

Academic Program: UG

Academic Year 2026-27

I & II Semester B.E.

Syllabus

Stream: Electrical & Electronics Engineering

Branch: Electronics and Communication Engineering



**SHRI DHARMASTHALA MANJUNATHESHWARA
COLLEGE OF ENGINEERING & TECHNOLOGY,
DHARWAD – 580 002**

**(An Autonomous Institute Approved by AICTE & Affiliated to VTU, Belagavi
Accredited by NBA under Tier-1 2023-2026)**

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SDMCET: Syllabus

SDM College of Engineering & Technology, Dharwad

It is certified that the scheme and syllabus for I & II semester B.E. in Electronics and Communication Engineering is recommended by the Board of Studies of Electronics and Communication Engineering Department and 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-02
Department of Electronics & Communication Engineering
College – Vision and Mission

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 and Mission**Vision**

Fostering excellence in the field of Electronics & Communication Engineering, showcasing innovation, research and performance with continuous Industry – Institute Interaction with the blend of Human values.

Mission

M1: To provide quality education in the domain of Electronics & Communication Engineering through state of the art curriculum, effective teaching learning process and the best of laboratory facilities.

M2: To encourage innovation, research culture and team work among students.

M3: Interact and work closely with industries and research organizations to accomplish knowledge atpar.

M4: To train the students for attaining leadership with ethical values in developing and applying technology for the betterment of society and sustaining the global environment.

Program Educational Objectives (PEOs)

The Graduates, after a few years of Graduation will be able to:

- I. **Apply** the latest in-depth knowledge in the field of Electronics and Communication Engineering with Mathematical applications to address real life challenges.
- II. **Exhibit** the confidence for independent working and / or spirit to work cohesively with group.
- III. **Readily** be accepted by the Industry globally.
- IV. **Develop** design skills, fault diagnosis skills, communication skills and create research orientation.
- V. **Inculcate** professional, social ethics and to possess awareness regarding societal responsibility, moral and safety related issues

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:EngineeringTool 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 frame work, 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 Teamwork : 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 Electronics and Communication

Engineering,

Scheme of Teaching and Examinations 2026

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

I SEMESTER (Physics Cycle)

Sl · N o	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	CIEMarks	SEEMarks	TotalMarks	
					L	T	P	SL						
1	ASC (IC)	26UMATEE11	Mathematics-I for EE Stream	Mathematics	42	0	28	50	120	3	50	100	100	4
2	ASC (IC)	26UPHYEE12	Physics for EE Stream	Physics	42	0	28	50	120	3	50	100	100	4
3	ESC	26UBEE13	Basic Electronics Engineering	ECE	42	0	0	48	90	3	50	100	100	3
4	ESC-I	26UESC144	Introduction to C programming	ECE	42	0	0	48	90	3	50	100	100	3
5	ETC	26UETC151	Introduction to AI and its application	ECE	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	SanskritikaKannada/ BalakeKannada	Humanities	14	0	0	16	30	1	50	50	100	1
8	AEC	26UIDT18	InnovationandDesignThinking	ECE	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

SDMCET: Syllabus

SDM College of Engineering and Technology, Dharwad B.E. in Electronics and Communication Engineering, Scheme of Teaching and Examinations 2026

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	CourseTitle	TeachingDepartment(TD)and Question Paper SettingBoard(P SB)	Teaching & Learning Scheme					Examination				Credits
					CI		LI	TW & SL	# TH/S	Duration in hours	CIEMarks	SEEMarks	TotalMarks	
					L	T	P	SL						
1	ASC (IC)	26UMATEE21	Mathematics-II for EE Stream	Mathematics	42	0	28	50	120	3	50	100	100	4
2	ASC (IC)	26UCHEEE22	Chemistry for EE Stream	Chemistry	42	0	28	50	120	3	50	100	100	4
3	ESC	26UCED23	Computer-Aided Engineering Drawing	Mechanical	28	0	28	34	90	3	50	100	100	3
4	ESC-II	26UESC241	Introduction to Electrical Engineering	EEE	42	0	0	48	90	3	50	100	100	3
5	PLC	26UPLC251	Introduction to Python Programming	ECE	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	ECE	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									

26UMATEE11

Mathematics-I for EE Stream

(42-0-28-50)4

Total Hours:120

Course Learning objectives (CLO's):

This course focuses on the following learning perspectives:

1. **Familiarize** the importance of calculus associated with one variable and two variables for electronics and electrical engineering
2. **Develop** the knowledge of Linear Algebra referring to matrices.
3. **Analyze** electronics and electrical engineering problems applying Ordinary Differential equations.

Course outcome (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 knowledge of calculus to solve problems related to polar	-	-	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. Solve higher order differential equations	-	1,2,11	
CO-4	Apply the matrix theory for solving system of linear equations and compute Eigen values and Eigenvectors	-	-	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 and matrices.

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. **08 Hrs.**

Unit-II**Series Expansion, Indeterminate Forms and Multivariable Calculus**

Statement and problems on Taylor's and Maclaurin's series expansion for one variable. Indeterminate forms - L'Hospital's rule. Partial differentiation, total derivative, differentiation of composite functions, Jacobians, Maxima and minima for the function of two variables. **08 Hrs.**

Unit-III**Ordinary Differential Equations of First Order**

Linear and Bernoulli's differential equation. Exact and reducible to exact differential equations with integrating factors: $\frac{1}{M}\left(\frac{\partial M}{\partial y} - \frac{\partial M}{\partial x}\right)$ and $\frac{1}{N}\left(\frac{\partial M}{\partial y} - \frac{\partial M}{\partial x}\right)$. Orthogonal trajectories and LR -Circuits.

Non linear differential equations: Introduction to general and singular solutions, solvable for p only, Clairaut's equations-problems. **09 Hrs.**

Unit-IV**Ordinary Differential Equations of Higher Order**

Higher-order linear ordinary differential equations with constant coefficients, homogeneous and non-homogeneous equations (e^{ax} , $\sin(ax+b)$, $\cos(ax+b)$, x^n only), Method of variation of parameters, Cauchy's and Legendre's homogeneous differential equations. Applications: Solving governing differential equations of Mass Spring. **09 Hrs.**

Unit -V**Linear Algebra**

Elementary row transformation of a matrix, Rank of a matrix. Consistency and Solution of system of linear equations - Gauss-elimination method and approximate solution by Gauss-Seidel method. Eigen values and Eigenvectors, Rayleigh's power method to find the dominant Eigen value and Eigenvector. Applications: Traffic flow. **08 Hrs.**

List of Laboratory experiments:

- 1) Introduction, Basics of Python.
- 2) Programming Structures in Python.
- 3) 2D plots for Cartesian and polar curves.
- 4) Finding angle between polar curves.
- 5) Finding Radius of curvature.
- 6) Expansion of Taylor's and Maclaurin's series.
- 7) Finding partial derivatives and Jacobian.
- 8) Solution of first order and higher order ordinary differential equations.
- 9) Plotting solutions of ODE.
- 10) Solution of Differential Equation of Oscillations of Spring with Various Load.
- 11) Finding rank, reduced echelon form, solving system of linear equations using Gauss elimination method.
- 12) Solving system of linear equations using Gauss-Seidel method.
- 13) Determine Eigenvalues and Eigenvectors.
- 14) Find the Dominant Eigen Value and Corresponding Eigen Vector by Rayleigh Power Method.

Suggested software: 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. B.V. Ramana, Higher Engineering Mathematics, McGraw-Hill Education, 11th Ed., 2017.

Course Learning Objectives (CLOs):

1. Physics for EE stream is designed to deliver optimum knowledge of materials and energy concepts.
2. Content explores the fundamental theories, experimental demonstrations and their applications in various engineering fields.
3. Scope of the curriculum includes the study of quantum mechanics to analyze microscopic systems, quantized states, and tunneling.
4. Electrical conduction in metals and semiconductors, including carrier concentration and Fermi energy.
5. Apply principles and applications of semiconductors, superconductors, optical devices and sensors.

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 the quantum mechanics to analyze microscopic particles and quantum tunneling	1	2	11
CO-2	Explain the electrical conduction in metals and semiconductors	1	2	11
CO-3	Summarize the superconductivity phenomenon and properties	1	2	11
CO-4	Apply concepts of laser, modulators and photonics in device design	1	2	11
CO-5	Illustrate the application of semiconductors devices and sensors	1	2	11

CO-6	Practices working in groups to conduct experiments in physics and perform precise and honest measurements	1	2	11
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Pre-requisites: Nil

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

Contents:

Unit-I

Quantum Physics:

Introduction to quantum mechanics.de-Broglie Hypothesis, Heisenberg's Uncertainty Principle and its application (Broadening of Spectral Lines), Principle of Complementarity, Wave Function, Quantum state through Feynman's double slit experiments, Time independent Schrödinger wave equation (Derivation), Physical significance of a wave function and Born Interpretation, Expectation value and its physical significance, Quantum Operators, Eigen functions and Eigen values of operators, Particle inside one dimensional infinite potential well, Waveforms and Probabilities, Quantum tunneling using potential barrier, Numerical Problems.**09 Hrs.**

Unit-II

Electrical Properties of Metals and Semiconductors:

Failures of classical free electron theory, Mechanism of electron scattering in solids, Matheissen's rule, Assumptions of Quantum free electron theory, Success of quantum free electron theory of metals, Density of states, Fermi Dirac statistics, Fermi energy, Variation of Fermi factor with temperature and energy, Expression for carrier concentration in a conductor, Mention of expression for electrical conductivity, Semiconductors, Derivation of electron concentration in an intrinsic and extrinsic semiconductors, Expression for electron and hole concentration in extrinsic semiconductor (Qualitative), Fermi level for intrinsic (with derivation) and extrinsic semiconductor (no derivation), Hall effect, Numerical Problems. **08 Hrs.**

Unit-III

Superconductivity

Para-magnetism and Dia-magnetism, Zero resistance state, Persistent current, Meissner's effect, Critical temperature and critical field, Critical current (Silsbee Effect) – Derivation for a cylindrical wire using ampere's law, BCS Theory - Formation of Cooper pairs, Mediation of phonons, Phase coherent state, Limitations of BCS theory, examples of systems with low and high electron-phonon coupling, Type-I and Type-II superconductors, Formation of Vortices, Explanation for upper critical field, Cooper pair tunneling (Andreev reflection), Josephson junction, Flux quantization, DC and AC SQUID (Qualitative), Numerical Problems. **08 Hrs.**

Unit-IV

Semiconductor devices and Sensors:

Direct and indirect band gap, Band gap engineering, Zener Diode, LED, Photodiode, Photo Transistor, Light dependent resistor, Resistance temperature detectors (high, medium, low), Sensing mechanisms, Piezo electric Sensors, Metal Oxide Semiconductor (MOS) gas sensors, Hall sensor, Superconducting Nanowire Single Photon Detector, Numerical Problems. **08 Hrs**

Unit-V

Photonics:

Interaction of radiation with matter – Significance of Einstein's A and B coefficients and derivation of expression for energy density, Prerequisites for lasing actions, Types of LASER – Semiconductor diode LASER, Applications of laser, Use of attenuators for single photon sources, Optical modulators – Pockel's effect, Kerr effect. Superconducting Nanowire Single Photon Detector. Introduction to Optical fiber, Types of optical fiber, Derivation of Numerical aperture, V-number, Number of modes, losses in optical fiber, Mach-Zehnder interferometer, Numerical problems.

09 Hrs.

PRACTICAL COMPONENTS**PART-A: LIST OF EXPERIMENTS**

1. Determination of wavelength of LASER using Diffraction Grating.
2. Determination of acceptance angle and numerical aperture of the given Optical Fiber.
3. Determination of resistivity of a semiconductor by Four Probe Method.
4. Determination of dielectric constant of the material of capacitor by charging and discharging method.
5. Study the Characteristics of a Photo-Diode and to determine the power responsivity.
6. Determination of Plank's Constant using LEDs/Black-Body.
7. Determination of Fermi Energy of Copper.
8. Interference by the division of amplitude (Air-wedge/Newton's Rings)
9. Black-Box Experiment (Identification of basic Electronic Components)
10. Study the I-V Characteristics of a Bipolar Junction Transistor and hence determine α and β .
11. Resonance in LCR circuit and hence determine the coefficient of self inductance.
12. Determine the Energy Gap of the given semiconductor.
13. To study the operation of a multimeter and use it for measuring resistance, current, voltage, and for testing diodes, transistors, and continuity in conductors.
14. Construction and Analyzing Electronic circuits using one of the following
 1. Expeyes: <https://expeyes.in/>
 2. Circuit Lab : <https://www.circuitlab.com/>
 3. Multisim: <https://www.multisim.com/>
 4. DCA Clab: <https://dcaclab.com/>

5. Falstad: <https://www.falstad.com/circuit/>

Reference Books

1. Engineering Physics, S Mani Naidu, Pearson, Fourteenth Impression, 2024.
2. Beiser, A. (2002). Concepts of Modern Physics (6th ed.). McGraw-Hill Education..
3. Tinkham, M. (2004). Introduction to Superconductivity (2nd ed.). Dover Publications.
4. Mishra, P. K. (2009). Superconductivity – Basics and Applications. Ane Books.
5. Ghatak, A., & Thyagarajan, K. (2005). Optical Electronics. Oxford University Press.
6. Saleh, B. E. A., & Teich, M. C. (2019). Fundamentals of Photonics (3rd ed.). Wiley

26UBEE13

Basic Electronics Engineering

(42-0-0-48)3

Total Hours: 90

Course Learning Objectives (CLOs): At the end of the course the student will be able to: Develop the basic knowledge on construction, operation and characteristics of semiconductor devices. Apply the acquired knowledge to construct small scale circuit consisting of semiconductor devices. Develop competence knowledge to construct basic digital circuits by make use of basic gate and its function. Construct the conceptual blocks for basic communication system. Apply the knowledge of various transducers principle in sensor system.

Course Outcomes (COs):

Description of the Course Outcome:		Mapping to POs (1-11)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Discuss the construction, operation and characteristics of semi conductor devices.	1,2	3,5,6	-

CO-2	Apply the acquired knowledge to construct small scale circuit consisting of semiconductor devices.	1,3	2,5	6
CO-3	Design and implement to construct basic digital circuit by making use of basic gates and its functions.	1,3,5	2	9
CO-4	Construct the conceptual blocks for basic communication system.	-	1,5	2,3,6,9
CO-5	Apply the knowledge of various transducers principles in sensor system.	-	1,5	2,3,6,9

POs	1	2	3	4	5	6	7	8	9	10	11
Mapping Level	2.6	1.8	2	-	2.2	1.25	-	-	1	-	-

Pre-requisites: Elementary Physics and Elementary Mathematics

Contents:

Unit-I

Semiconductor Diodes: Introduction, PN Junction diode, Characteristics and Parameters, Diode Approximations, DC Load Line analysis

Diode Applications: Introduction, Half Wave Rectification, Full Wave Rectification, Full Wave Rectifier Power Supply: Capacitor Filter Circuit, RC π Filter (includes numerical)

Zener Diodes: Junction Breakdown, Circuit Symbol and Package, Characteristics and Parameters, Equivalent Circuit, Zener Diode Voltage Regulator. **08 Hrs**

Unit-II

Bipolar Junction Transistors: Introduction, BJT Voltages & Currents, BJT

Amplification, Common Base Characteristics, Common Emitter Characteristics, Common Collector Characteristics, BJT Biasing: Introduction, DC Load line and Bias point

Field Effect Transistor: Junction Field Effect Transistor, JFET Characteristics, MOSFETs: Enhancement MOSFETs, Depletion Enhancement MOSFETs. **09 Hrs**

Unit-III

Operational Amplifiers: Introduction, The Operational Amplifier, Block Diagram Representation of Typical Op-Amp, Schematic Symbol, Op-Amp Parameters-Gain, input resistance, Output resistance, CMRR, slew rate, Bandwidth, input offset voltage, Input bias

Current and Input offset Current, The Ideal Op-Amp, Equivalent Circuit of Op-Amp, Open Loop Op-Amp configurations, Differential Amplifier, Inverting & Non-Inverting Amplifier

Op-Amp Applications: Inverting Configuration, Non-Inverting Configuration, Differential Configuration, Voltage Follower, Integrator, Differentiator **08 Hrs**

Unit-IV

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

Combinational Logic: Introduction, Design procedure, Adders-Half adder, and Full adder **09 Hrs**

Unit-V

Introduction to Transducers: Introduction, Resistive Transducers, Inductive Transducers, Capacitive Transducers, Thermal transducers, Opto-electronic transducer, and Piezo electric transducers

Communications: Introduction to communication, Communication System, Modulation **08 Hrs**

Reference Books:

- 1) Electronic Devices and Circuits, David A Bell, 5th Edition, Oxford, 2016
- 2) Op-amps and Linear Integrated Circuits, Ramakanth A Gayakwad, Pearson

Education, 4th Edition

- 3) Digital Logic and Computer Design, M. Morris Mano, PHI Learning, 2008 ISBN-978-81-203-0417-8
- 4) Electronic Instrumentation and Measurements (3rd Edition) – David. Bell, Oxford University Press, 2013
- 5) Electronic Communication Systems, George Kennedy, 4th Edition, TMH

26UESC144

Introduction to C Programming

(42-0-0-48) 3

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: 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 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
Mapping Level	1.8	2.0	2.0	-	-		-	-	-	-	-

Pre-requisites: NIL

Contents:

Unit-I

Introduction to C: Introduction to computers, input and output devices, Algorithms and Flow charts, 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. **08 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, go to statement. **08 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. **09 Hrs**

Unit-IV

Functions: Introduction to user defined functions, Function definition, function declaration, function call, return statement, passing parameters to functions, recursive functions. **09 Hrs**

Unit-V

Strings: String taxonomy, string operations
Pointers: Introduction to Pointers, Declaring Pointer Variables. Structures: Introduction to structures. **08 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****Total Hours: 90****Course Learning Objectives (CLOs):**

This course focuses on the following learning perspectives:

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

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 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, Jupyter note book

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. **09 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) **09 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. **07Hrs.**

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). **08 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. **09 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:

1. To know about Fundamentals of Communicative English and Communication Skills in general.
2. To train to identify the nuances of phonetics, intonation and enhance pronunciation skills for better Communication skills.
3. To impart Basic English grammar and essentials of important language skills.
4. To enhance with English vocabulary and language proficiency for better communication skills.
5. 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	-	-

Pre-requisites: None

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

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. **03 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. **03 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. **03 Hrs**

Unit-IV

Grammar: Parts of Speech, Articles and Preposition, Tenses, Sentences, Kinds of sentences, Transformation of sentences, Question Tags. **02 Hrs**

Unit-V

Communication Skills for Employment: Presentation Skills, Extempore, Public Speaking, Mother Tongue Influence (MTI), Reading and Listening Comprehensions **03 Hrs**

Reference Books:

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

26UKSK17**ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ/ Samskrutika Kannada****(14-0-0-16) 1****Total Hours: 30**

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

1. ಪದವಿ ವಿದ್ಯಾರ್ಥಿಗಳಾಗಿರುವುದರಿಂದ ಕನ್ನಡ ಭಾಷೆ, ಸಾಹಿತ್ಯ ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು. ಆಧುನಿಕ ಪೂರ್ವ ಮತ್ತು ಆಧುನಿಕ ಕಾವ್ಯಗಳನ್ನು ಪರಿಚಯಿಸುವುದು.

2. ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಸಾಹಿತ್ಯ ಮತ್ತು ಸಂಸ್ಕೃತಿಯ ಬಗ್ಗೆ ಅರಿವು ಹಾಗೂ ಆಸಕ್ತಿಯನ್ನು ಮೂಡಿಸುವುದು.
ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯ ಹಾಗೂ ಅವರು ಸಾಧಿಸಿದ ವಿಷಯಗಳನ್ನು ಪರಿಚಯಿಸುವುದು

ಘಟಕ-I**ಕನ್ನಡ ಸಂಸ್ಕೃತಿ ಮತ್ತು ಭಾಷೆ ಕುರಿತಾದ ಲೇಖನಗಳು**

1. ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ - ಹಂಪ ನಾಗರಾಜಯ್ಯ
2. ಕರ್ನಾಟಕ ಏಕೀಕರಣ - ಒಂದು ಅಪೂರ್ವ ಚರಿತ್ರೆ - ಜಿ. ವೆಂಕಟಸುಬ್ಬಯ್ಯ
3. ಆಡಳಿತ ಭಾಷೆಯಾಗಿ ಕನ್ನಡ-ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ ಮತ್ತು ಪ್ರೊ. ವಿ. ಕೇಶವಮೂರ್ತಿ **03 Hrs**

ಘಟಕ-II**ಆಧುನಿಕ ಪೂರ್ವದ ಕಾವ್ಯ ಭಾಗ**

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

1. ಕೀರ್ತನೆಗಳು: ಅದರಿದೇನು ಫಲ ಇದರಿದೇನು ಫಲ - ಪುರಂದರದಾಸರು,
ತಲ್ಲಣಿಸದಿರು ಕಂಡ್ಯ ತಾಳು ಮನವೇ - ಕನಕದಾಸರು
2. ತತ್ವಪದಗಳು: ಸಾವಿರ ಕೊಡಗಳ ಸುಟ್ಟು - ಶಿಶುನಾಳ ಶರೀಫ **03 Hrs**

ಘಟಕ-III**ಆಧುನಿಕ ಕಾವ್ಯ ಭಾಗ**

1. ಡಿವಿಜಿ ರವರ ಮಂಕುತಿಮ್ಮನ ಕಗ್ಗದಿಂದ ಆಯ್ದ ಕೆಲವು ಭಾಗಗಳು
2. ಕುರುಡು ಕಾಂಚಾಣ: ದ. ರಾ. ಬೇಂದ್ರೆ **03 Hrs**

ಘಟಕ-IV**ತಾಂತ್ರಿಕ ವ್ಯಕ್ತಿಗಳ ಪರಿಚಯ**

1. ಡಾ. ಸರ್.ಎಂ.ವಿಶ್ವೇಶ್ವರಯ್ಯ: ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹ್ಯ - ಎ. ಎನ್. ಮೂರ್ತಿರಾವ್
2. ಕರಕುಶಲ ಕಲೆಗಳು ಮತ್ತು ಪರಂಪರೆಯ ವಿಜ್ಞಾನ: ಕರೀಗೌಡ ಬೀಚನಹಳ್ಳಿ **03 Hrs**

ಘಟಕ-V**ಸಾಂಸ್ಕೃತಿಕ, ಜನಪದ ಕಥೆ ಮತ್ತು ಪ್ರವಾಸ ಕಥನ**

1. ಯುಗಾದಿ: ವಸುಧೇಂದ್ರ
2. ಮೆಗಾನೆ ಎಂಬ ಗಿರಿಜನ ಪರ್ವತ: ಹಿ. ಚಿ. ಬೋರಲಿಂಗಯ್ಯ **02 Hrs**

Course Outcome

ಸಾಂಸ್ಕೃತಿಕ ಕನ್ನಡ 26UKSK17ಪಠ್ಯ 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

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

Reference Books:

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

26UKBK17

ಬಳಕೆಕನ್ನಡ/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

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

03Hrs

Unit-II

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

03Hrs

Unit-III

1. ಚತುರ್ಥಿ ವಿಭಕ್ತಿ ಪ್ರತ್ಯಯದ ಬಳಕೆ ಮತ್ತು ಸಂಖ್ಯಾ ವಾಚಕಗಳು – Dative Cases, and Numerals
2. ಸಂಖ್ಯಾ ಗುಣವಾಚಕಗಳು ಮತ್ತು ಬಹುವಚನ ನಾಮ ರೂಪಗಳು – Ordinal numerals and Plural markers
3. ನ್ಯೂನ/ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾಪದಗಳು ಮತ್ತು ವರ್ಣ ಗುಣವಾಚಕಗಳು – Defective/Negative Verbs & Colour Adjectives.

03Hrs**Unit-IV**

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 ಕ್ರಿಯಾ ಪದಗಳು, ಸಂಭಾವ್ಯ ಸೂಚಕ ಮತ್ತು ನಿಷೇಧಾರ್ಥಕ ಕ್ರಿಯಾ ಪದಗಳು– 'Helping Verbs "iru and iralla", Corresponding Future and Negation Verbs.
4. ಹೋಲಿಕೆ (ತರತಮ), ಸಂಬಂಧ ಸೂಚಕ, ವಸ್ತು ಸೂಚಕ ಪ್ರತ್ಯಯಗಳು ಮತ್ತು ನಿಷೇಧಾತ್ಮಕ ಪದಗಳ ಬಳಕೆ – Comparative, Relationship, Identification and Negation Words.

03Hrs**Unit-V**

1. ಕಾಲ ಮತ್ತು ಸಮಯ ಹಾಗೂ ಕ್ರಿಯಾಪದಗಳ ವಿವಿಧ ಪ್ರಕಾರಗಳು – Different types of Tense, Time and Verbs.
2. -ದ್,ತ್, -ತು, -ಇತು, -ಆಗಿ, -ಅಲ್ಲ,ಗ್, ಕ್, 'ಇದೆ' ಮೊದಲಾದ ಕ್ರಿಯಾಪ್ರತ್ಯಯಗಳೊಂದಿಗೆ ಭೂತ, ಭವಿಷ್ಯತ್ಯು 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.

02Hrs**Reference Books:****ವಿಶ್ವವಿದ್ಯಾಲಯನಿಗದಿಪಡಿಸಿದಪಠ್ಯಪುಸ್ತಕ**

1. ಪಠ್ಯಪುಸ್ತಕ: ಬಳಕೆಕನ್ನಡ
ಲೇಖಕರು: ಡಾ. ಎಲ್. ತಿಮ್ಮೇಶ್
ಪ್ರಕಟಣೆ: ಪ್ರಸಾರಾಂಗ, ವಿಶ್ವೇಶ್ವರಯ್ಯತಾಂತ್ರಿಕವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ.

26UIDT18

Innovation and Design Thinking

(14-0-0-16)1

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. **03 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. **03Hrs**

Unit-III

Design Thinking in IT Design: Thinking to Business Process modelling, Agile processes in design collaboration environment, Scenario based Prototyping. **03Hrs**

Unit-IV

Design Thinking 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 process and social pitch: Innovation showcase, poster design, project pitching with impact for assessment, prototype and sustainability plan. **02 Hrs**

Reference Books:

- 1) John. R. Karsnitz, Stephen O'Brien and John P. Hutchinson, "Engineering Design", Cengage learning (International edition) Second Edition, 2013.
- 2) Roger Martin, "The Design of Business: Why Design Thinking is the Next Competitive Advantage", Harvard Business Press, 2009.
- 3) Hasso Plattner, Christopher 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.
- 5) Yousef Haik and Tamer M. Shahin, "Engineering Design Process", Cengage Learning, Second Edition, 2011.

26UMATEE21 Mathematics-II for EE stream**(42-0-28-50) 4****Total Hours: 120****Course Learning Objectives (CLO's):**

1. **Develop** the knowledge of solving electronics and electrical engineering problems numerically.
2. **Familiarize** the importance of Integral calculus and Vector calculus essential for electronics and electrical engineering.
3. **Analyze** Electronics and Electrical Engineering problems by applying Laplace transform techniques.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to Pos (1-11)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO1	Apply the concepts of integral calculus and vector calculus to model and solve problems in engineering applications such as area, volume.	-	-	1,2,11
CO2	Apply the concepts of vector calculus and solve problems in engineering.	-	1,2,11	-
CO3	Apply appropriate numerical methods to find approximate solutions of algebraic, transcendental, and ordinary differential equations and to perform interpolation and numerical integration in engineering contexts.	-	1,2,11 -	-
CO4	Apply Laplace transform techniques for time domain, wave forms, periodic functions and solving differential equations.	-	-	1,2,11
CO5	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

Integral Calculus and its applications:

Multiple Integrals: Evaluation of double and triple integrals, change of order of integration, changing to polar coordinates. Areas and volume using double integration.

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

08 Hrs

Unit-II

Vector calculus and its applications: Vector differentiation: Scalar and vector fields, gradient of a scalar field, directional derivatives, divergence of a vector field, solenoidal vector, curl of a vector field, irrotational vector, physical interpretation of gradient, divergence and curl and scalar potential.

Vector Integration: Line integrals, Statement of Green's and Stokes' theorem without verification problem.

08 Hrs

Unit-III

Numerical Methods-1:

Solution of algebraic and transcendental equations: Regula-Falsi method, and Newton-Raphson method.

Finite Differences and Interpolation: Forward and backward differences, Interpolation, Newton forward and backward interpolation formulae, Newton's divided difference interpolation formula and Lagrange's interpolation formula.

07 Hrs

Unit-IV

Numerical Methods-2:

Numerical Integration: Trapezoidal rule, Simpson's $1/3^{\text{rd}}$ rule and, Simpson's $3/8^{\text{th}}$ rule.

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, Milne's predictor corrector method.

09 Hrs

Unit-V

Laplace transforms: Definition and Formulae of Laplace Transforms, Laplace Transforms of elementary functions. Properties—Linearity, Scaling, shifting property, differentiation in the s domain, division by t. Laplace Transforms of periodic functions, Heaviside Unit step function.

Inverse Laplace Transforms: Definition, evaluation of Inverse Laplace Transforms using different methods, and applications to solve ordinary differential equations

10 Hrs

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

- 1) Evaluate double integration and compute area and volume
- 2) Evaluate triple integration and compute volume
- 3) Improper integrals beta and gamma functions
- 4) Evaluate line integrals
- 5) Finding gradient, divergence and curl
- 6) Regula falsi and newton Raphson method
- 7) Interpolation
- 8) Numerical integration
- 9) Taylor series method
- 10) modified euler's method
- 11) Runge-Kutta method
- 12) Milne's method
- 13) Laplace transform
- 14) inverse laplace transforms

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

Software used: Python

Reference books:

- 1) B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44thEd., 2021.
- 2) E.Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 10thEd., 2018.
- 3) B.V.Ramana, Higher Engineering Mathematics, McGraw-Hill Education, 11thEd.,2017.

26UCHEEE22**Chemistry for EE Stream****(42-0-28-50) 4****Total Hours: 120****Course Learning Objectives (CLOs):**

1. To enable students to acquire knowledge on principles of chemistry for engineering applications.
2. To develop an intuitive understanding of chemistry by emphasizing the related branches of engineering.
3. To provide students with a solid foundation in chemical analysis 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 the principles of various chemical processes used in electronics components.	1	-	2,3
CO-2	Explain the chemical phenomena behind various engineering processes.	1	-	2,3
CO-3	Solve the problems in chemistry that are pertinent in engineering applications dealing with polymers.	1	2	3,4
CO-4	Apply the basic concepts of electrochemistry to explain the chemical properties and processes involved in sensor design.	1	-	2,3
CO-5	Analyze properties and processes associated with chemical substances influencing corrosion, metal finishing and E-waste management.	1	7	2,3,6,11

POs	1	2	3	4	5	6	7	8	9	10	11
Mapping Level	3.0	1.2	1.0	1.0	-	1.0	2	-	-	-	1.0

Course Contents:

Unit-I

Semiconductors: Introduction, organic semiconductors: types of organic semiconductors, p-type semiconductor-pentane and n-type semiconductor-perfluoropentacene. Inorganic semiconductors, types, p-type and n-type silicon Organic photovoltaic -working principle and applications of Poly (3-hexylthiophene) (P3HT) as a donor and PhenylC61-butyric acid methyl ester (PCBM) as an acceptor.

Energy Storage Devices: Introduction, classification of batteries-primary, secondary and reserve battery, characteristics - capacity, power density, shelf life & cycle life. Construction and working of lithium-ion battery and its advantages in EV applications.

Energy Conversion Devices: Introduction, construction, working principal, advantages and limitations of solar photovoltaic cell (PV cell). Working principle and applications of Microelectromechanical systems (MEMS)-based energy harvesters.

08 Hrs

Unit-II

Nano materials: Introduction, size-dependent properties of nanomaterials - surface area, catalytic, optical properties, and electrical conductivity. Synthesis of TiO₂ nanoparticles by sol-gel method and their uses in sensor applications.

Quantum Dot Materials: Introduction, types, optical and electronic properties of quantum dots (QDs).

Inorganic Quantum Dot Materials (IQDMs): Introduction, synthesis and properties of silicon based QDs by sol-gel method and Cd-Se Quantum Dots by hot injection method, and applications in optoelectronic devices.

Organic Quantum Dot Materials (OQDMs): Introduction, synthesis, and properties of chitosan-carbon quantum dots hydrogel and its applications in next-generation flexible and wearable electronics. **08 Hrs**

Unit-III

Polymers: Introduction, Molecular weight of polymers: Number average and weight average molecular weight of polymers-numerical problems. Synthesis, conduction mechanism of polyacetylene and its applications in electronic devices. Synthesis and properties of Polyvinylidene Fluoride (PVDF) and its applications in E-nose devices.

Polymer Composites: Introduction, synthesis and properties of epoxy resin-magnetite (Fe₃O₄) composite (ultrasonication method) for sensor applications. Synthesis and properties of Kevlar Fiber Reinforced Polymer (KFRP) for smart electronic devices applications.

Stretchable and Wearable Microelectronics: Introduction, basic principle and working of lithography for micro-patterned copper deposition. Synthesis, properties and applications of PDMS (Polydimethylsiloxane) and its uses in e-skin (electronic skin) and RFID applications. **09 Hrs**

Unit-IV

Electrode System: Introduction, types of electrodes, reference electrode-construction and working of calomel electrode, its application in the determination of electrode potential of unknown electrode. Ion selective electrode- definition, construction, working of glass electrode, determination of pH using glass electrode. Construction and working of concentration cell and numerical.

Electrochemical Sensors: Introduction, principle and instrumentation of colorimetric sensors; its application in the estimation of copper, Principle and instrumentation of potentiometric sensors and its application in the estimation of iron, conductometric sensors; its application in the estimation of acid mixture in the sample. **08 Hrs**

Unit-V

Corrosion Chemistry: Introduction, electrochemical theory of corrosion, types of corrosion, differential metal corrosion in electronic circuits and differential aeration corrosion, waterline and pitting corrosion. Corrosion control- galvanization, anodization, cathodic protection, and impressed current method. Corrosion penetration rate (CPR) - definition, importance and weight loss method, numerical problems.

Metal Finishing: Introduction, technological importance of metal finishing, difference between electroplating & electroless plating, electroplating of chromium for hard and decorative coatings, electroless plating of copper on PCBs.

E-waste: Introduction, sources of e-waste, need of e-waste management & effects of e-waste on environment and human health. Extraction of gold from e-waste from bioleaching method.

09 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) S.K.Malik, Materials Science: Publisher: New Age International Publishers, ISBN:978- 8122418713.
- 2) Dr. K. K. Rajeshwar (IIT Madras), Electrochemical Energy System: Publisher: IIT Madras Open Courseware (Free PDF & videos), ISBN: N/A (Open Educational Resource).
- 3) Vrusha bendra B,C Manasa and Srikanthamurthy N, "Applied Chemistry for Civil Engineering and Allied Branches" Publisher: Astitva Prakashan, ISBN:9788119064465.
- 4) Dhanpat Rai, Engineering Chemistry: Jain & Jain, Publisher: Dhanpat Rai

Publishing Company, ISBN: 978- 935316118.

5) M.G.Fontana, R.W,Staettle, Advances in Corrosion Science and Technology, Springer publications,2012, ISBN: 9781461590620

26UCED23 Computer-Aided Engineering Drawing (28-0-28-34) 3

Total Hours: 90

Course Learning Objectives (CLOs):

1. To understand the basic principles and conventions of engineering drawing
2. To use drawing as a communication mode
3. To generate pictorial views using CAD software
4. To understand the development of surfaces
5. 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 electronic 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	-

Pre-requisites: Elementary Physics and Elementary Mathematics

Course Contents:**Unit - I****Introduction:**

Significance of Engineering drawing, BIS Conventions of Engineering Drawing, Freeh and 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. Command sand 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 laminas (Placed in First quadrant only using change of position method).

09Hrs**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.

08 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.

09 Hrs

Unit - IV

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 in to orthographic views. Problems on applications of Isometric projections of simple objects / engineering components.

08Hrs

Unit - V

Multidisciplinary Applications & Practice:

Electronic Components Visualization:

Simple Electronics Circuit Drawings, practice on layers concept. Optical fiber cable with core and cladding, Photonic crystal fibers, Antenna: Single element patch antenna, antenna array.

Sheet Metal & Surface Design: PCB Enclosures: Creation of different geometry with slots as per Standards: NMEA-0183, applying material properties for heat sink and water/dust proofing and rendering for realistic visualization. Concept of Industrial drawing.

Graphs & Charts: Drawing graphs and charts like, Column chart, Pie chart, Line charts, Gantt charts, etc.

08Hrs

Reference Books:

1. S.N. Lal, & T Madhusudhan :Engineering Visulisation, 1st Edition, Cengage Publication 2022.
2. K. R.Gopala Krishna, & Sudhir Gopala Krishna: Text book of Computer Aided Engineering Drawing, 39th Edition ,Subash Stores, Bangalore, 2017
3. Parthasarathy N.S., Vela Murali, Engineering Drawing, Oxford University Press,2015.
4. Chris Schroder, Printed Circuit Board Design using Auto CAD, Newnes,1997.
5. Bhatt N.D., Engineering Drawing: Plane and Solid Geometry, 53rd edition, Charotar Publishing House Pvt. Limited, 2019.

Total Hours: 90

Course Learning Objectives (CLOs):

The students are expected to explain the laws used in the analysis of DC and AC circuits, the behavior of circuit elements in single-phase circuits, the construction and operation of transformers, DC generators, motors, and induction motors. Further, they are expected to understand the concepts of circuit protection devices, earthing, explain electric power generation, transmission, distribution, and electricity billing, and equipment and personal safety measures.

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 concepts of various energy sources and electric circuits.	1	2	11
CO-2	Apply the basic electrical laws to solve circuits.	1	2	11
CO-3	Discuss the construction and operation of various electrical machines.	1	2	11
CO-4	Identify a suitable electrical machine for practical implementation.	1	2	11
CO-5	Explain the concepts of electric power transmission and distribution, electricity billing, circuit protective devices, and personal safety measures.	1	2	6,7,9,11

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

Pre-requisites: Basic physics and mathematics

Course Contents:

Unit-I

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

Power Generation: Hydel, Nuclear, Solar & wind power generation (Block Diagram approach).

DC Circuits: Ohm's Law and its limitations. KCL & KVL, series, parallel, series-parallel circuits. Numericals.

08 Hrs

Unit-II

A.C. Fundamentals: Equation of AC voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor (only definitions). Voltage and current relationship with phasor diagrams in R, L, and C circuits. Concept of Impedance. Analysis of R-L, R-C, R-L-C Series circuits. Active power, reactive power, and apparent power. Concept of power factor. Numericals.

Three Phase Circuits: Generation of three-phase AC quantity, advantages and limitations; star and delta connections, relationship between line and phase quantities (Simple Numerical on balanced system only).

09 Hrs

Unit-III

DC Machines: DC Generator: Principle of operation, constructional details, induced emf expression, types of generators. Relation between induced emf and terminal voltage. Numerical.

DC Motor: Principle of operation, back emf, and its significance. Torque equation, types of motors, characteristics, and speed control (armature & field) of DC motors (series & shunt only). Numericals.

09 Hrs

Unit-IV

Transformers: Necessity of transformers, principle of operation, types and construction of single- phase transformers, EMF equation, losses, variation of losses with respect to load. Efficiency and numericals.

Three-phase induction Motors: Concept of rotating magnetic field, Principle of operation, constructional features of motor, types – squirrel cage and wound rotor. Slip and its significance and numericals.

08 Hrs

Unit-V

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

Electricity Bill: Power rating of household appliances, including air conditioners, PCs, laptops, printers, etc. Definition of “unit” used for the consumption of electrical energy, a two-part electricity tariff, and the calculation of the electricity bill for domestic consumers.

Equipment Safety measures: Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits.

Personal safety measures: Electric Shock, Earthing and its types, Safety Precautions to avoid shock.

08 Hrs**Reference Books:**

- 1) Basic Electrical Engineering by D C Kulshreshtha, Tata McGraw Hill, First Edition 2019.
- 2) A text book of Electrical Technology by B.L. Theraja, S Chand and Company, reprint edition 2014.
- 3) Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Tata McGraw Hill 4th edition, 2019.
- 4) Principles of Electrical Engineering & Electronics by V. K. Mehta, Rohit Mehta, S. Chand and Company Publications, 2nd edition, 2015.
- 5) Fundamentals of Electrical Engineering by Rajendra Prasad, PHI, 3rd edition, 2014.
- 6) Basic Electrical Engineering, Acme Learning, 2010, Dr Ramesh L Chakrasali, ISBN, 9380408412,9789380408415

26UPLC251 Introduction to Python Programming**(28:0:28:34) 3****Total Hours: 90****Course Learning Objectives (CLOs):**

1. Learn the syntax and semantics of the Python programming language.
2. Illustrate the process of structuring the data using lists, tuples
3. Appraise the need for working with various documents like Excel, PDF, Word and others.
4. Demonstrate the use of built-in functions to navigate the filesystem.
5. 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	Write basic Python programs using various data types and control structures.	1	2,5	3
CO-2	Illustrate and write python programs using 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

POs	1	2	3	4	5	6	7	8	9	10	11
Mapping Level	2.1	2	1.6	1.7	2.6	--	--	--	--	--	--

Course Contents:

Unit - I

Python Basics: Entering Expressions in to 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, Key word Arguments and print (), Local and Global Scope, The global Statement, Exception Handling.

10Hrs

Unit - II

Lists: The 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.

08 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.

08 Hrs

Unit - IV

Organizing Files: The shutil Module, Walking a Directory Tree, Compressing Files with the zip file Module.

Debugging: Raising Exceptions, Getting the Trace back as a String, Assertions, Logging.

08 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.

08 Hrs

Reference Books:

- 1) Al Sweigart, “**Automate the Boring Stuff with Python**”, 1st Edition, No Starch Press, 2015. (Available under CC-BY-NC-SA license at <https://automatetheboringstuff.com/>) (Chapters 1 to 18, except 12) for lambda functions use this link: <https://www.learnbyexample.org/python-lambda-function/>
- 2) Allen B. Downey, “**Think Python: How to Think Like a Computer Scientist**”, 2nd Edition, Green Tea Press, 2015. (Available under CC-BY-NC license at <http://greenteapress.com/thinkpython2/thinkpython2.pdf> (Chapters 13, 15, 16, 17, 18) (Download pdf/html files from the above link)
 - <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(), read lines(), 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 Div Exp which takes TWO parameters a, b and returns a value c ($c=a/b$). Write suitable assertion for $a>0$ in function Div Exp and raise an exception for when $b=0$. Develop a suitable program which reads two values from the console and calls a function Div Exp.
- 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

Total Hours: 30

Course Learning Objectives (CLOs):

1. To Identify the Common Errors in Writing and Speaking of English.
2. To achieve better technical writing and Presentation skills for employment.
3. To read technical proposals properly and make them write good technical
 - a. reports.
4. To acquire Employment and Workplace communication skills.
5. To learn about Information Transfer techniques through presentation in different
 - a. 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

Pre-requisites: None**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.

03 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. **02 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. 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. **03 Hrs**

Unit-V

Professional Communication at Workplace: Agenda, Minutes of Meeting, Group Discussion and Professional Interviews, Characteristics and Strategies of a GD and Pl'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**

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

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. **03Hrs**

Unit-II

Salient features of Indian Constitution. Preamble of Indian Constitution & Key concepts of the Preamble. Fundamental Rights (FR's) and its Restriction and limitations indifferent Complex Situations. Buiding. **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. **02 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

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 Contents:**Unit-I**

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

04 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.

03Hrs

Unit-III

Human organ systems and bio-designs - 2: Lungs as purification system, Kidney as a filtration system, Muscular and Skeletal Systems as scaffolds. **02 Hrs**

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. **03Hrs**

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. **02Hrs**

Reference Books:

- 1) Human Physiology, Stuart Fox, Krista Rompolski, 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 Sunil kumar, N Geetha A. C. Udaya shankar Lambert Academic Publishing, 2019.
- 6) Electronic Noses and Tongues in Food Science, Maria Rodriguez Mende, Academic Press, 2016