application.
- Scope of the curriculum includes the study of Acoustics and safety of civil structure against the natural hazards like earthquake and tsunami etc.
- The subject also deals with various methods of NDT and related instrumentation.
- The subject aims to study about different smart materials like, dielectric, magnetic piezo electric materials and related equipments.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs(1-11)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Describe and implement the concepts of oscillatory motion in mechanical systems like springs, beams and real time applications.	1	2	11
CO-2	Determine and implement the elastic properties of material and apply the principle in the development of various Mechanical structures and to find material strength.	1	2	11
CO-3	Apply and implement the principle and laws and thermoelectricity to fabricate various thermoelectric devices and their applications.	1	2	11
CO-4	Concepts and implement of thermodynamic and cryogenic principle, attaining cryogenic temperature, measurement, various methods to liquefy the gasses and application.	1	2	11
CO-5	Explain and implement the concepts of quantum theory and nano materials systems. Various characterizations technique to study the behavior of material in nanoscale.	1	2	11

POs	1	2	3	4	5	6	7	8	9	10	11
Mapping Level	3	2	-	-	-	-	-	-	-	-	1

Prerequisites: Nil

Contents:

Unit-I

Oscillations:

Simple harmonic motion (SHM), Differential equation for SHM, Springs: Stiffness factor and its physical significance, Series and Parallel combination of springs (Derivation), Types of springs and their applications. Theory of damped oscillations (Qualitative), Types of damping (Graphical Approach). Engineering applications of damped oscillations, Theory of forced oscillations with derivation, Resonance, Sharpness of resonance, Resonance in LCR circuits (Qualitative), Numerical problems.

8 Hrs

Unit-II**Elasticity**

Hook's law, three Moduli of elasticity Stress-Strain Curve, Strain hardening and softening. Elastic Moduli, Poisson's ratio, Relation between Y , n and σ (with derivation), mention relation between K , Y and σ , limiting values of Poisson's ratio. Static and dynamic loading, Beams, Bending moment and derivation of expression, Cantilever, Torsion and Expression for couple per unit twist, Elastic materials (qualitative). Failures of engineering materials - Ductile fracture, Brittle fracture, Stress concentration, Fatigue and factors affecting fatigue (only qualitative explanation), S-N Curve (Wohler curve), Numerical problems. **9 Hrs**

Unit-III**Thermoelectric materials and devices:**

Thermo emf and thermo current, Sebeck 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 (Radioisotope Thermoelectric Generator- RTG), Numerical Problems **8 Hrs**

Unit-IV**Cryogenics:**

Introduction to Thermodynamics, Carnot's principle, Efficiency, 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, Linde's air liquefier, Liquefaction of Helium and its properties (super fluidity), Platinum Resistance Thermometer, Applications of Cryogenics: Aerospace, Dewar Flask, Numerical Problems **8 Hrs**

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

Quantum Properties of materials: Wave-particle duality, the Heisenberg Uncertainty Principle, and the Schrödinger wave equation, Analyzing a particle in a 1D box (infinite potential well) and the Quantum Harmonic Oscillator, Energy quantization, probability densities, and state vectors; Band structure and electron transport of materials; quantum tunneling (scanning tunneling microscopy), semiconductors, and photo detectors.

Instrumentation Techniques: Introduction to nanomaterials, MEMS and NEMS; quantum sensors to measure force, acceleration, and rotation Crystallography, X-

Ray Diffractometer (XRD), Scherrer equation, Atomic Force Microscope (AFM), X-ray Photoelectron Spectroscopy (XPS), Scanning Electron Microscope (SEM), TEM, Numerical Problems. **9 Hrs**

List of Experiments

1. Determination of Young's modulus of the material of the given bar Uniform Bending.
2. Determination of Rigidity modulus of the Material of the wire using Torsional Pendulum.
3. Study of Forced Mechanical Oscillations and Resonance.
4. Study of the frequency response of Series & Parallel LCR circuits.
5. Determination of effective spring constant of the given springs in series and parallel combinations.
6. Verification of Newton's Law of Cooling.
7. Determination of Young's modulus of the material of the given bar using Single Cantilever.
8. Determination of Moment of Inertia of the given irregular body by setting Torsional Oscillations.
9. Determination of Grating constant using LASER Diffraction / Estimation of particle size of lycopodium powder using Laser Diffraction
10. Experiment on Thermo-emf / Peltier Module
11. Determination of Planck's Constant using LEDs.
12. STEP Interactive Physical Simulations. (Springs, Simple Pendulum)
13. PHET Interactive Simulation (Relevant to Theory)
14. Data Analysis using Spread Sheets

Reference books / Manuals:

- 1) A P French, Vibrations and Waves (MIT introductory Physics Series), CBS, 2003 Edition
- 2) D S Mathus, Elements of Properties of Matter, , S Chand, Reprint 2016
- 3) S L Kakani, Shubra Kakani, Engineering Physics, 3rd Edition, 2020, CBS Publishers and Distributors Pvt. Ltd.
- 4) S.S. Thipse, Cryogenics: A Textbook, Alpha Science International, Limited, 2013.
- 5) M. N Saha and B N Srivastava Treatise on Heat, 2nd Edition, Indian Press, 1935; Original from, the University of California.
- 6) Sam Zhang, Lin Li, Ashok Kumar, Materials Characterization Techniques- CRC Press, First Edition, 2008.

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):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs(1-11)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Generate orthographic projections of points, Lines and planes manually and with Computer-aided tools.	10	1,2,5	6,8,9
CO-2	Generate orthographic projections of solids manually and with Computer-aided tools.	10	1,2,5	6,8,9
CO-3	Develop the lateral surfaces of solids for real-world applications.	10	1,2,5	6,8,9
CO-4	Draw isometric views and convert isometric drawings to orthographic views.	10	1,2,5	6,8,9
CO-5	Create schematics diagrams of basic models of engineering components and parts	10	1,2,5	9

POs	1	2	3	4	5	6	7	8	9	10	11
Mapping Level	2	2	--	--	2	1	--	1	1	3	--

Course Contents:

Unit - I

Introduction:

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 1st and 3rd 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).

6 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.

6 Hrs

Unit - III

Section of Solids:

Introduction, section planes, Sectional views: apparent shapes and true shapes, Sections of right regular prisms, pyramids, cylinders and cones resting with their base on HP. (Concepts only and No problems for practice)

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.

6 Hrs

Unit - IV

Isometric Projections:

Introduction to isometric views, 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 into orthographic views.

5 Hrs

Unit - V

Multidisciplinary Applications & Practice:

Free hand Sketching:

Drawing Simple Mechanisms; Bicycles, Gear trains, Ratchet and pawl, wheeler cart.

Electric Wiring and lighting diagrams: Call bell system, Fire alarm circuit. **Basic Building Drawing; 1 BHK** Building floor plan.

Electronics Engineering Drawings- Simple Electronics Circuit Drawings, practice on layers concept. **Graphs & Charts:** Column chart, Pie chart, Line charts, Gantt charts, etc.. **5 Hrs**

Reference Books:

- 1) S.N. Lal, & T Madhusudhan: Engineering Visulisation, 1st Edition, Cengage Publication 2022.
- 2) P.J.Shah, Computer-Aided Engineering Drawing, S. Chand Publishing, 2021
- 3) Bhatt, N.D., Engineering Drawing: Plane and Solid Geometry, 53rd edition, Charotar Publishing House Pvt. Limited, 2019.
- 4) K. R. Gopalakrishna, & Sudhir Gopalakrishna: Textbook of Computer Aided Engineering Drawing, 39th Edition, Subash Stores, Bangalore, 2017
- 5) M.B. Shah & B.C. Rana, Engineering Drawing, Pearson education, Revised edition, 2009.

26UESC144	Introduction to C Programming	(42-0-0-48) 3
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Total Hours:90

Course Learning Objectives (CLOs): The course focuses on developing the problem solving skills that can be applied to problems in different areas which enables students to take-up subsequent IT related courses and professional career.

Course Outcomes (COs):

Description of the Course Outcome: the end of the course the student will be able to:		Mapping to POs(1-11)		
		Substantial Level(3)	Moderate Level(2)	Slight Level(1)
CO-1	Explain the basic structure and Working principles of computer.	-		1

CO-2	Write a C program using C Programming constructs to solve given problems.	-	1,2,3	-
CO-3	Explain and apply the features of data structures like arrays to solve given problems.	-	1,2,3	-
CO-4	Explain the usage and the need for writing modular programs and in writing programs.	-	1,2,3	-
CO-5	Illustrate string manipulations, and various building blocks of data structures like structures, pointers in solving real-life problems.	-	1,2,3	-

POs	1	2	3	4	5	6	7	8	9	10	11
MappingLevel	1.8	2.0	2.0	-	-		-	-	-	-	-

Course Contents:

Unit - I

Introduction to C: Introduction to computers, input and output devices, Algorithms and Flowcharts, 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.

8 Hrs

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

8 Hrs

Unit - III

Arrays: Declaration of arrays, accessing the elements of an array, Operations on arrays, operations on two-dimensional arrays, introduction to multidimensional arrays.

Applications of arrays: case study with sorting and searching techniques: Bubble sort, Linear Search.

Strings: String taxonomy, string operations

10 Hrs

Unit – IV

Functions: Introduction to user defined functions, Function definition, function declaration, function call, return statement, passing parameters to functions, recursive functions. **10 Hrs**

Unit - V

Pointers: Introduction to Pointers, Declaring Pointer Variables. Structures: Introduction to structures. **6 Hrs**

Reference Books:

- 1) E Balagurusamy, "Programming in ANSI C", 6th Edition, Tata McGraw Hill, 2012
- 2) Reema Thareja, "Computer fundamentals and Programming in C", Oxford University, 2/E, 2017.
- 3) Brian W. Kernighan and Dennis M. Ritchie, The 'C' Programming Language, Prentice Hall of India.

26UETC151	Introduction to AI and its Applications	(42-0-0-48) 3
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Total Hours: 90**Course Learning Objectives (CLOs):**

This course focuses on the following learning perspectives:

- Understand the basics of Artificial Intelligence and Machine Learning
- Use of Gen AI and prompts to get the results for a given problem
- Learn Current trends in AI and its future directions
- Applications of AI in various industrial domains

Course Outcomes (COs):

Description of the Course Outcome:		Mapping to POs (1-11)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Explain the concepts and types of artificial intelligence	-	6	1,8,11
CO-2	Illustrate basic machine learning methods for regression, classification and clustering	-	3	2,4,5,8,11

CO-3	Illustrate prompt engineering Techniques to interact with generative AI tools	2	3	5,8,11
CO-4	Identify real-world applications across different disciplines	-	2,3	5,8,11
CO-5	Outline recent trends in artificial intelligence and machine learning	-	1,5	8,11

POs	1	2	3	4	5	6	7	8	9	10	11
Mapping Level	1.5	2.0	2.0	1.0	1.25	2.0	-	1.0	-	-	1.0

Pre-requisites: Google website and AI related information through any search Engines

Suggested Platforms: Chat GPT for prompt engineering, Jupiter notebook

Course Contents:

Unit - I

Introduction to Artificial Intelligence: Definition and Brief discovery of Artificial Intelligence How Does AI Work? Advantages and Disadvantages of Artificial Intelligence, Types of Artificial Intelligence based on functionalities and capabilities, Augmented Intelligence Vs Cognitive Computing.

Defining Intelligence, Components of Intelligence, AI Agent and types, Uninformed Search Algorithms, and Informed Search Algorithms: Pure Heuristic Search, Best-First Search Algorithm (Greedy Search).

Introduction of Knowledge representation and concept of Knowledge Based Agent, Brief Discussion of Types of Knowledge. **9 Hrs**

Unit - II

Machine Learning: Basic Techniques in AI, Machine Learning Model, Regression Analysis in Machine Learning, Classification Techniques, Clustering Techniques, Naïve Bayes Classification, Neural Network, Support Vector Machine (SVM).

9 Hrs

Unit - III

Introduction to Prompt Engineering: Introduction and evolution of Prompt Engineering, Types of Prompts, How Does Prompt Engineering Work? The Advantages of Prompt Engineering, The Future of LLM Communication.

Prompt Engineering Techniques for Chat GPT / Perplexity/ Deep seek/ Claude AI, Copilot and practical demonstration in the class room: Different types of Prompt Engineering Techniques, Zero, One, Few Shot Prompting and Self-Consistency Prompt. **7 Hrs**

Unit - IV

Recent Trends in AI: Recent trends in AI, Brief reasons for maintaining Ethics in AI, AI as a Service (AlaaS), Vendors of AlaaS, Collaborative systems, Game theory and social sciences, Neuromorphic Computing and its models, Expert System and its functions Artificial Intelligence of Things (AIoT). **8 Hrs**

Unit - V

Application of AI using Robotics and Drones Introduction to No Code AI and Low Code AI. Application of AI in Healthcare, Application of AI in Finance, Application of AI in Retail, Application of AI in Agriculture, Application of AI in Education, Application of AI in Transportation, AI in Experimentation and Multi-disciplinary research. **9 Hrs**

Reference Books:

- 1) Reema Thareja, Artificial Intelligence: Beyond Classical AI, Pearson Education, 2023.
- 2) Ajantha Devi Vairamani and Anand Nayyar, Prompt Engineering: Empowering Communication, 1st Edition, CRC Press, Taylor & Francis Group, 2024. (DOI: <https://doi.org/10.1201/9781032692319>).
- 3) Saptarsi Goswami, Amit Kumar Das and Amlan Chakrabarti, "AI for Everyone — A Beginner's Handbook for Artificial Intelligence", Pearson, 2024.

26UENG16	Communicative English	(14-0-0-16) 1
Total Hours: 30		

Course Learning Objectives (CLOs): This course focuses on the following learning perspectives:

- 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):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs(1-11)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Apply the Fundamentals of Communication Skills in their Career.	-	9,11	-
CO-2	Identify the nuances of phonetics, intonation and enhance pronunciation skills.	-	9,11	-
CO-3	Communicate basic English grammar and essentials of language skills as per present requirement.	9,11	-	-
CO-4	Acquire vocabulary and language proficiency.	-	9,11	-
CO-5	Adopt the Techniques of Information Transfer through presentation.	9,11	-	-

POs	1	2	3	4	5	6	7	8	9	10	11
Mapping Level	-	-	-	-	-	-	-	-	2.4	-	2.4

Pre-requisites: None

Course Contents:

Unit-I

Introduction to Communicative English: meaning and Definition, Fundamentals of Communicative English, Process of Communication, Barriers to Effective Communicative English, Different styles and levels in Communicative English. Interpersonal and Intrapersonal Communication Skills. **3 Hrs**

Unit-II

Introduction to Phonetics: Sounds- consonants, vowels and diphthongs, Syllables and Structure. Word Accent, Stress Shift and Intonation, Phonetic Transcription, Common Errors in Pronunciation. **3 Hrs**

Unit-III

Vocabulary: Word formation Synonyms, Antonyms, Homophones, Homonyms, Affixes, Abbreviations, Strong and Weak forms of Words, Word pairs, One Word Substitutes and Error identification. **3 Hrs**

Unit-IV

Grammar: Parts of Speech, Articles and Preposition, Tenses, Sentences, Kinds of sentences, Transformation of sentences, Question Tags. **2 Hrs**

Unit-V

Communication Skills for Employment: Presentation Skills, Extempore, Public Speaking, Mother Tongue Influence (MTI), Reading and Listening Comprehensions. **2 Hrs**

Reference Books:

- 1) Communication Skills by Sanjay Kumar & PushpLata, 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.
- 3) A Course in Technical English – D Praveen Sam, KN Shoba, Cambridge University Press – 2020.
- 4) Yadugiri, M A. Making Sense of English - A Textbook of Sounds, Words and Grammar, Viva Books, 2020.

26UKSK17	Samskrutika Kannada	(14-0-0-16) 1
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Total Hours: 30

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ – ಕನ್ನಡ ಬಲ್ಲ ಮತ್ತು ಕನ್ನಡ ಮಾತೃಭಾಷೆಯ ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ನಿಗದಿಪಡಿಸಿದ ಪಠ್ಯಕ್ರಮ.
ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ ಪಠ್ಯ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು:

- ಪದವಿ ವಿದ್ಯಾರ್ಥಿಗಳಾಗಿರುವುದರಿಂದ ಕನ್ನಡ ಭಾಷೆ, ಸಾಹಿತ್ಯ ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು. ಆಧುನಿಕ ಪೂರ್ವ ಮತ್ತು ಆಧುನಿಕ ಕಾವ್ಯಗಳನ್ನು ಪರಿಚಯಿಸುವುದು.
- ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯ ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ಅರಿವು ಹಾಗೂ ಆಸಕ್ತಿಯನ್ನು ಮೂಡಿಸುವುದು. ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯ ಹಾಗೂ ಅವರು ಸಾಧಿಸಿದ ವಿಷಯಗಳನ್ನು ಪರಿಚಯಿಸುವುದು

Course Outcome

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ 26UKSK17

ಪಠ್ಯ ಕಲಿಕೆಯ ನಂತರ ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ:

ಅ. ಸಂ	ಪಠ್ಯ ವಿಷಯ	Mapping to POs(1-11)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
ಅ01	ಕನ್ನಡ ಭಾಷೆ, ಸಾಹಿತ್ಯ ಮತ್ತು ಕನ್ನಡದ ಸಂಸ್ಕೃತಿಯ ಕುರಿತು ಅರಿವು ಮೂಡಿರುತ್ತದೆ.	—	9	11
ಅ02	ಕನ್ನಡ ಸಾಹಿತ್ಯದ ಆಧುನಿಕ ಪೂರ್ವ ಮತ್ತು ಆಧುನಿಕ ಕಾವ್ಯಗಳನ್ನು ಸಾಂಕೇತಿಕವಾಗಿ ಕಲಿತು ಹೆಚ್ಚಿನ ಓದಿಗೆ ಮತ್ತು ಜ್ಞಾನಕ್ಕೆ ಸ್ಪೂರ್ತಿ ಮೂಡುತ್ತದೆ.	—	9	11
ಅ03	ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯ ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ಅರಿವು ಹಾಗೂ ಆಸಕ್ತಿ ಹೆಚ್ಚಾಗುತ್ತದೆ.	—	9	11
ಅ04	ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯ ಹಾಗೂ ಅವರು ಸಾಧಿಸಿದ ವಿಷಯಗಳನ್ನು ತಿಳಿದುಕೊಂಡು ನಾಡಿನ ಇನ್ನಿತರೆ ವ್ಯಕ್ತಿಗಳ ಬಗ್ಗೆ ತಿಳಿದುಕೊಳ್ಳಲು ಕೌತುಕತೆ ಹೆಚ್ಚಾಗುತ್ತದೆ.	—	9	11

ಅ05	ಸಾಂಸ್ಕೃತಿಕ, ಜನಪದ ಹಾಗೂ ಪ್ರವಾಸ ಕಥನಗಳ ಪರಿಚಯವಾಗುತ್ತದೆ.	-	9	11
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POs	1	2	3	4	5	6	7	8	9	10	11
Mapping Level	-	-	-	-	-	-	-	-	2.0	-	1.0

ಘಟಕ-I

ಕನ್ನಡ ಸಂಸ್ಕೃತಿ ಮತ್ತು ಭಾಷೆ ಕುರಿತಾದ ಲೇಖನಗಳು

3 Hrs

- 1) ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ - ಹಂಪ ನಾಗರಾಜಯ್ಯ
- 2) ಕರ್ನಾಟಕ ಏಕೀಕರಣ - ಒಂದು ಅಪೂರ್ವ ಚರಿತ್ರೆ - ಜಿ. ವೆಂಕಟಸುಬ್ಬಯ್ಯ
- 3) ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕನ್ನಡ-ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ ಮತ್ತು ಪ್ರೊ. ವಿ. ಕೇಶವಮೂರ್ತಿ

ಘಟಕ-II

ಆಧುನಿಕ ಪೂರ್ವದ ಕಾವ್ಯ ಭಾಗ

3 Hrs

ವಚನಗಳು: ಬಸವಣ್ಣ, ಅಕ್ಕಮಹಾದೇವಿ, ಅಲ್ಲಮಪ್ರಭು, ಆಯ್ದಕ್ಕಿ ಮಾರಯ್ಯ,
ಜೇಡರದಾಸಿಮಯ್ಯ, ಆಯ್ದಕ್ಕಿ ಲಕ್ಕಮ್ಮ

1. ಕೀರ್ತನೆಗಳು: ಅದರಿಂದೇನು ಫಲ ಇದರಿಂದೇನು ಫಲ - ಪುರಂದರದಾಸರು,
ತಲ್ಲಣಿಸದಿರು ಕಂಡ್ಯ ತಾಳು ಮನವೇ - ಕನಕದಾಸರು
2. ತತ್ವಪದಗಳು: ಸಾವಿರ ಕೊಡಗಳ ಸುಟ್ಟು - ಶಿಶುನಾಳ ಶರೀಫ

ಘಟಕ-III

ಆಧುನಿಕ ಕಾವ್ಯ ಭಾಗ

3 Hrs

1. ಡಿವಿಜಿ ರವರ ಮಂಕುತಿಮ್ಮನ ಕಗ್ಗದಿಂದ ಆಯ್ದ ಕೆಲವು ಭಾಗಗಳು
2. ಕುರುಡು ಕಾಂಚಾಣ: ದ. ರಾ. ಬೇಂದ್ರೆ

ಘಟಕ-IV

ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯ

3 Hrs

1. ಡಾ. ಸರ್.ಎಂ.ವಿಶ್ವೇಶ್ವರಯ್ಯ: ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹ್ಯ - ಎ. ಎನ್. ಮೂರ್ತಿರಾವ್
2. ಕರಕುಶಲ ಕಲೆಗಳು ಮತ್ತು ಪರಂಪರೆಯ ವಿಜ್ಞಾನ: ಕರೀಗೌಡ ಬೀಚನಹಳ್ಳಿ

ಘಟಕ-V

ಸಾಂಸ್ಕೃತಿಕ, ಜನಪದ ಕಥೆ ಮತ್ತು ಪ್ರವಾಸ ಕಥನ

2 Hrs

1. ಯುಗಾದಿ: ವಸುಧೇಂದ್ರ
2. ಮೆಗಾನೆ ಎಂಬ ಗಿರಿಜನ ಪರ್ವತ: ಹಿ. ಚಿ. ಬೋರಲಿಂಗಯ್ಯ

Reference Books:

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

26UKBK17

Balake Kannada

(14-0-0-16) 1

Total Hours: 30

Course Objectives/ಬಳಕೆ ಕನ್ನಡ' ಪಠ್ಯ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು:

The course will enable the students

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs(1-11)		
		Substanti al Level (3)	Moderate Level (2)	Slight Level (1)
CO1	To Create the awareness regarding the necessity of learning local language for comfortable and healthy life.	-	9	11
CO2	To enable learners to Listen and understand the Kannada language properly.	-	9	11
CO3	To speak, read and write Kannada language as per requirement.	-	9	11
CO4	To train the learners for correct and polite conservation.	-	9	11
CO5	To know about Karnataka state and its language, literature and General information about this state		9	11

POs	1	2	3	4	5	6	7	8	9	10	11
Mapping Level	-	-	-	-	-	-	-	-	2.0	-	1.0

Unit-I

3 Hrs

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 ಸರ್ವನಾಮಗಳು ಮತ್ತು ಪ್ರಶ್ನಾರ್ಥಕ ಪದಗಳು-
Personal Pronouns, Possessive Forms, Interrogative words

Unit-II**3 Hrs**

1. ನಾಮಪದಗಳ ಸಂಬಂಧಾರ್ಥಕ ರೂಪಗಳು, ಸಂದೇಹಾಸ್ಪದ ಪ್ರಶ್ನೆಗಳು ಮತ್ತು ಸಂಬಂಧವಾಚಕ ನಾಮಪದಗಳು-Possessive forms of nouns, dubitative question and Relative nouns
2. ಗುಣ, ಪರಿಮಾಣ ಮತ್ತು ವರ್ಣಬಣ್ಣ ವಿಶೇಷಣಗಳು, ಸಂಖ್ಯಾವಾಚಕಗಳು - Qualitative, Quantitative and Colour Adjectives, Numerals
3. ಕಾರಕ ರೂಪಗಳು ಮತ್ತು ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯಗಳು - ಸಪ್ತಮಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯ - (ಅ, ಅದು, ಅವು, ಅಲ್ಲಿ), Predictive forms, Locative case.

Unit-III**3 Hrs**

1. ಚತುರ್ಥಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯದ ಬಳಕೆ ಮತ್ತು ಸಂಖ್ಯಾವಾಚಕಗಳು - Dative Cases, and Numerals
2. ಸಂಖ್ಯಾಗುಣವಾಚಕಗಳು ಮತ್ತು ಬಹುವಚನ ನಾಮರೂಪಗಳು - Ordinal numerals and Plural markers
3. ನ್ಯೂನ/ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾಪದಗಳು ಮತ್ತು ವರ್ಣ ಗುಣವಾಚಕಗಳು - Defective/Negative Verbs & Colour Adjectives.

Unit-IV**3 Hrs**

1. ಅಪ್ಪಣೆ /ಒಪ್ಪಿಗೆ, ನಿರ್ದೇಶನ, ಪ್ರೋತ್ಸಾಹ ಮತ್ತು ಒತ್ತಾಯ ಅರ್ಥರೂಪ ಪದಗಳು ಮತ್ತು ವಾಕ್ಯಗಳು - Permission, Commands, encouraging and Urging words (Imperative words and sentences).
2. ಸಾಮಾನ್ಯ ಸಂಭಾಷಣೆಯಲ್ಲಿ ದ್ವಿತೀಯ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯಗಳು ಮತ್ತು ಸಂಭವನೀಯ ಪ್ರಕಾರಗಳು - Accusative Cases and Potential Forms used in General Communication.
3. 'ಇರು' ಮತ್ತು 'ಇರಲ್ಲ' ಸಹಾಯಕ ಕ್ರಿಯಾಪದಗಳು, ಸಂಭಾವ್ಯಸೂಚಕ ಮತ್ತು ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾಪದಗಳು - 'Helping Verbs "iru and iralla", Corresponding Future and Negation Verbs.
4. ಹೋಲಿಕೆ (ತರತಮ), ಸಂಬಂಧಸೂಚಕ, ವಸ್ತುಸೂಚಕ ಪ್ರತ್ಯಯಗಳು ಮತ್ತು ನಿಷೇಧಾತ್ಮಕ ಪದಗಳ ಬಳಕೆ - Comparative, Relationship, Identification and Negation Words.

Unit-V**3 Hrs**

1. ಕಾಲ ಮತ್ತು ಸಮಯ ಹಾಗೂ ಕ್ರಿಯಾಪದಗಳ ವಿವಿಧ ಪ್ರಕಾರಗಳು - Different types of Tense, Time and Verbs.
2. -ದ, -ತ್, -ತು, -ಇತು, -ಆಗಿ, -ಅಲ್ಲ, ಗ, ಕ, 'ಇದೆ' ಮೊದಲಾದ ಕ್ರಿಯಾಪ್ರತ್ಯಯಗಳೊಂದಿಗೆ ಭೂತ, ಭವಿಷ್ಯತ್ ಮತ್ತು ವರ್ತಮಾನ ಕಾಲದ ವಾಕ್ಯರಚನೆ - Formation of Past, Future and Present Tense Sentences with Verb Forms.
3. Kannada Vocabulary List - ಸಂಭಾಷಣೆಯಲ್ಲಿ ದಿನೋಪಯೋಗಿ ಕನ್ನಡ ಪದಗಳು Kannada Words in Conversation.

Reference Books:**ವಿಶ್ವವಿದ್ಯಾಲಯ ನಿಗದಿಪಡಿಸಿದ ಪಠ್ಯಪುಸ್ತಕ**

1) ಪಠ್ಯಪುಸ್ತಕ: ಬಳಕೆ ಕನ್ನಡ

ಲೇಖಕರು: ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ್

ಪ್ರಕಟಣೆ: ಪ್ರಸಾರಾಂಗ, ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ.

26UIDT18	Innovation and Design Thinking	(14-0-0-16) 1
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Total Hours:30

Course Learning Objectives (CLOs):

Apply design thinking and innovation principles to develop efficient systems focusing on product design, process optimization, safety, and sustainability.

Course Out comes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs(1-11)		
		Substantial Level(3)	Moderate Level(2)	Slight Level(1)
CO-1	Explain various design process procedure.	--	--	3
CO-2	Develop design Ideas through different techniques.	--	--	3
CO-3	Design various Engineering products through strategic innovation	--	--	6
CO-4	Strategize technical drawing for design ideas.	--	--	1
CO-5	Assess design thinking process.	--	--	1

POs	1	2	3	4	5	6	7	8	9	10	11
Mapping Level	1.0	-	1.0	-	-	1.0	-	-	-	-	-

Pre-requisites: None

Contents:

Unit-I

Introduction: Process of Design: Understanding Design thinking concepts Shared model in team-based design process – Theory and practice of Design thinking – Explore major design ideas across globe – MVP or Prototyping. **3 Hrs**

Unit-II

Tools for Design Thinking: Real-Time design interaction capture and analysis – Enabling efficient design process collaboration in digital space – Empathy for design – Collaboration in distributed Design **3 Hrs**

Unit-III

Design Thinking in IT Design: Thinking to Business Process modelling – Agile processes in design collaboration environment – Scenario based Prototyping. **3 Hrs**

Unit-IV

Design Thinking For strategic innovations: Growth – Story telling 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. **2 Hrs**

Unit-V

Design thinking process and social pitch: Innovation showcase, poster design, project pitching with impact for assessment, prototype and sustainability plan. **2 Hrs**

Reference Books:

- 1) John.R.Karsnitz, Stephen O'Brien and John P. Hutchinson, "Engineering Design", Cengage learning (International edition) 2nd 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, 1st Edition, 2011.
- 4) Idris Mootee, "Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School", John Wiley & Sons 1st Edition, 2013.
- 5) Yousef Haik and Tamer M.Shahin, "Engineering Design Process", Cengage Learning, 2nd Edition, 2011.

II Semester

26UMATME21	Mathematics-II for ME Stream	(42-0-28-50) 4
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Course learning objectives (CLO's):

This course focuses following learning perspectives:

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

Course outcomes:

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs (1-11)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Apply the knowledge of numerical methods in solving physical and engineering phenomena.	--	--	1,2,11
CO-2	Apply the knowledge of multiple integrals to compute area and volume.	--	1,2,11	-
CO-3	Demonstrate partial differential Equations and their solutions for physical interpretations.	--	1,2,11	-
CO-4	Develop the applications of vector calculus referring to solenoidal, irrotational vector field.	--	--	1,2,11
CO-5	Implement solutions for various mathematical problems using	--	5	1,2,11

POs	1	2	3	4	5	6	7	8	9	10	11
Mapping Level	1.4	1.4	-	-	2	-	-	-	-	-	1.4

Pre-requisite: Knowledge of fundamentals of calculus.

Unit-1**Numerical Methods-1**

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 formula, Newton's divided difference formula and Lagrange's interpolation formula (All formula without proof). Only Problems **8 Hrs**

Unit-2

Numerical Methods-2

Numerical integration:

Trapezoidal, Simpson's (1/3)rd and (3/8)th rules (without proof) **Numerical**

Solution of Ordinary Differential Equations (ODE's): Numerical solution of ordinary differential equations of first order and first degree Taylor's series method, Modified Euler's method, Runge-Kutta method of fourth order and Milne's predictor-corrector formula (No derivations of formulae). Problems. **9 Hrs**

Unit-3

Ordinary Differential equations of higher order

Higher-order linear ODEs with constant coefficients-Inverse differential operator- e^{ax} , $\sin(ax+b)$, $\cos(ax+b)$, x^n only, Method of variation of parameters, Cauchy's and Legendre's homogeneous differential equations-Problems. **8 Hrs**

Unit-4

Integral Calculus

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

Beta and Gamma functions: Definitions, properties, relation between Beta and Gamma functions. Problems. **9 Hrs**

Unit-5

Vector Calculus

Vector Differentiation: Scalar and vector fields. Gradient, directional derivative, curl and divergence- physical interpretation, solenoidal and irrotational vector fields problems. **Vector Integrations:** Line integrals, Surface integrals Applications to work done by a force and flux. Statement of Green's theorem and Stoke's theorem Problems. **8 Hrs**

List of Laboratory experiments (2 hours/week, 14 lab sessions)

1. Solution of algebraic and transcendental equations by Regula-Falsi and Newton-Raphson method.
2. Solution of algebraic and transcendental equations by Newton-Raphson method

3. Interpolation/Extrapolation using Newton's forward and backward difference formula.
4. Computation of area under the curve using Trapezoidal, Simpson's (1/3)rd and (3/8)th rule.
5. Solution of ODE of first order and first degree by Taylors series method.
6. Solution of ODE of first order and first degree by Modified Eulers method
7. Solution of ODE of first order and first degree by Runge-Kutta method
8. Solution of ODE of first order and first degree by Milnes Predictor-Corrector method.
9. Solution of second order ordinary differential equation and plotting the solution curve.
10. Solution of differential equation of oscillations of Spring with various Load.
11. Program to compute area, volume and centre of Gravity.
12. Evaluation of improper integrals, Beta and Gamma functions.
13. Finding gradient, divergent, curl and their geometrical interpretation.
14. Verification of Greens theorem.

Suggested softwares: Mathematica/MATLAB/Python/Sci lab

Software used: Python.

Reference Books

- 1) N.P.Bali and Manish Goyal: "A textbook of Engineering Mathematics" Laxmi Publications, 10th Ed., 2022.
- 2) B.S. Grewal: "Higher Engineering Mathematics", Khanna publishers, 44th Ed., 2021.
- 3) E.Kreyszig: "Advanced Engineering Mathematics", John Wiley & Sons, 10th Ed., 2018.

26UCHEME22**Chemistry for ME Stream****(42-0-28-50) 4****Total Hours: 120**

Course Learning Objectives (CLOs): This course focuses on the following learning perspectives:

- 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(1-11)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Explain corrosion mechanisms, types, factors and control methods and apply coating technologies for corrosion protection.	1	-	2,3
CO-2	Apply fuel properties, calorific value, knocking, fuel ratings and related numerical problems and evaluate green fuels for sustainable energy applications	1,11	6	2
CO-3	Analyze the size dependent properties and engineering applications of nano-materials and evaluate the performance and applications of batteries and fuel cells in energy system	1	-	2,3,6,11
CO-4	Analyze polymer characteristics, glass transition behavior, and related numerical problems and evaluate polymer composites for engineering applications.	1	-	2,3,6
CO-5	Explain the properties and applications of lubricants and industrial coolants and apply instrumental methods for the analysis of industrial samples.	1	-	2,3,7,9,11

POs	1	2	3	4	5	6	7	8	9	10	11
Mapping Level	3.0	1.0	1.0	-	-	1.3	3.0	-	1.0	-	1.6

Contents:

Unit-I

Corrosion: Introduction, electrochemical theory of corrosion, , factors affecting rate of corrosion-Nature of the metal, nature of the corrosion product, anodic and cathodic area, pH, temperature and conductance of the medium, types of corrosion-differential metal and differential aeration corrosion-water line and pitting corrosion, and stress corrosion. Corrosion control- metal coating; galvanization, surface conversion coating; anodization and cathodic protection; sacrificial anode method, corrosion penetration rate (CPR) - Introduction and numerical problems.

Coating Technologies: Introduction, technological importance, electroplating - electroplating of chromium-decorative and hard chromium, electro-less plating - electroless plating of Nickel, difference between electroplating and electroless plating.

8 Hrs

Unit-II

Fuels: Introduction, calorific value, determination of calorific value using bomb's calorimeter, numerical problems on GCV and NCV. Knocking in internal combustion (IC) engines - knocking mechanism in IC engines. Anti-knocking agents lead petrol and unleaded petrol - methyl tertiary butyl ether (MTBE) and ethyl tert-butyl ether (ETBE). power alcohol – properties, applications Importance of octane and cetane rating of fuel.

Green Fuels: Biodiesel- synthesis by trans-esterification method, advantages and its applications. Production of green hydrogen by photocatalytic water splitting and its advantages.

8 Hrs

Unit-III

Nanomaterials: Introduction, Size-dependent properties of nanomaterial-surface area, catalytical, electrical and thermal conductivity. Graphene - Synthesis by chemical vapor deposition (CVD) method, properties and engineering applications. synthesis of TiO₂ nanomaterials by sol-gel method and its uses in catalytic converter.

Energy Systems: Batteries - Introduction, classification of batteries, characteristics-capacity, power density, shelf life and cycle life. Construction, working and applications of lead-acid & Li-ion battery.

Fuel cells - Introduction, construction and working of solid oxide fuel cells (SOFCs) and its uses in auxiliary power units (APUs). Differences between fuel cells and battery.

9 Hrs

Unit-IV

Polymers: Introduction, classification, Number average and weight average molecular weight of polymer-numerical problems. Glass transition temperature (T_g), factor affecting T_g and its significance. synthesis, properties and engineering applications of chlorinated polyvinyl chloride (CPVC), polymethyl methacrylate (PMMA), ABS polymer and polycarbonate. Preparation, properties and industrial applications of graphene oxide by Hummer's method.

Unit-V

Lubricants: Introduction, types, ideal properties and applications. Lubricant testing; experimental determination of viscosity using Ostwald's viscometer.

Industrial Coolants: Introduction, types - water and oil-based coolants, properties and industrial applications.

Sensors: Potentiometric sensors: Principle, instrumentation and application in the estimation of iron in industrial effluents. Conductometric sensors: Principle, instrumentation and application in the determination of acid mixture in industrial effluents. Colorimetric sensor: Principle, instrumentation and application in the

estimation of copper in brass alloy. pH sensor: Glass electrode, principle, working and determination pH by using glass electrode. Mentions its advantages and limitations.

Self-learning: Functions of Industrial Coolants. pH sensor -Its application in the estimation of pKa of acid electrolyte. **8Hrs**

Polymer Composites: Introduction, fiber-reinforced polymers (FRPs); Kevlar – Synthesis, properties and industrial applications. Carbon-fiber - Preparation from Polyacrylonitrile (PAN), properties and industrial applications. **9 Hrs**

PRACTICAL MODULE

1. Estimation of total hardness of given water sample by EDTA method.
2. Estimation of percentage of CaO in cement by complexometric method.
3. Determination of chemical oxygen demand (COD) of industrial effluents.
4. Determination copper in brass by iodometric method.
5. Estimation of iron in Haematite ore solution by external indicator method.
6. Estimation of Chloride by argentometric method.
7. Determination of alkalinity of water sample by HCl method.
8. Estimation of acid mixture using conductometric sensor.
9. Estimation of iron in rust sample using potentiometric sensor.
10. Determination of pKa value of vinegar solution using pH sensor.
11. Estimation of copper present in e-waste (WPCB) by optical sensor (Colorimetry).
12. Determination of viscosity coefficient of green fuel using Ostwald's viscometer.
13. Estimation of percentage of iron in steel industry effluent by using optical sensor.
14. Estimation of Li/Na/K by using Flame photometer.

Reference books:

- 1) Wiley Engineering Chemistry, Wiley India Pvt. Ltd. New Delhi, 2013- 2nd Edition.
- 2) Shashi Chawla, Dhanpat Rai & Co. (P) Ltd., A Textbook of Engg. Chemistry.
- 3) R.V. Gadag and Nityananda Shetty, A Textbook of Engineering Chemistry, I. K. International Publishing house. 2nd Edition, 2016.
- 4) V R Gowariker, N V Viswanathan, Jayadev, Sreedhar, Newage, Polymer Science, Int. Publishers, 4th Edition, 2021.
- 5) G.A. Ozin & A.C., Nanotechnology A Chemical Approach to Nanomaterials, Arsenault, RSC Publishing, 2005.

26UEME23	Elements of Mechanical Engineering	(42-0-0-48) 3
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Total Hours:90

Course Learning Objectives (CLOs):

- Understand the fundamentals of steam formation, boilers, power plants, renewable and non-renewable energy sources.
- Understand the basics of machine tools and operations.
- Analyze and apply concepts of power transmission elements, including belt and gear drives, and metal joining processes.
- Acquire knowledge about the working principles of IC engine, refrigeration and air conditioning, and performance parameters (of 2-stroke and 4-stroke petrol and diesel engines).
- Acquire a basic insight into advancements in manufacturing, automation and automotive technology

Course outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs(1-11)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Analyze the properties of steam, steam applications and renewable and non-renewable energy sources.	1	2	6,7,10
CO-2	Demonstrate the working and operations of machine tools.	1	2	6,7,10
CO-3	Apply the concepts of gear and belt drives and metal joining techniques.	1	2	6,7,10
CO-4	Demonstrate the working of petrol and diesel engines, refrigeration and air conditioning systems, performance parameters of IC engines.	1,2	--	6,7,10
CO-5	Discuss the role of advanced technology in mechanical engineering	1	--	6,7,10

POs	1	2	3	4	5	6	7	8	9	10	11
Mapping Level	3	2.6	--	--	--	1	1	--	--	1	--

Course Contents:**Unit - I****Steam, Boilers and Power Plants**

Steam formation and its applications: Formation of steam, Properties of Steam, Numerical related to properties of steam.

Boilers: Simple and high-pressure boilers, mountings and accessories

Power plants: Thermal power plants, nuclear power plants, hydroelectric power plants Renewable and non-renewable energy sources: Classification, sketch and brief explanation. **9 Hrs**

Unit - II**Machine Tool Operations:**

Lathe: Working principle, parts and its functions, lathe operations, Taper turning and its methods

Drilling machine: Working principle, parts and its functions, drilling machine operations (Sketch and operations only)

Milling machine: Working principle, parts and its functions, Milling machine operations (Sketch and operations only). **7 Hrs**

Unit – III**Power transmission**

Gear drives: Gear types, Simple and compound gear trains, Numerical problems

Belt drives: Flat and V-belts, advantages of V-belt over flat belts, length of the belt derivation,

Tension ratio, angle of contact, power transmitted (No derivation), Numerical problems.

Joining processes: Welding, soldering and brazing, Arc and TIG welding, Differences between them. **9 Hrs**

Unit – IV**Internal combustion engines, Refrigeration and air conditioning**

IC Engines: Engine parts and materials, Working of 2-stroke 4-stroke engines, Differences between 2-stroke 4-stroke engines, Differences between petrol and diesel engines. Performance parameters, Numerical problems.

Refrigeration System: Refrigeration principle, ton of refrigeration, vapor compression refrigeration (VCR) system, refrigerants. properties of refrigerants.

Air conditioning: Summer and winter air conditioning system. **10 Hrs**

Unit – V**Emerging trends in mechanical engineering**

Artificial intelligence and machine learning applications in mechanical engineering, Mechatronics, open and closed loop control systems, Robot and its classification.

3 Computer numerical control, flexible manufacturing systems (FMS), computer integrated manufacturing (CIM) system (Block diagram, Definition and Benefits), benefits compared to convention systems. Advanced technologies used in manufacturing and automotive industries. Electric and hybrid vehicles, advantages and disadvantages compared to conventional vehicles **9 Hrs**

Reference Books:

- 1) K.R. Gopalakrishna, Elements of mechanical engineering, Subhash publications, 2008.
- 2) N.R. Banapurmath, V.S. Yaliwal, Basic mechanical engineering, First Edition, Vikas Publishing House, New Delhi, 2014.
- 3) Hazra Choudary Nirzar Roy, Elements of workshop technology Vol-I and II, Media promoters and publishers Pvt Ltd, 2010,
- 4) P. Radhakrishnan, S. Subramanyam, CAD/CAM/CIM, New Age International Pvt Ltd Publishers, 2008.
- 5) Appu Kuttan KK Robotics, , I K International Publishing House Pvt, Ltd, New Delhi, 2007
- 6) Mehrdad Ehsani, Yimin Gao, Stefano Longo and Kambiz Ebrahimi Modern electric, hybrid electric and fuel cell vehicles, , Third edition, CRC Press, Taylor and Francis group, London, 2019

26UESC243	Introduction to Electronics and Communication Engineering	(42-0-0-48) 3
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Total Hours: 90

Course Learning Objectives (CLOs):

This course at the II Semester level introduces the subject of Electronics and Communication Engineering to non-E&C branches. The subject matter includes Power Supplies, Amplifiers, Oscillators, Operational Amplifiers, Boolean Algebra and Logic circuits, Embedded Systems, Analog and Digital Communication Schemes. Each of the above topics are briefly described.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs (1-11)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Explain Power Supplies, Half Wave, Full Wave Rectifiers and amplifier circuits.	-	-	1,2
CO-2	Describe the concept of Oscillators and Operational amplifier circuits.	-	-	1,2

CO-3	Explain the concepts of Boolean Algebra and Logic circuits.	-	-	1,2
CO-4	Explain microprocessor, microcontrollers, Embedded Systems and sensor interfacing.	-	1,2	-
CO-5	Describe various modulation schemes and the need for modulation with respect to analog and digital communication.	-	1,2	-

POs	1	2	3	4	5	6	7	8	9	10	11
Mapping Level	1.4	1.4	-	-	-	-	-	-	-	-	-

Pre-requisites: None

Contents:

Unit-I

Power Supplies –Block diagram, Half-wave rectifier, Full-wave rectifier, and Full-wave bridge rectifier and filters, Voltage regulators, Output resistance and voltage regulation, Voltage multipliers (only voltage doublers).

Amplifiers –Types of amplifiers, Transistor amplifier, Gain, Input and output resistance, Frequency response, Bandwidth, Phase shift, Negative feedback. **8 Hrs**

Unit-II

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

Operational amplifiers -Operational amplifier parameters, Operational amplifier characteristics, Operational amplifier configurations, Operational amplifier circuits. **8 Hrs**

Unit-III

Boolean Algebra and Logic Circuits: Binary numbers, Number Base Conversion, Octal & Hexadecimal Numbers, Complements, Basic definitions, Axiomatic Definition of Boolean Algebra, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Other Logic Operations, Digital Logic Gates.

Combinational logic: Introduction, Design procedure, Adders- Half adder, Full adder. **9 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. **8 Hrs**

Unit-V

Communication Systems: Introduction Electromagnetic spectrum, Elements of communication system, Terminologies in communication system, Need for modulation, Types of modulation.

Analog Modulation Schemes: Amplitude Modulation, Frequency modulation, Phase modulation: definition, time-domain representation, waveforms.

Digital Modulation Schemes: Advantages of digital communication over analog communication, Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Phase

Shift Keying (PSK): definition, signal representation, waveforms.

9 Hrs

Reference Books:

- 1) **Mike Tooley**, "Electronic Circuits", Fundamentals & Applications', 4th Edition, Elsevier, 2015.
- 2) **M. Morris Mano**, "Digital Logic and Computer Design", PHI Learning, 2008 ISBN-978-81-203-0417-84.
- 3) **K V Shibu**, "Introduction to Embedded Systems", 2nd Edition, McGraw Hill Education (India), Private Limited, 2016.
- 4) **S L Kakani and Priyanka Punglia**, "Communication Systems", New Age International Publisher, 2017.
- 5) **George Kennedy, Bernard Davis, SRM Prasanna**, "Electronic Communication Systems", 6E, McGraw Hill Education, 2018.

26UPLC251	Introduction to Python Programming	(28-0-28-34) 3
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Total Hours: 90

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 and data analysis concepts in Python.

Course outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs(1-11)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Apply Python syntax, data types, and control structures to develop basic programs.	1	2,5	3
CO-2	Utilize lists, tuples, and dictionaries to store and manipulate structured data.	1	2,3,5	-
CO-3	Implement string processing and file handling techniques for data storage and retrieval.	5	1,2,3	4
CO-4	Apply file management and debugging techniques to develop efficient and error-free programs.	2,5	1,3,4	-

CO-5	Develop object-oriented programs and perform data analysis and visualization using Python libraries.	5	4	1,2,3
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POs	1	2	3	4	5	6	7	8	9	10	11
Mapping Level	2.1	2	1.6	1.7	2.6	--	--	--	--	--	--

Pre-requisites: None

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, Keyword Arguments and print(), Local and Global Scope, The global Statement, Exception Handling. **10 Hrs**

Unit - II

Lists: List Data Type, Working with Lists, Augmented Assignment Operators, Methods, List-like Types: Tuples and Dictionaries
Dictionaries and Structuring Data: The Dictionary Data Type, Pretty Printing. **8 Hrs**

Unit - III

Manipulating Strings: Working with Strings, Useful String Methods.
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. **8 Hrs**

Unit - IV

Organizing Files: The shutil Module, Walking a Directory Tree, Compressing Files with the zip file Module.
Debugging: Raising Exceptions, Getting the Traceback as a String, Assertions, Logging. **8 Hrs**

Unit - V

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

Data Analysis and Visualization using Python: Introduction to Data Analysis, NumPy for Numerical Computing, Pandas for Data Handling, Data Visualization.

8 Hrs

Reference Book:

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

Programming Exercises:

- 1) Develop a program to read the student details like Name, USN, and Marks in three subjects. Display the student details, total marks and percentage with suitable messages.
- 2) Develop a program to read the name and year of birth of a person. Display whether the person is a senior citizen or not.
- 3) Develop a program to generate Fibonacci sequence of length (N). Read N from the console.
- 4) Write a function to calculate factorial of a number. Develop a program to compute binomial coefficient (Given N and R).
- 5) Read N numbers from the console and create a list. Develop a program to print mean, variance and standard deviation with suitable messages.
- 6) Read a multi-digit number (as chars) from the console. Develop a program to print the frequency of each digit with suitable message.
- 7) Develop a program to print 10 most frequently appears words in a text file. [Hint: Use dictionary with distinct words and their frequency of occurrences. Sort the dictionary in the reverse order of frequency and display dictionary slice

of first 10 items]

- 8) Develop a program to sort the contents of a text file and write the sorted contents into a separate text file. [Hint: Use string methods strip(), len(), list methods sort(), append(), and file methods open(), readlines(), and write()].
- 9) Develop a program to backing Up a given Folder (Folder in a current working directory) into a ZIP File by using relevant modules and suitable methods.
- 10) Write a function named DivExp which takes TWO parameters a, b and returns a value c ($c=a/b$). Write suitable assertion for $a>0$ in function DivExp and raise an exception for when $b=0$. Develop a suitable program which reads two values from the console and calls a function DivExp.
- 11) Develop a program using a class to represent a rectangle. The program should calculate the area and perimeter of the rectangle using appropriate functions.
- 12) Develop a Python program using NumPy and Pandas to analyze the data and determine velocity and acceleration.
- 13) Write a Python program using Pandas to read, process, and analyze tabular data from a dataset (Excel/CSV). Perform operations such as filtering, sorting, and summarizing data.
- 14) Write a Python program to visualize experimental data using line and scatter plots with Matplotlib.

26UPWS26	Professional Writing Skills in English	(14-0-0-16) 1
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Total Hours: 30

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 write good technical reports.
- To acquire Employment and Workplace communication skills.
- To learn about Information Transfer techniques through presentation in different levels.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs(1-11)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Identify the Common Errors in Writing and Speaking.	-	9,11	-
CO-2	Illustrate better technical writing and Presentation skills.	-	9,11	-
CO-3	Read Technical proposals properly and write standard technical reports.	9,11	-	-
CO-4	Demonstrate Employment and Workplace communication skills.	-	9,11	-
CO-5	Learn Effective Presentation Skills	9,11	-	-

POs	1	2	3	4	5	6	7	8	9	10	11
Mapping Level	-	-	-	-	-	-	-	-	2.4	-	2.4

Course Contents:

Unit – I

Identifying Common Errors in Written and Spoken English: Verb Phrase and phrasal verbs, Auxiliary verbs and their forms, Subject Verb Agreement (Concord Rules), Common errors in Subject-verb agreement, Words Confused / Misused, errors identification.

3 Hrs

Unit-II

Nature and Style of sensible writing: Punctuation marks, Paragraph Writing, Writing Articles, Precise writing and Techniques in Essay writing, Sentence arrangements and Corrections activities. Misplaced modifiers, Contractions, Collocations, Correction of Errors.

2 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.

3 Hrs

Unit-IV

Professional Communication for Employment: Listening Comprehension, Types of Listening, Listening Barriers, Improving Listening Skills. TED talks, Reading Comprehension, Tips for effective reading. Job Applications, Types of official/employment/business Letters, Resume vs. Bio Data, Profile, CV. and effective resume writing, Emails, Blog Writing and Memos. **3 Hrs**

Unit-V

Professional Communication at Workplace: Agenda, Minutes of Meeting, 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. **3 Hrs**

Reference Books:

- 1) "Professional Writing Skills in English" published by Fillip Learning – Education (ILS), Bangalore – 2022.
- 2) Technical Communication – Principles and Practice, Third Edition by Meenakshi Raman and Sangeetha Sharma, Oxford University Press 2017.
- 3) Wood, Frederick. A Remedial English Grammar for Foreign Students. Macmillan Education, India, 1990.
- 4) Yadugiri, M A. Making Sense of English - A Textbook of Sounds, Words and Grammar, Viva Books, 2020.

26UICO27	Indian Constitution	(14-0-0-16) 1
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Total Hours: 30

Course Learning Objectives (CLOs):

- 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):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to Pos (1-11)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Explain the basic structure of Indian Constitution.	-	-	7
CO-2	Describe the Fundamental Rights and Fundamental Duties present in our constitution.	-	-	7
CO-3	Describe the directive principles of state policy.	-	-	7
CO-4	Explain State Executive & Elections system in India.	-	-	7
CO-5	Describe the Amendments and Emergency Provisions, other important provisions given by the constitution.	-	-	7

POs	1	2	3	4	5	6	7	8	9	10	11
Mapping Level	-	-	-	-	-	-	1	-	-	-	-

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.

3 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.

3 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.

3 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. **3 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. **2 Hrs**

Reference Books:

- 1) "Constitution of India" (for Competitive Exams)- Published by Naidhruva Edutech Learning Solutions, Bengaluru.–2022.
- 2) "Constitution of India, Professional Ethics and Human Rights" by Shubham Singles, Charles E. Haries, and etal: published by Cengage Learning India, Latest Edition–2019.

26UBEC28	Biology for Engineers	(14-0-0-16) 1
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Total Hours: 30

Course Learning Objective (CLO):

Gain a fundamental understanding of basic biological concepts and their relevance to engineering applications.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to		Mapping to POs (1-11)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Describe diverse applications of biomolecules.	-	2,3	1
CO-2	Explain the architecture and functioning of the brain, eye, and heart as integral systems in the human body.	-	2,3	1
CO-3	Explain the structure, functions, and bioengineering approaches related to the lungs, kidneys, muscular system, and skeletal system.	-	2,3	1

CO-4	Describe nature-inspired materials and mechanisms.	-	2,3	1
CO-5	Summarize the latest trends in bioengineering.	-	2,3	1

POs	1	2	3	4	5	6	7	8	9	10	11
Mapping Level	1	2	2	-	-	-	-	-	-	-	-

Course content:

Unit-I

Biomolecules and their applications: Carbohydrates, Nucleic acids, Proteins, lipids, and Enzymes. **4 Hrs**

Unit-II

Human organ systems and bio designs - 1: Brain as a CPU system, Eye as a Camera system, Heart as a pump system. **3Hrs**

Unit-III

Human organ systems and bio-designs - 2: Lungs as purification system, Kidney as a filtration system, Muscular and Skeletal Systems as scaffolds. **2Hrs**

Unit-IV

Nature-bioinspired materials and mechanisms: Echolocation, Photosynthesis, Bird flying (GPS and aircrafts), Shark skin (Friction reducing swim suits), Kingfisher beak (Bullet train). Human Blood substitutes. **3Hrs**

Unit-V

Trends in bioengineering: Bioprinting techniques and materials, 3D printing of ear, bone, and skin. Electrical tongue and electrical nose in food science, Bioimaging and Artificial Intelligence for disease diagnosis. **2Hrs**

Reference Books:

- 1) Human Physiology, Stuart Fox, Krista Romliski, McGraw-Hill eBook. 16/e Edition, 2022
- 2) Biology for Engineers, Thyagarajan S., Selvamurugan N., Rajesh M.P., Nazeer R.A., Thilagaraj W., Barathi S., and Jaganthan M.K., Tata McGraw-Hill, New Delhi, 2012.
- 3) Biomedical Instrumentation, Leslie Cromwell, Prentice Hall 2011.
- 4) Biology for Engineers, Sohini Singh and Tanu Allen, Vayu Education of India, New Delhi, 2014.
- 5) Bioremediation of heavy metals: bacterial participation, by C R Sunilkumar, N Geetha A. C. Udayashankar Lambert Academic Publishing, 2019.
- 6) Electronic Noses and Tongues in Food Science, Maria Rodriguez Mende, Academic Press, 2016