Academic Program: UG

Academic Year 2024-25 Syllabus

III & IV Semester B. E.

Electrical & Electronics Engineering

SHRI DHARMASTHALA MANJUNATHESHWARA COLLEGE OF ENGINEERING & TECHNOLOGY,
DHARWAD – 580 002
An Autonomous Institution Approved by AICTE & Affiliated to VTU, Belagavi
Department Accredited by NBA under Tier-1 (July 2022-June 2025)

Ph: **0836-2447465 Fax: 0836-2464638 Web:** www.sdmcet.ac.in

SDM College of Engineering & Technology, Dharwad

It is certified that the scheme and syllabus for III & IV semester B.E. in Electrical & Electronics Engineering is recommended by the Board of Studies of Electrical and Electronics 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 2024-25 till further revision.

Principal Chairman BoS & HoD

Department of Electrical & Electronics Engineering

*(**Our motto: P**rofessional **C**ompetence with **P**ositive **A**ttitude)*

College Vision and Mission

Vision

To develop competent professionals with human values

Mission

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

QUALITY POLICY:

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

CORE VALUES:

Competency

Commitment

Equity

Team work and

Trust

DEPARTMENT VISION AND MISSION

Vision:

To develop globally acceptable Electrical and Electronics Engineering professionals with human values.

Mission:

- Adopting the state of the art curricula
- Practicing effective and innovative teaching-learning methodologies
- Initiating complementary learning activities to enhance competence
- Inculcating positive attitude and commitment to society.

Program Educational Objectives (PEOs)

I. To impart the domain knowledge and soft skills to secure employment or become entrepreneur or pursue higher studies.

II. To provide training for teamwork, leadership qualities, lifelong learning and adaptability to achieve professional growth.

III. To develop sense of positive attitude and practice ethics to contribute positively to the society as a responsible citizen.

POs and PSOs

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

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

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

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

PO 5 **Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

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

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

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

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

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

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

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

PSO 1 Enhancement of professional competence in cutting edge domain through value addition activities.

PSO 2 Ability to demonstrate the skill of carrying out operation and Maintenance of electrical distribution system effectively.

PSO 3 Design and implement the electronic circuits/programs for practical applications.

SDM COLLEGE OF ENGINEERING AND TECHNOLOGY, DHARWAD
Department of Electrical & Electronics Engineering
III Semester
Scheme of Teaching and Examinations 2024 – 25

Course Code	Course Category	Course Title	Teaching		Examination				
			L-T-P (Hrs/Week)	Credits	CIE	Theory (SEE)		Practical (SEE)	
					Max. Marks	*Max. Marks	Duration in Hrs.	Max. Marks	Duration in Hrs.
22UMAC300	ASC	Engineering Mathematics-III	2-2-0	3	50	100	03	-	
22UEEC300	PCC	Network Analysis	3-2-0	4	50	100	03	-	-
22UEEC301	PCC	Analog Electronic Circuits	3-0-0	3	50	100	03	-	-
22UEEC302	PCC	Digital Electronics	3-0-0	3	50	100	03	-	-
22UEEL303	PCCL	Analog Electronic Circuits Lab	0-0-2	1	50	-	-	50	03
22UEEL304	PCCL	Digital Electronics Lab	0-0-2	1	50	-	-	50	03
22USEEC305	ESC	Energy Conversion Technology	3-0-0	3	50	100	03	-	-
22UHVK306	UHV	Universal Human Values-I	1-0-0	1	50	50	01	-	-
22UEEE321	AEC	Electrical & Electronics Measurements	1-0-0	1	50	50	01	-	-
22UMBA301	ASC	Mathematics	3-0-0	Audit	50	-	-	-	-
22UPYK307	MC	Physical Education and Yoga	0-0-2	Audit	50	-	-	-	-
		Total	**19-4-6**	**20**	**550**	**600**	**-**	**100**	**-**

ASC: Applied science course, **PCC:** Program Core Course, **PCCL:** Program Core Course laboratory, **ESC:** Engineering Science Course, **ETC:** Emerging Technology Course, **PLC:** Programming Language Course, **UHV:** Universal Human Value Course, **AEC:** Ability Enhancement Course, **SEC:** Skill Enhancement Course, **MC:** Mandatory Course, **L**: Lecture, **T**: Tutorial, **P**: Practical, **CIE**: Continuous Internal Evaluation, **SEE**: Semester End Evaluation. **MC:** Mandatory Course. This letter in the course code indicates common to all the stream of engineering. **TD**: Teaching department, **PSB**: Paper Setting Board.
Physical Education/Yoga: All students have to register for the course namely National Service Scheme (NSS) with the concerned course coordinator during the first week of respective semester. Activities shall be carried out between III semester to the VI semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS activities. This course shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the course is mandatory for the award of degree.
AICTE activity point: Every regular student, who is admitted to the 4-year degree program, is required to earn 100 activity points in addition to the total credits earned for the program. The activity points earned by the student shall be reflected on the students VIII semester grade card. The activities to earn the points can be spread over the duration of the program. However, minimum prescribed duration should be fulfilled. Activity points (non-credit) have no effect on SGPA/CGPA and shall not be considered for vertical progression. In case student fails to earn the prescribed activity points; VIII semester grade card shall be issued only after earning the required activity Points. Students shall be eligible for the award of degree only after the release of the VIII semester grade card.

SDM COLLEGE OF ENGINEERING AND TECHNOLOGY, DHARWAD
Department of Electrical & Electronics Engineering
IV Semester
Scheme of Teaching and Examinations 2024 – 25

Course Code	Course Category	Course Title	Teaching		Examination				
			L-T-P (Hrs/Week)	Credits	CIE	Theory (SEE)		Practical (SEE)	
					Max. Marks	*Max. Marks	Duration in Hrs.	Max. Marks	Duration in Hrs.
22UMAC400	ASC	Engineering Mathematics-IV	2-2-0	3	50	100	03	-	
22UEEC400	PCC	Control Systems	3-0-0	3	50	100	03	-	-
22UEEC401	PCC	Microcontrollers	3-0-0	3	50	100	03	-	-
22UEEC402	PCC	Electrical Machines-I	3-0-0	3	50	100	03	-	-
22UEEL403	PCCL	Microcontroller Lab	0-0-2	1	50	-	-	50	03
22UEEL404	PCCL	Measurements and Circuit Simulation Lab	0-0-2	1	50	-	-	50	03
22USEEC405	ESC	Electrical Power Transmission & Distribution	3-0-0	3	50	100	03	-	-
22UHVK406	UHV	Universal Human Values-II	1-0-0	1	50	50	01	-	-
22UEEE421	AEC	Signals & Systems	1-0-0	1	50	50	01	-	-
22UBEK407	MC	Biology for Engineers	1-0-0	1	50	50	01	-	-
22UMBA401	ASC	Mathematics	3-0-0	Audit	50				
22UPYK408	MC	Physical Education and Yoga	0-0-2	Audit	50	-	-	-	-
		Total	**20-2-6**	**20**	**600**	**650**	**-**	**100**	**-**

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AICTE activity point: Every regular student, who is admitted to the 4-year degree program, is required to earn 100 activity points in addition to the total credits earned for the program. The activity points earned by the student shall be reflected on the students VIII semester grade card. The activities to earn the points can be spread over the duration of the program. However, minimum prescribed duration should be fulfilled. Activity points (non-credit) have no effect on SGPA/CGPA and shall not be considered for vertical progression. In case student fails to earn the prescribed activity points; VIII semester grade card shall be issued only after earning the required activity Points. Students shall be eligible for the award of degree only after the release of the VIII semester grade card.

III Semester

22UMAC300	Engineering Mathematics-III	(2- 2 - 0) 3

Contact Hours:39

Course Learning Objectives (CLOs):

To have an insight into Fourier series, Fourier transforms, Z-transforms. To solve linear and non-linear programming problems and use statistical tools to problems arising in 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 (1-12) PSOs(1 to 3)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Express** periodic function as a Fourier series and obtain the various harmonics of the Fourier series expansion for the given numerical data.			1,2
CO-2	**Transform** the given function using Fourier transforms depending on the nature of engineering applications. **Apply** Z-transform for series of mathematical conversion to mathematical framework used as digital filter. **Solve** difference equations using Z-transform.			1,2
CO-3	**Solve** first and second order ordinary differential equations arising in engineering problems using single step and multi-step numerical methods.			1,2
CO-4	**Determine** the extremals of functional using calculus of variations and solve problems arising in engineering.			1,2
CO-5	**Apply** the knowledge of numerical methods to fit an interpolating curve to the experimental data			1,2

	and **obtain** solution of transcendental equation.			

POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
Mapping Level	1.0	1.0													

Pre-requisites: Knowledge of fundamentals of calculus, Statistical averages

Contents:

Unit-I

Fourier Series: Periodic functions, Dirichlet's condition. Fourier series of periodic functions of period 2π and arbitrary period. Half- range Fourier series. Practical harmonic analysis, examples from engineering field. **08 Hrs.**

Unit-II

Fourier Transforms: Infinite Fourier transforms, Fourier sine and cosine transforms. Inverse Fourier transforms.(Simple problems).

Z-Transforms and Difference Equations : Z-transform- definition, Standard Z-transforms, Damping and shifting rules, Initial value and Final value theorems (without proof) problems. Inverse Z-transform. Simple problems. Difference equations-basic definition. Application of Z-transform to solve Difference equations. **09Hrs.**

Unit-III

Special functions: Series solution of Bessel's differential equation leading to $J_n(x)$- Bessel's function of first kind, Recurrence relations, Generating function of Bessel's functions , orthogonality of Bessel's function. **08 Hrs.**

Unit-IV

Curve Fitting: Curve fitting by the method of least squares- fitting the curves of the form $= \boldsymbol{ax} + \boldsymbol{b}; \boldsymbol{y} = \boldsymbol{ax^2} + \boldsymbol{bx} + \boldsymbol{c}; \boldsymbol{y} = \boldsymbol{ax^b}$..

Statistical Methods: Correlation and regression-Karl Pearson's coefficient of correlation - problems. Regression analysis- lines of regression–problems. **07 Hrs.**

Unit-V

Linear and Non-Linear programming: Introduction, Mathematical formulation of a L.P.P, basic solution. Geometric (or graphical) method, Simplex method.

Non Linear Programming – Constrained extremal problems-Lagrange's multiplier method.

07 Hrs.

Reference Books:

1 **B.S.Grewal**: Higher Engineering Mathematics, Khanna Publishers, 44th Ed., 2017.

2.**E.Kreyszig**: Advanced Engineering Mathematics, John Wiley &Sons, 10th Ed.(Reprint) 2016.

3. **Srimanta Pal et al**: Engineering Mathematics, Oxford University Press, 3rd Edition, 2016.

4. **B. V. Ramana**:"HigherEngineering Mathematics" 11th Edition, Tata McGraw- Hill, 2010.

5. **Er.Prem Kumar Gupta, Dr.D.S.Hira,** "Operation Research " S.Chand & Company Pvt.Ltd. 7th edition, 2014.

22UEEC300	Network Analysis	(3-2-0) 4

Contact Hours: 52

Course Learning Objectives (CLOs):

The students are expected to learn fundamentals of energy sources and different methods like network reduction, loop current and node voltage methods to solve AC and DC Circuits. They will learn different network theorems and their application to AC and DC circuits, concepts of resonance and transient response of RL, RC and RLC series circuits. Further, they will be able to calculate rms and average values of non-sinusoidal signals and calculate power consumed by the network. They will apply Laplace Transforms to find out response of the network to different inputs. They will be introduced to coupled circuits and to two port network parameters.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs(1 to 12)/ PSOs(1 to 3)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	Apply network reduction techniques, KVL, KCL and superposition, Thevenin's and Norton's theorems for the solution of electrical networks.	1	2	
CO-2	Use Maximum Power Transfer & Reciprocity theorem for ac & dc circuits and analyze resonance phenomena in electric circuits.	1	2	

CO-3	Determine initial and final values of currents/ voltages and their derivatives; carry out transient analysis of circuits excited by dc voltages.	1	2	
CO-4	Obtain the solutions for electrical network using Laplace transform technique, and also to calculate power and power factor for the circuits excited by non- sinusoidal signals.	1	2	
CO-5	Analyze the series and parallel magnetically coupled circuits and two port networks.	1	2	

POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
Mapping Level	3.0	2.0													

Prerequisites: 1. Basic Electrical Engineering, 2. Engineering Mathematics

Contents:

Unit-I

Basic Concepts: Source transformation techniques. Concept of Super mesh and Super node analysis of DC and AC networks. Star-Delta transformation (only quantitative analysis)

Network Theorems: Superposition theorem, Thevenin's theorem, Norton's theorem for dc and ac networks. **08+02T Hrs.**

Unit-II

Maximum power transfer theorem and Reciprocity Theorems for dc and ac networks**.**

Resonance in Electric circuits: Variation of impedance with frequency in series circuits and of admittance with frequency in practical tank circuits. Calculation of resonant frequency, half power frequencies, band width and quality factor in series and parallel resonant circuits. **08+02T Hrs.**

Unit-III

Initial conditions: Initial conditions in R, L, C and RLC networks. Procedure for evaluating initial conditions. Calculation of initial values of current/ voltage and their derivatives.

Transients in DC circuits: Growth and decay of current in RL circuit, charging and discharging of capacitor in RC circuits, transient response of RLC circuits. **08+02T Hrs.**

Unit-IV

Application of Laplace Transformation Techniques: Review of Laplace transforms of standard signals, Laplace Transform of periodic signals, Solution of electrical networks excited by step, pulse and other standard signals using Laplace Transformation techniques.

Non sinusoidal signals: Calculation of average and rms values of non-sinusoidal signals, power calculation in networks excited by non-sinusoidal inputs. **08+02T Hrs.**

Unit-V

Coupled Circuits: Magnetic coupling, coefficient of coupling, Dot convention, Analysis of series and parallel coupled circuits.

Two Port Networks: Impedance, admittance, hybrid and ABCD parameters. Relation between parameter ses, interconnection of two port networks. Symmetrical and reciprocal networks. **10+02T Hrs**.

Reference Books:

1) Hayt, Kemmerley, Durbin, “Engineering Circuit Analysis”, 6th Edition, TMH, 2002.
2) M. V. Vanvalkenburg, “Network Analysis”, 3rd Edition, PHI/ Pearson Education, 1997.
3) A. Chakrabarti, “Circuit Theory (Analysis and Synthesis)”, 5th Edition, Dhanpat Rai & Co.2007.
4) Roy Choudhary, “Networks and Systems”, 2nd Edition, New Age International

22UEEC301	Analog Electronics Circuits	(3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs):

To develop strong basics in design concepts of wave shaping, rectifiers, amplifiers circuits. Orient the students to develop ability in problem solving, mathematical reasoning, and analyzing Electronic circuits. To train the students in designing Analog systems using transistor /ICs which have immediate end application to Engineering problems.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to PO’s(1 to 12)/PSO’s(1 to3)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	Demonstrate basic knowledge in analysis and design of rectifiers, clipping, clamping circuits using diode.	1, 2	3	

CO-2	Comprehend FET and MOSFET construction, operation and demonstrate basic knowledge in FET biasing.	1, 2		
CO-3	Analyze and design common source and common drain FET amplifiers.	1, 2, 3		
CO-4	Demonstrate basic knowledge & analysis of feed-back amplifiers, Oscillators and 555 timer.	1, 2		3
CO-5	Analyze Power amplifiers.	1, 2		

POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
Mapping Level	3.0	2.0													

Prerequisites: Diode and Transistor fundamentals viz. forward & reverse bias, CE, CB, CC configuration of Transistor.

Contents:

Unit-I

Diode circuits: Diode as circuit element, piece-wise linear model, full wave rectifier circuit and capacitor filters working analysis and numerical problems.

Diode wave shaping circuits: Clipping and clamping circuits (brief analysis), Numerical **07Hrs**

Unit-II

FET fundamentals and Biasing: JFET, MOSFET constructions & their characteristics, operating point; Analysis: Fixed bias, Self-bias circuits and numerical problems.

FET biasing Extended: Voltage divider biasing of, FET and MOSFETs, numerical problems. **08Hrs**

Unit-III

Field Effect Transistor Circuits: FET small signal model, FET CS and CD Amplifier (source follower) analysis. i.e. voltage gain and input-output impedance derivation. Low frequency and High frequency response FET amplifier. **10Hrs**

Unit-IV

Feed Back Amplifiers: Feed-back Concepts, Characteristics of Feed Back amplifiers, advantages of negative feed-back, derivation of sensitivity factor, Feed-back configuration:

Voltage series, Current series, Voltage shunt, Current shunt configuration- their input and output impedance derivation, (any two configuration derivation) **self-study: left out configuration's input and output impedance derivation**, Band-width of feedback amplifier.

Oscillator and timers: Oscillator Principle, Phase shift Oscillators (only qualitative treat treatment), derivation of frequency of Oscillations of Colpitt's oscillator,; **555** timer block diagram, Astable Operation and derivation of frequency of oscillations, Mono-stable multi vibrator operation, pulse width derivation. **08Hrs**

Unit-V

Large signal amplifiers: Classifications of amplifiers based on frequency, power; Power amplifiers**:** Class A power amplifier analysis viz. efficiency, Second harmonic distortion, power dissipation, numerical problems.

Power amplifiers: Class B Push-Pull operation and analysis, power dissipation derivation, numerical problems, transformer-less class B operation. **07Hrs**

Reference Books:

1) Electronic Devices and Circuit theory by Boylstead and Neshlsky. 11th edition, Pearson publication.
2) Millman & Halkias, Satybritjha – Electronic Devices and Circuits, Tata McGraw Hill, 2005.
3) Electronic Circuit Analysis and Design Sudhakar Samuel - Electronics circuits, Sanguine Technical Publishers, 2005.
4) Integrated Electronics by Millman and Halkias McGraw Hill.

22UEEC302	Digital Electronics	(3-0-0) 3

Contact Hours: 39

Course Learning Objective (CLOs):

The students are expected to review the concept of Boolean algebra, Boolean functions and logic gates. The students learn about K-map, tabular and VEM methods for equation simplification. They learn to explain the concept and design of combinational logic circuits and PLDS. The students shall analyze & synthesize the clocked synchronous sequential circuits.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs(1 to 12)/PSO(1 to 3)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Recite the concepts of Boolean algebra, logic expressions, gates and use various tools to minimize logic functions.	1		
CO-2	Describe and design MSI logic circuits, (analysis & synthesis) both at gate and IC levels	1	3	5
CO-3	Use PLDs for function implementation and explain the working of latches, flip flop circuits, characteristic equations along with applications & timing considerations	1		5
CO-4	Describe the types of register, design asynchronous & synchronous mod-n counters, non-binary counters	1, 3		5,12
CO-5	Demonstrate the knowledge about Logic families. Analyze & Synthesize finite state Moore and Mealy machines.	1,3	2	

PO's	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
Mapping Level	3.0	2.0	2.7		1.0							1.0

Prerequisites: Basic Electronics (Preferred)

Contents:

Unit-I

Boolean algebra and logic gates: Review of Boolean Algebra, Boolean functions, normal and standard forms. POS and SOP **01 Hr.**

Logic Gates: Review of Basic, Universal and other gates. **01 Hr.**

Simplification of expressions: Minimal sums and minimal products using Karnaugh map (up to five variables), Quine McCluskey method, Prime implicant chart, Petrick's method and table reduction and Variable entered Karnaugh map.

Self-study: Simplification of Boolean expressions using Boolean laws. NAND and NOR realization of logic circuits and AOI to NAND and NOR conversion. **06 Hrs.**

Unit-II

Combinational logic design with MSI components: Combinational circuits, analysis & synthesis procedure, half and full adder, carry look ahead adder, BCD adder, subtractor. Comparator, Code converters, decoder, logic design using decoder and demultiplexer, encoder, priority encoder, multiplexers, logic design using MUX.

Self-study: Study of ICs: 7483, 74153 & 74139. 7446/7447. **08 Hrs.**

Unit-III

Programmable Logic Devices: Introduction, PROM, PLA, PAL and function realization using PLDs. **03 Hrs**.

Sequential circuits: Basic bi-stable element, latches, SR latch, switch debouncer, Gated SR and D latch, Timing considerations, JK flip-flop, Master slave JK flip-flop, Race around condition, Direct inputs, characteristic equations, Flip-Flop conversions. **05 Hrs.**

Unit-IV

Registers and counters: Bidirectional shift registers & universal registers. Counters: Binary ripple counters. Synchronous counters: Design of modulo- M counters using JK, T, D & SR flip-flops. Register based counters: Ring counter, switch tail counter with decoding logic.

Self-study: Study of IC 7493 & IC 7490. **08 Hrs.**

Unit-V

Introduction to synchronous sequential networks: Structure, analysis and synthesis of clocked synchronous sequential circuits, Mealy Model and Moore Model.

Self-study: Logic families: Definition of Logic level, scale of Integration, propagation delay, fan-in and fan-out. TTL with totem pole output and wired logic. MOS families, CMOS inverters, NOR and NAND gates. **07 Hrs.**

Reference books:

1) Donald D. Givone, "Digital Principles and Design" 1/e, TMH, 2004.
2) Morris Mano, "Digital Circuits & Logic Design", 4/e, Pearson Education 2007.
3) Malvino Leech, "Digital Circuits & Applications", 2/e, TMH, 2008.
4) Yarbrough, "Digital Logic Applications and Design", 2/e, Thomas publishing company, 1997.

22UEEL303	Analog Electronic Circuits Lab	(0-0-2) 1

Contact Hours: 26

Course Learning Objectives (CLOs):

The students are expected to realize Diode circuits and do analysis viz. rectifiers, wave shaping circuits**;** Design & implement CE amplifier using BJT/MOSFET, also learn to conduct experiments by designing Oscillator circuit using BJT and analyze Power amplifier.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs(1 to 12)/ PSOs(1 to 3)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	Design and demonstrate the working of Diode rectifiers, clipping and clamping circuits, FET biasing circuits.	9,2	5, 6, PSO-3	
CO-2	Demonstrate the design fundamentals of Transistor and analyze MOSFET amplifiers.	9, 2	5, 3, 6	PSO-3
CO-3	Perform and analyze fundamentals of oscillator circuits and feed-back amplifier.	9	5, 1, 2	PSO-3
CO-4	Preform and analyze class-B power amplifier		9	1, 2, PSO-3

POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
Mapping Level	1.5	2.25	2.0		2.0	2.0			2.75						1.25

Prerequisites: 1. Basic Electronics
2. Course on Analog Electronics (Preferred)

Contents:

Prescribed Experiments:

1. Design of Rectifier (full wave) with filter.
2. Stability analysis of BJT/FET.

3. Clipping circuits using diodes.
4. Clamping circuits using diodes.
5. Amplifier design using BJT/FET.
6. R C Coupled Amp. Freq. response.
7. Colpitt's Oscillator.
8. Class B Power Amplifier.
9. Simulation of Voltage series feed-back.
10. Simulation of Summing/Subtractor.

Reference Books:

1) Analog Electronics Laboratory manual.
2) Millman & Halkias, "Integrated Electronics", 5/e, McGraw Hill, 2005.
3) Sudhakar Samuel, "Electronics circuits", Sanguine Technical Publishers, 2005.
4) Ramakant Gayakwad, "Op-amp & LICs", 4th Edition, Eastern economy edition, 2004.

22UEEL304	Digital Electronics Lab	(0-0-2) 1

Contact Hours: 26

Course Learning Objectives (CLOs):

The students are expected to learn to simplify, realize and verify logic circuits using basic, universal, and special gates by conducting experiments. They learn to demonstrate the skills of implementation and verification of combinational MSI circuits both at gate level and IC level, sequential circuits for data storage, movement, and conversion. To learn implementation and verification of synchronous and asynchronous sequential circuits for pattern generation/counting etc. and clock generation using timer ICs.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs(1 to 12)/ PSOs(1 to 3)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	Recite the knowledge of Simplifying the given expression and implement minimal circuits.	4		1
CO-2	Comprehend and Realize MSI circuits like arithmetic circuits, encoders, decoders with driver/display,	4	2	

	multiplexers, De multiplexers, priority encoders etc.			
CO-3	Apply the techniques for data manipulation and realize latches, flip flops, shift registers both at gate and IC level	4, 5		2
CO-4	Design and test counter circuits, generate clock of desired frequency, pulse stretcher circuits, frequency division employing timer IC 555.	4, 5		

POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
Mapping Level	1.0	1.5		3.0	3.0										

Prerequisites:1. Basic electronics (preferred). 2. Digital fundamentals.

Contents: Prescribed Experiments:

Note: Minimum of 10 experiments to be conducted.

1. Simplification & realization of Boolean expressions using different gates.
2. Implementation of arithmetic circuits using basic/universal gates. Use 4-bit binary parallel adder IC 7483.
3. Implementation of Code converters: Excess-3 to Binary, Binary to Gray and Gray to Binary and Binary to excess-3 using IC 7483.
4. Realization of a) 2 to 4 line decoder b) 4 to 2 encoder and priority encoder.
5. Realization of BCD to 7-segment decoder/driver using IC 7446/7447.
6. Logic design using multiplexers and de-multiplexers using IC 74153 and IC 74139 respectively.
7. Implementation of flip flops using gates and study of IC 7446 and IC 7474.
8. Realization of 3-bit asynchronous up/down counter using IC 7476.
9. Design and implementation of mod-n (mod-6) counter using IC 7476 or IC 7474.
10. Realization of shift registers using IC 7474: SISO, SIPO, PISO and PIPO. Bidirectional shift register and universal register. Shift register based counters i.e., ring counter and twisted ring counter with decoding logic.
11. Design and Implementation of astable and monostable multi-vibrators using timer IC 555.

12. Design of two-bit magnitude comparator and study of IC 7485 4-bit magnitude comparator.

Reference Books/materials:

1) Laboratory Manual
2) Donald D. Givone, “Digital Principles and design” 1/e, TMH, 2004.
3) Morris Mano, “Digital Circuits & Logic Design”, 4/e, Pearson Education 2007.
4) Malvino Leech, “Digital Circuits & Applications”, 2/e, TMH, 2008.
5) Yarbrough, “Digital Logic Applications and Design”, 2/e, Thomas publishing company, 1997.

22USEEC305 Energy Conversion Technology (3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs):

The students are expected to learn different energy sources for generation of electric power, the concept of load curve & plant capacity factor etc. Further, they will be learning the concept of power generation from hydroelectric, steam, and nuclear power plants and economics of power generation and importance of power factor.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs(1 to 12)/ PSOs(1 to 3)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	Describe Hydrology, working of hydroelectric plant and its classification and choice of suitable turbine.	1		7
CO-2	Describe working of thermal power plant and its components.	1		7
CO-3	Describe the pros and cons of nuclear energy and working of Nuclear Power Plant involving different reactors.	1		7
CO-4	Describe the Necessity of Energy Storage and factors affecting the	1	2	

	cost of energy. forecasting the Load and describe its need.			
CO-5	Analyze economic aspects of power generation and its effects.	1	2	

POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
Mapping Level	3.0	2.0					1								

Prerequisites: 1.Basic Electrical Engineering.

Contents:

Unit-I

Hydroelectric power plants: Selection of site. General arrangement of hydal plant, main components of the plant, Hydrology and numericals. Classification of the hydroelectric power plants, types of Water turbines and their choice. **09 Hrs.**

Unit-II

Steam Power Plants: Introduction, selection of site, Fuel, Power plant equipment layout and its working. Efficiency of steam plants, Main flow circuits and main parts of Steam power plant. Governing system for turbines. **08 Hrs.**

Unit-III

Nuclear Power Plants: Introduction, Economics of nuclear plants, Merits and demerits, selection of site, Schematic of Nuclear power plant, main components of nuclear power plant. Types of nuclear reactors, Effects of nuclear plants, Disposal of nuclear waste and effluent and shielding. **07 Hrs.**

Unit-IV

Energy Storage: Introduction, Necessity of Energy Storage, Energy Storage Methods: Batteries, pumped storage plants, flywheel, super capacitors.

Factors influencing cost of energy - Demand factor, diversity factor, load factor, plant capacity factor, plant use factor, loss factor, energy load curve, load duration curve; Introduction to Load forecasting. **07 Hrs.**

Unit-V

Economics of Power generation: load sharing. Sizing of alternators. Tariffs: objective, factors affecting the tariff and types. Types of consumers and applicable tariff. Power factor, disadvantages, causes, methods of improving power factor: Advantages of improved power factor and economics of power factor improvement. **08Hrs.**

Reference Books:

1) Soni Gupta & Bhatnagar, “A Course of Electrical Power”, 4/e, Dhanpatrai and Sons, 1981.
2) C. L. Wadhwa, “Electrical Power Systems”, 2/e, Wiley Eastern, 1991.
3) S. N. Singh, “Electric Power Generation Transmission and Distribution”,1/e, Prentice Hall of India Ltd.
4) J. B. Gupta, “A Course in Electrical Power”, 12/e, S. K. Kataria, 2002.
5) H. Partab. “Utilization of Electrical Power”.
6) B. H. Khan, “Non-Conventional Energy Resources”, 3/e, TMH, 2008.
7) G. D. Rai, “Non-Conventional Sources of Energy”, 2/e, Khanna publishers, 2007.
8) Twiddle, “Renewable Energy Sources”, 1/e , ELBS, 1986.
9) Mukherjee D. & Chakraborti S, “Fundamentals of Renewable Energy Systems”, 2/e, New Age International Publishers, 2005.

22UHVK306	**Universal Human Values-I**	**(1-0-0) 1**

Contact Hours: 13 Hrs.

Course Learning Objectives (CLOs):

This course provides an opportunity for the students to enhance their life skills like right understanding leading to the harmonious living in relationship with the self and family enhancing holistic development of the students.

Course Outcomes (COs):

Description of the course outcome: At the end of course the student should be able to:		**Mapping to PO’s(1 to 12)/PSO’s(1 to 3)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	Recite and follow interpersonal relations with peers and the others	6		
CO-2	Comprehend happiness, prosperity and distinguish between body and self		6,9	
CO-3	Comprehend harmony and practice Sanyam and Svasthya		9	
CO-4	Demonstrate the values of human-human interaction and universal values such as *Nyaya*, *Visvasa*, and *Sammana*	7		

CO-5	Clearly visualize the co-relation between lack of Human Values and the prevailing problems and use tangible steps and a roadmap for moving in the cherished direction.	8	9	

PO's	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
Mapping Level	-	-	-	-	-	2.5	3	3	2	-	-	-

Contents:

Unit I

Introduction to Value Education:

Understanding Value Education: Living a Fulfilling Life, Education for Fulfilling Life Priority of Values over Skills Appreciating the Need and Implications of Value Education Guidelines for Value Education - Self-exploration – its content and process; 'Natural Acceptance'. Basic Human Aspirations and their fulfillment **04 Hrs.**

Unit II

Understanding Happiness and Prosperity: Exploring the meaning of Happiness and Prosperity, Programme for continuity of Happiness. A look at the prevailing Notions of Happiness. The programme for Happiness, Natural outcome of the programme. **02 Hrs.**

Unit III

Understanding Harmony at Various Levels: Harmony in the Self – Understanding Myself : Understanding human being as a co-existence of the sentient 'I' and the material 'Body' and the needs of Self ('I') and 'Body' - Sukh and Suvidhã.Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) **03 Hrs.**

Unit IV

Harmony in the Family- Understanding the Values in Human Relationships:

Understanding the Family as the basic unit of human interaction. Understanding values in human-human relationship; meaning of Nyãya and program for its fulfillment to ensure Ubhaya –tripti; Trust (Visvãsa) and Respect (Sammãna) as the foundational values of relationship **02 Hrs.**

Unit V

Understanding Intention and Competence: Distinguish between Intention and Competence. Understanding the meaning of Nine Values. **02 Hrs.**

Reference Book:

1) R.R.Gaur, R Asthana, and G.P Bagaria. **A Foundation Course in HUMAN VALUES and professional Ethics**: 2nd Revised Edn. EXCEL BOOKS, New Delhi. 2019.

22UEEE321 Electrical and Electronics Measurements (1-0-0) 1

Contact Hours: 13

Course Learning Objectives (CLOs):

The students are exposed to power and energy measurements, electronic instruments, display devices, signal generators and their applications. Further, they learn about different electrical transducers, the concept of data acquisition, modulation, construction & working of signal generators and filters.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to PO's(1 to 12)/PSO's(1 to 3)**		
		Substantial Level(3)	**Moderate Level(2)**	**Slight Level(1)**
CO-1	Understand the working of analog & Digital electronic Instruments and their applications.	1	2	
CO-2	Understand the concepts of transducers, its classifications and measurement of non-electrical quantities.	1	2	
CO-3	Describe the signal conditioning & data acquisition systems.	1		2
CO-4	Understand the concept of filters, modulation (AM & FM), measurements of power, energy.	1		
CO-5	Describe the working of signal generators, recorders, and digital display devices.	1		

PO's	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
Mapping Level	3.0	1.6										

Prerequisites: 1.Basic Electrical Engineering.

Contents:

Unit-I

Electronic Instruments and Measurements: Introduction, true RMS voltmeter, electronic multi-meters, digital voltmeters, Dynamometer type wattmeter, **03 Hrs.**

Unit-II

Transducers: Classification and selection of Transducers, strain gauges, LVDT, photovoltaic cells, and thermo-couple. **03 Hrs.**

Unit-III

Signal conditioning and Data Acquisition: Introduction, block diagram of electronic aided measurement, dc signal conditioning system, ac signal conditioning system, generalized data acquisition system. **03 Hrs.**

Unit IV

Modulation, power & energy meters: Filters, Amplitude and Frequency modulation, principle of electronic energy meter and trivector meter. **02 Hrs.**

Unit-V

Signal generators and display devices: AF oscillators, basic standard signal generator-sine wave, LCD and LED display, Introduction to digital storage oscilloscope**.** **02 Hrs.**

Reference Books:

1) A K Sawhney, ”Electrical & Electronic Measurements & Instrumentation”,10/e, Dhanpat Rai & Sons, 2002.
2) Cooper D & A D Heifrick, “Modern Electronic Instrumentation and Measuring Techniques”, PHI, 1998.
3) David A Bell ”Electronic Instrumentation and Measurements” Oxford University press Second Edition 2014.
4) H. S. Kalsi, “Electronic Instrumentation”, 2/e, TMH, 2004.
5) Golding and Widdies, “Electrical Measurements and Measuring Instruments”, 4/e, Wheelers Edition, 1999.

22UMBA301	**Mathematics**	**(3-0-0) Audit**

Contact Hours: 39

Course Learning Objectives (CLOs):

This course will enable students to master the basic tools of differential & integral calculus, differential equations and partial differential equations and become skilled to formulate, solve and analyze science and engineering problems.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12) / PSOs(1 to 3)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Apply** the knowledge of calculus to solve problems related to polar curves, curvature and its applications in determining the bentness of a curve.	-	-	1,2
CO-2	**Solve** multiple integration and use Beta and Gamma function to solve definite integrals	-	1,2	
CO-3	**Solve** first order linear differential equations analytically using standard methods.	-	1,2	
CO-4	**Solve** higher order differential equations with constant co-efficients and variable co-efficients.	-	1,2	-
CO-5	**Learn** partial differentiation to calculate rates of change of multivariate functions. Solve problems related to composite functions and Jacobians. Solve problems on partial differential equations by method of separation of variables.	-		1,2

PO's	**PO-1**	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**PO-9**	**PO-10**	**PO-11**	**PO-12**
Mapping Level	1.6	1.6	-	-	-	-	-	-	-	-	-	-

Pre-requisites:

1. Differentiation of function
2. Integration of function.

Contents:

Unit-I

Differential Calculus: n^{th} order differentiation of standard functions. Leibnitz theorem (Statement only & illustrative examples), Taylor's series for single variable (Statement only & illustrative examples), Maclaurin's series for single variable (Statement only & illustrative examples).

Polar curves-angle between the radius vector and tangent (Formula & illustrative examples), angle between two curves (Formula & illustrative examples). Definition of Curvature and radius of curvature.-Radius of curvature for Cartesian and polar curves (Formulas & illustrative examples) **10 Hrs.**

Unit-II

Integral Calculus: Reduction formula for $\int_0^{\pi/2} sin^n\, xdx$, $\int_0^{\pi/2} cos^n\, xdx$ and $\int_0^{\pi/2} sin^n\, xcos^m xdx$ (Formula &illustrative examples). Definition of Beta and Gamma functions (illustrative examples).Relation between Beta and Gamma functions (No Proof) (illustrative examples).Evaluation of Double integral (direct and region given), Change of variables. Evaluation of Triple integral (direct examples). **10 Hrs.**

Unit-III

Ordinary Differential Equations of first order:-

Libnitz's Linear differential equation, Bernoulli's differential equation, Exact differential equations. Orthogonal trajectories. **05 Hrs**.

Unit-IV

Differential Equations of higher order

Solution of Second order Linear ordinary differential equation with constant coefficients. Method of variation of parameters. Legendre's homogeneous equations. **08 Hrs.**

Unit-V

Partial Differentiation:

Definition of Partial derivative (illustrative examples), Total differentiation (illustrative examples), Differentiation of Composite functions (illustrative examples) Jacobians and its properties (No Proof) (illustrative examples).

Partial Differential Equations (PDE's):

Formation of PDE's by elimination of arbitrary constants /functions. Solution of PDE by variable separable method. **06 Hrs.**

Text Books:

1) **B.S. Grewal**: Higher Engineering Mathematics, Khanna Publishers, 44thedition,2017.

2**) H. K. Dass & Rajnish Verma**, Higher Engineering Mathematics,3rd edition, 2014.

Note: 1. Grades (i) PP (ii) NP
2. No semester End Examination
3. Audit (Bridge course).

1. The mandatory non – credit courses Mathematics for III and IV semesters respectively, to the lateral entry Diploma holders admitted to III semester of BE/B.Tech., programs, shall attend the classes during the respective semesters to complete all the formalities of the course and appear for the Continuous Internal Evaluation (CIE). In case, any student fails to register for the said course/fails to secure the minimum 40% of the prescribed CIE marks, he/she shall be deemed to have secured an F grade. In such a case, the student has to fulfill the requirements during subsequent semester/s to appear for CIE.

2. These Courses shall not be considered for vertical progression, but completion of the courses shall be mandatory for the award of degree.

22UPYK307	Physical Education and Yoga	(0-0-2) Audit

Contact Hours: 24

Course Learning Objectives:

1. The course focuses on overall development and importance of Physical Education & Yoga in day to day life.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO1	Gaining the importance of Physical Education & yoga	12		8, 9
CO2	Understanding the benefits & preventive measures of health	12	6	8, 9
CO3	Gaining the knowledge of yoga	12		8, 9
CO4	Understanding the importance of Human Body conditioning & Sports training	12		8, 9
CO5	Get awareness of Modern technology in sports	12		5, 8, 9

POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Mapping Level	-	-	-	-	1	2	-	1	1	-	-	3

Contents

Unit-I

Introduction to Physical Education: Meaning and importance, definition, components, benefits of Physical Education. **04Hrs**

Unit-II

Health and wellness, Anatomy and Physiology: Meaning and importance, definition, components, benefits, ealth habits, basics of diseases and preventive measures, mental health, physical health, social health, spiritual health. Meaning and definition, first aid, injuries and preventions. **05Hrs**

Unit-III

Introduction of Yoga: Origin and history of Yoga, meaning and definition, benefits, importance, prayer, Suryanamaskara,

Asana:- Vrikshasana, Padmasana, Bhujangasana, Halasana.
Pranayama:-Anuloma viloma praanayama,
Mudras:- China mudra, Bhrama Mudra. **05Hrs**

Unit-IV

Sports Training: Meaning and definitions, warming up, cooldown, methods of exercises, stretching, speed, endurance, flexibility, agility, Athletics, Karata, Caracket, Basketball, Handball, Kho Kho & Volleyball Rules and regulation of all games. **05 Hrs**

Unit-V

Modern Technology in Sports and Games: Meaning and definitions, objectives, assisting umpires, referees, hawk-eye technology, sports specific, computer software, technology in playfields, athletes clothing and equipment, graphics of sports and games, artificial intelligence. **05Hrs**

Reference Books:

1) Petipus, et al., Athlete's Guide to Career Planning, Human Kinetics, 1997
2) The Human Body in Health and Disease with Access 8th Edition 2023.
3) Anatomy and Physiology, Shri K.G. Nadgir College of Physical Education. Dharwad.
4) Health & Wellness Shri K.G. Nadgir College of Physical Education. Dharwad.
5) Nagendra HR., The art and science of Pranayama, 2009
6) Iyengar BKS., The illustrated Light on Yoga(English), 2005

IV Semester

22UMAC400	Engineering Mathematics-IV	(2-2-0)3

Contact Hours:39 Hrs.

Course Learning Objectives (CLOs):

To provide an insight into applications of conformal mapping, integration of complex functions and application of probability distributions in Engineering.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Construct** and use the concepts of analytic function to solve the problems arising in Engineering field.			1,2
CO-2	**Utilize** conformal transformation and complex integral to transform irregular domain onto a relatively simple domain.			1,2
CO-3	**Apply** discrete and continuous probability distributions in analyzing the probability models arising in engineering field.			1,2,12
CO-4	**Estimate** the correlation, covariance using joint probability distributions. **Recite** Markov chains and describe stochastic process.			1,2,12
CO-5	**Use** student's t-distribution, Chi-square distribution as a test of goodness of fit .			1,2,12

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

Contents:

Unit - I

Calculus of complex functions: Review of function of a complex variable, limits, continuity, and differentiability. Analytic functions: Cauchy-Riemann equations in Cartesian and polar forms. Construction of analytic functions: Milne-Thomson method-Problems**.** **08 Hrs.**

Unit - II

Conformal transformations:

Introduction. Discussion of conformal transformations:

$\mathbf{w}= e^z; w = z^2, w = z + \frac{1}{z}, z \neq o$. Bilinear transformations- Problems.

Complex integration: Line integral of a complex function, Cauchy's theorem and Cauchy's Integral theorem. **08 Hrs.**

Unit - III

Probability Distributions: Random variables (discrete and continuous), probability mass/density functions. Binomial, Poisson, Exponential and normal distributions- problems (No derivation for mean and standard deviation)-Illustrative examples**.** **08 Hrs.**

Unit - IV

Joint probability distribution: Joint Probability distribution for two discrete random variables, expectation and covariance.

Markov chains– Introduction, probability vectors, Stochastic Matrices, Fixed points and Regular stochastic matrices, Markov chains, higher transition probabilities, stationary distribution of regular Markov chains and absorbing states**.** **08Hrs.**

Unit - V

Sampling Theory: Introduction to sampling distributions, standard error, Type-I and Type-II errors. Test of hypothesis for means, student's t-distribution, Chi-square distribution as a test of goodness of fit. **08 Hrs.**

Reference Books:

1) **B.S. Grewal**: Higher Engineering Mathematics, Khanna Publishers, 44th Ed., 2017.
2) **E. Kreyszig**: Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed.(Reprint), 2016.
3) **Peter V.O'Neil**: Advanced Engineering Mathematics, International students edition, 2011.
4) **Kishor S. Trivedi**: Probability& Statistics with Reliability, Queuing, and Computer Science Applications, Prentice-Hall of India, 2005.
5) **N. P Bali and Manish Goyal**: "A textbook of Engineering Mathematics" LaxmiPublications,10th Ed., 2022.

22UEEC400	Control Systems	(3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs):

The students are expected to learn the definition of control system, open loop and closed loop system, electromechanical systems, differential equations of physical systems and mathematical modeling. They will learn to formulate, solve and analyze control engineering problems. Further, they learn to check the stability of control systems using different techniques and also write simple MATLAB programs for the same.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to PO's(1 to 12)/PSO's(1 to 3)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Distingush between open loop and closed loop systems, write the mathematical representation of electromechanical systems and reduction of block diagrams, demonstrate the transfer function of ac and dc servomotors.	1,2	PSO 2	
CO-2	Develop the knowledge of signal flow graphs, Mason's gain formula and illustrate the time domain specifications.	1,2		4, PSO 2
CO-3	Examine the stability using Routh Hurwitz's criterion and introduction to types of controllers.	1,2		4
CO-4	Illustrate the stability analysis using root locus and get introduced to MATLAB programming.	1,2		4, 5 PSO 2
CO-5	Predict the stability analysis of frequency domain using Bode and Nyquist plots.	1,2		PSO 2

PO's	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
Mapping Level	3.0	3.0		1.0	1.0									1.25	

Prerequisites: 1. Basic Electrical engineering.
2. Engineering Mathematics.

Contents:

Unit-I

Introduction: Definition of control systems, open loop and closed loop system comparison with examples. Electromechanical systems. Differential equations of physical systems **Block diagram and reduction of block diagrams**: Transfer function, Block diagram representation and reduction, Transfer functions of control components dc servomotor, two-phase AC servomotor. **08 Hrs**.

Unit-II

Signal flow graphs and reduction of signal flow graphs: signal flow graph representation and reduction using Mason's Gain formula.

Time response: feedback control system, standard test signals, unit step response of first and second order systems, examples, static error analysis, examples. **08 Hrs.**

Unit-III

Stability: Concept of stability, Relative stability analysis, stability for a second order system, Routh-Hurwitz stability criterion, examples, Introduction to P, PI and PID controllers.

07 Hrs.

Unit-IV

Root locus: Concept, steps to solve the problems with root locus, advantages of root locus, examples on determination of gain constant and damping ratio.

Introduction to MATLAB: Obtaining transient response, Root locus, Bode plot using MATLAB, Exercises. Introduction to SIMULINK, P, PI & PID controllers using SIMULINK

08 Hrs.

Unit-V

Frequency domain Analysis: Stability analysis, Bode plot and to obtain phase margin and gain margin of third order system, examples. **08 Hrs.**

Reference Books:

1) I. J. Nagrath and M. Gopal, "Control Systems Engineering", 3/e, Wiley Eastern Ltd, 2003.
2) K. Ogata, "Modern Control Engineering", 4/e, PHI, 2004.
3) B. C. Kuo, "Automatic control systems", 7/e, PHI.2000.
4) Gopal M., "Control System - Principles & Design", 4/e,TMH, 1984.
5) http://www.nptelvideos.in/2012/11/control-engineeringprof-gopal.html

22UEEC401	Microcontrollers	(3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs):

To understand the basic differences between microcontrollers and microprocessors and microcontroller architecture. To understand the different addressing modes and instruction

set Assembly. Programs associated with 8051 Microcontroller. To write and test assembly and C language programs with a tradeoff between size and complexity using development tools. To understand the concepts of timers, interrupts, serial communication and memory interfacing to design an embedded system and to implement real time applications.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to PO's(1 to 12)/PSO's(1 to 3)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	Explain the basics of microprocessor & microcontrollers and write assembly programs for 8051.	1, 2		
CO-2	Write Assembly and C programs for 8051.	1, 2	5	
CO-3	Apply programming techniques for timers and serial communication.	1, 2	3, 5	
CO-4	Apply concepts of interfacing to implement controllers for applications using interrupts, memory and data converters.	1, 2, 3	5	PSO3
CO-5	Apply concepts of interfacing to implement controllers for applications using, display device, motors; Learn basic concepts about ARM Micro-controllers.	3	2, 5	1

PO's	**PO-1**	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**PO-9**	**PO-10**	**PO-11**	**PO-12**	**PSO-1**	**PSO-2**	**PSO-3**
Mapping Level	2.6	2.8	2.5		2.0										1.0

Prerequisites: 1. Logic design.2. C programming language

Contents:

Unit-I

Microprocessors and Microcontrollers: Microcontrollers and Micro-Processors. RISC & CISC Architectures, Harvard & Von-Neumann CPU architecture.

The 8051 Architecture and Instruction set of 8051: Instruction set (Arithmetic, data transfer, Logical and Boolean), Addressing modes with examples, I/O port: H/w block schematic, its working and programming. **08Hrs**.

Unit-II

Assembly Language Programming: Assembly programming examples: addition and subtraction, smallest and biggest no finding, data serialization, code conversion, checksum byte program.

8051 programming in C: Data types and time delays in 8051, I/O programming, logic operation, code conversion programs, accessing code ROM space. **07Hrs**.

Unit-III

Timer and Counter Programming of 8051 in Assembly and C: Programming 8051 Timers and counters in mode 1 and mode 2.

Serial Communication and Programming of 8051 in Assembly and C: Basics of Serial Communication, 8051 connections to RS 232, DB 9 Pin Connector, 8051 Serial Communication Programming. **10Hrs.**

Unit-IV

8051 Interrupts, Programing in Assembly and C: Response of 8051 to interrupts, Interrupt types, Programing Timers, serial, external Hardware interrupts and Interrupt priority

8051 Interfacing and Applications: Data converters viz ADC LM34/35 interfacing and DAC interfacing to 8051. **07Hrs.**

Unit-V

Display, Memory and Motor Interfacing to 8051: Interfacing 8051 to: LCD and Memory viz RAM, Data ROM, Program ROM; Stepper motor Interfacing to 8051.

Introduction to ARM Microcontrollers: Architecture, Features, Instruction set: (Brief) data transfer, Arithmetic group with simple examples. **08Hrs.**

Reference Books:

1) Muhammad Ali Mazidi, Janice Gillespie Mazidi and Rolling D. Mekinlay - The 8051 Microcontroller and Embedded Systems-using assembly and C, Pearson, 2006.
2) Kenneth J. Ayala - The 8051 Microcontroller Architecture, Programming &Applications, 2nd edition, Thomson Learning, 2005.
3) Microcontroller and Applications by Dr. Ramani Kalpathi and Ganesh Raja Sanguine Publication
4) Raj Kamal - Microcontrollers: Architecture, Programming, Interfacing and System Design, Pearson, 2005.

5) ARM System Developer's Guide: Designing and Optimizing System Software" by Andrew N. Sloss, Dominic Symes, and Chris Wright.

6) ARM system on chip Architecture, 2nd Edition, Pearson Education, 2000 by Steve Furber.

22UEEC402	Electrical Machines-I	(3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs):

The students are expected to learn the basic principle, construction, characteristics and operating modes of dc machines, the performance analysis, and applications of dc machines. They also learn the basic principle, construction, characteristics and operating modes, the performance analysis, and applications of single and three phase transformers. They are also exposed to the basic concepts, construction, and characteristics of special electrical machines.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs(1 to 12)/ PSOs(1 to 3)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	Explain Electromechanical Energy Conversion, the construction and working, e.m.f equation, armature reaction, draw the characteristics, numerical related to DC Generator	1, 2		
CO-2	Explain Principle, types, characteristics, necessity of Starter, speed control, testing &applications of DC motors.	1, 2		
CO-3	Explain Construction, operation, emf equation, phasor diagram, determination of voltage regulation, all day efficiency & equivalent circuit of single-phase transformer, Parallel operation,	1, 2		
CO-4	Comprehend the Single-phase auto transformers: Principle, construction, determination of saving in copper, Construction, Types of connections, Magnetization characteristics and harmonics in three phase transformers and applications in transmission section.	1, 2		

CO-5	Explain the Construction, working, Drawing the characteristics of dc servomotor, PMDC motor and universal motor.	1		

PO's	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
Mapping Level	3.0	3.0													

Prerequisites: Basic Electrical Engineering

Contents:

Unit-I

Principle of Electromechanical Energy Conversion: Energy in magnetic system, field energy and mechanical force, mechanical energy. Doubly excited magnetic field systems. Forces/ Torques in systems with permanent magnets. Dynamical equations of electromechanical systems.

DC Generators: Construction, emf equation, armature reaction, calculation of demagnetizing and cross magnetizing AT/pole. Compensating winding, commutation and inter poles, Characteristics, and applications of different types of dc generators. **08 Hrs.**

Unit-II

DC Motors: Principle, types, characteristics, and applications of dc motors. Starters for dc shunt motors, speed control and braking of dc motors. Losses, efficiency and testing of dc machines (Swinburne's test, Hopkinson's test and retardation tests). Field test on dc series machines. **08 Hrs.**

Unit-III

Single Phase Transformers: Construction of core and shell type transformers. Operation on no load and on load. Phasor diagrams. O.C., S.C and Sumpner's tests. Losses, efficiency, and voltage regulation. Equivalent circuit and predetermination of performance. All day efficiency. Parallel operation and load sharing. **09 Hrs.**

Unit-IV

Three Phase Transformer: Construction, star-star, star-delta, delta-star and delta-delta transformers, Scott connection and open delta connections. Magnetization characteristics and harmonics. Parallel operation, three winding transformers.

Auto Transformer: Single phase auto transformers: Principle, construction, saving in copper. Three phase auto transformers and applications. **08 Hrs.**

Unit-V

Special Machines: Pulse transformer, Welding Transformer, Servo motors, PMDC motor, BLDC Motor, Stepper Motor, Universal motor. **06 Hrs.**

Reference Books:

1) D. P. Kothari and I. J. Nagrath, "Electric Machines", TMH 4th Edition 2011
2) M. G. Say, "Performance and design of AC machines", 3/e, CBS Publications, 2002.
3) Ashfaq Hussain, "Electric Machines", 2/e, Dhanpat Rai& Co, 2005.
4) Mulukutla S. Sarma & Mukesh K. Pathak, "Electric Machines", 4th Indian Reprint 2011, Cengage Learning India Pvt. Ltd.

22UEEL403	Microcontroller Lab	(0-0-2) 1

Contact Hours: 26

Course Learning Objectives (CLOs):

The students are expected to learn fundamentals of Assembly Language Programming, acquire logical skills for developing / implementing given problem, acquire Programming skills in embedded 'C' and understand and get the knowledge, about interfacing I / O s, mixed signal circuits and actuators.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs(1 to 12)/ PSOs(1 to 3)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	Demonstrate the fundamentals of assembly language and C programming skills.	9, 5	1, PSO 3	2
CO-2	Demonstrate on chip timer counters for counting, serial communication and generating waveforms.	9, 5	1, 2	3
CO-3	Demonstrate the interfacing of DAC and external ADC.	9, 5, PSO 3	1	3, 6
CO-4	Demonstrate the interfacing stepper motor and. LCD	9, 5, PSO 3	1	3, 6

PO's	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
Mapping Level	2.0	1.5	1.0		3.0	1.0			3.0						2.67

Prerequisites: Course on microcontrollers.

Contents:

Prescribed Experiments:**(Note: Minimum of 10 experiments to be conducted)**

I. PROGRAMMING:

1. Data Transfer - Block move, Exchange, Sorting, Finding largest element in an array.
2. Arithmetic Instructions - Addition/subtraction, multiplication and division, square, Cube – (16 bits Arithmetic operations – bit addressable).
3. Counters.
4. Boolean & Logical Instructions (Bit manipulations)
5. Code conversion: BCD – ASCII; ASCII – Decimal; Decimal - ASCII; HEX - Decimal and Decimal - HEX
6. Programs using serial port and on-chip timer /counter.
   i. Program on serial communication.
   ii. Program on timer (on chip). Waveform generation using on chip timer of 8051on the ports of 8051.

II. **INTERFACING:**C programs to interface 8051 chip to Interfacing modules to develop single chip solutions.

1. Alphanumeric LCD panel and Hex keypad input interface.
2. External ADC and Temperature control interface.
3. Generate different waveforms Sine, Square, Triangular, Ramp etc. using DAC interface; change the frequency and amplitude.
4. Stepper and DC motor control interface. Generate waveform of a particular frequency using on-chip timer.

Reference Books / Materials:

1) Microcontroller Laboratory Manual**.**

2) Muhammad Ali Mazidi, Janice Gillespie Mazidi and Rolling D. Mekinlay, “The 8051 Microcontroller and Embedded Systems-using assembly and C: 1/e, Pearson,2006.

3) Kenneth J. Ayala, “The 8051 Microcontroller Architecture, Programming & Applications”, 2/e, Thomson Learning, 2005.

4) Predko, “Programming and Customizing the 8051 Microcontroller”, 1/e, TMH, 2004.

22UEEL404 Measurements and Circuit Simulation lab (0-0-2) 1

Contact Hours: 26

Course learning Objectives (CLOs):

The students are expected to learn conducting experiments to determine the resistance, inductance, and capacitance of given specimen by using suitable bridges. The students learn to measure power in three phase circuit and to draw calibration curve of energy meter. They will also study to obtain transfer functions of ac, dc motors and learn to write simple MATLAB programs to solve control system 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 to12)/ PSOs(1 to 3)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	Demonstrate the fundamental skills of determining the values of circuit elements using bridges.		2, PSO 2	
CO-2	Measure power in three phase circuit and to draw the calibration curve of digital energy meter.		2, PSO 2	
CO-3	Demonstrate the verification of network theorems		2, PSO 2	
CO-4	Demonstrate the knowledge of obtaining transient response of 2^{nd} order system, RL, RC and RLC circuits.		2, PSO 2	
CO-5	Plot current v/s frequency graph of RLC series circuit		2, PSO 2	

Prerequisites: 1. Basic Electrical Engineering.

2. Electrical and Electronics Measurements.

PO's	**PO-1**	**PO-2**	**PO-3**	**PO-4**	**PO-5**	**PO-6**	**PO-7**	**PO-8**	**PO-9**	**PO-10**	**PO-11**	**PO-12**	**PSO-1**	**PSO-2**	**PSO-3**
Mapping Level		2.0												2.0	

Contents:

Prescribed Experiments:

(**Note:** Minimum of 10 experiments is to be conducted.)

1. Measurement of resistance using Wheatstone Bridge
2. Measurement of resistance using Kelvin's Double Bridge.
3. Measurement of inductance using Anderson Bridge.
4. Measurement of capacitance by Schering Bridge.
5. Measurement of three phase power using two-wattmeter method.
6. To draw the calibration curve of single phase energy meter.
7. Transient response of second order system and determination of transient response specifications analytically and obtaining from experiment.
8. Verification of network theorems i) Maximum power transfer theorem ii) Superposition theorem
9. Verification of network theorems i) Thevenin's theorem ii) Reciprocity theorem
10. Transient response of RL, RC and RLC circuits.
11. Study of series resonance
12. Demonstration of measurement of high resistance using Megger.
13. Study of Transducers

Reference Books:

1) Measurements and control systems Laboratory Manual.
2) A. K. Sawhney, "Electrical & Electronic Measurements & Instrumentation", 10th edition, Dhanpat Rai & Sons, 2002.
3) Cooper D & A D Heifrick, "Modern Electronic Instrumentation and Measuring Techniques", PHI, 1998.
4) I. J. Nagrath and M. Gopal, "Control Systems Engineering" 3/e, Wiley Eastern Ltd, 2003.7.K. Ogata, "Modern Control Engineering", 4/e, PHI, 2004.

22USEEC405 Electrical Power Transmission & Distribution (3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs):

The students are expected to learn the different supports of over-head transmission line, corona effect, insulators of O.H. lines and line parameters & performance of O.H. lines. And also, the students are expected to learn the importance of underground cables in distribution systems, the distribution system types and calculation of electrical quantities for concentrated loads.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs(1 to12)/ PSOs(1 to 3)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	Explain Standard voltages for transmission; describe AC & DC transmission, Corona, string efficiency of insulators and testing of insulators.	2	1, PSO-2	
CO-2	Explain Estimation of the inductance & capacitance O.H. lines.	2		PSO-2
CO-3	Assess performance of O.H. lines.	2		PSO-2
CO-4	Explain Cable types, materials used, grading, testing and evaluation of inter sheath potentials.	1,2		PSO-2
CO-5	Explain Types of distribution systems, volume of copper used, designing of the feeder by applying Kelvin's law, Substations & Neutral Grounding.	1,2		PSO-2

POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
Mapping Level	2.75	3.0												1.25	

Prerequisites: 1.Basic Electrical Engineering.

Contents:

Unit-I

Transmission lines: Typical transmission scheme (HVDC), Standard voltages for transmission, Sag calculation in conductors, (a) Suspended on level supports (b) supports at different levels. Effect of wind, ice, tension, and sag at erection. Stringing chart.

Corona: Phenomena, expression for disruptive and visual critical voltages and corona power loss.

Insulators: Types, potential distribution over a string of suspension insulators. String efficiency and methods of increasing string efficiency and testing of insulators. **09 Hrs.**

Unit-II

Line parameters: Calculation of inductance of single phase and three phase lines with equilateral and unsymmetrical spacing. Inductance of composite conductor lines.

Capacitance – Calculation for single phase systems and for 3 phase lines with equilateral and unsymmetrical spacing. Bundled conductors. Transposition of conductors. **07 Hrs.**

Unit-III

Line Performance: Performance calculation of short, medium, and long transmission lines: equivalent T and π network representation of long transmission lines. Line regulation and efficiency, ABCD constants. Line regulation. **07 Hrs.**

Unit-IV

Underground Cables: Types, material used. Insulation resistance, thermal rating of cables, charging current. Grading of cables, capacitance grading and inter sheath grading, testing of cable, problems**.** **08 Hrs.**

Unit-V

Distribution: Introduction: Radial and ring main systems, AC & DC distribution: calculation for concentrated loads, problems. Design of feeders-Kelvin's law.

Sub-stations and neutral grounding: Classification of substations, Gas insulated substation, substation equipments, earthing in substations, power system earthing, neutral groundingtypes. **08 Hrs.**

Reference Books:

1) S. M. Singh, "Electric Power Generation Transmission and Distribution",1/e, Prentice Hall of India Ltd.
2) Soni Gupta & Bhatnagar, "A Course of Electrical Power", 4/e, Dhanpatrai and Sons, 1981.
3) C. L. Wadhwa, "Electrical Power Systems", 2/e, Wiley Eastern, 1991.
4) J. B. Gupta, "A Course in Electrical Power", 12/e, S. K. Kataria, 2002.
5) H. Partab. "Utilization of Electrical Power".

22UHVK406	**Universal Human Values –II**	**(1-0-0) 1**

Contact Hours: 13

Course Learning Objectives (CLOs):

This course provides an opportunity for the students to enhance their life skills like right understanding leading to the harmonious living in relationship with the society and environment enhancing holistic development of the students.

Course Outcomes (COs):

Description of the course outcome: At the end of course the student should be able to:		**Mapping to PO's(1 to 12)/PSO's(1 to 3)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	Recite and follow interpersonal relations with peers and the society.	6		

CO-2	Demonstrate the concept of harmony in nature and need of self-regulation.		6,9	
CO-3	Recite and follow Natural Acceptance and Differentiate between Intention and Competence.		9	
CO-4	Differentiate between the characteristics and activities of different orders existing in Nature and demonstrate the role of human beings in mutual fulfillment with all the orders of Nature.	7		
CO-5	Visualize and involve in the strategic preparation for Universal Human Order.	8	9	

PO's	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
Mapping Level	-	-	-	-	-	2.5	3	3	2	-	-	-	-	-	-

Contents:

Unit I

Harmony in the Society: Understanding Universal Human Order:
Understanding Human Goal. Appraisal of the Current Status, The Way Ahead. Dimensions of Human Order **02 Hrs.**

Unit II

Harmony in the Nature: Nature as Collection of Units: Understanding the harmony in the Nature. Interconnectedness and mutual fulfillment among the four orders of nature – recyclability and self-regulation in nature. Understanding existence as co-existence (Sah-astitva) of mutually interacting units in all-pervasive space. Dependence of the Human Being on the Other Three Orders. **03 Hrs.**

Unit III

Harmony in Existence: Understanding Co-existence at Various Levels: Existence as Units in Space, Understanding Submergence. Existence as Co-existence – Units Submerged in Space. Development in the Existential Sense, Expression of Co-existence at Different Levels. Understanding Role of Human Being in Existence. **03 Hrs.**

Unit IV

Ethical Human Conduct and Professional Ethics in the Light of Right Understanding Universal Values Naturally Emerging from the Right Understanding. Definitiveness of Ethical Human Conduct, Development of Human Consciousness. Implications of Value-based Living. Profession – in Context with the Comprehensive Human Goal. Ensuring Ethical Competence, Issues in Professional Ethics – The Current Scenario. Prevailing Approaches towards Promotion of Professional Ethics – their Inadequacy. Inherent Contradictions and Dilemmas and Their Resolution. **03 Hrs.**

Unit V

Holistic Development towards Universal Human Order: Visualization of Comprehensive Human Goal**.** Vision for Holistic Technologies, Production Systems and Management Models**.** Journey towards Universal Human Order – The Road Ahead. **02 Hrs.**

Reference Book:

1) R. R. Gaur, R Asthana, and G.P Bagaria. **A Foundation Course in HUMAN VALUES and professional Ethics**: 2nd Revised Edn. EXCEL BOOKS, New Delhi. 2019.

22UEEE421	Signals & Systems	(1-0-0) 1

Contact Hours: 13

Course Learning Objectives (CLOs):

The students are expected to Learn and understand various types of signals and systems and their properties. They are also aware of carrying out analysis and synthesis of signals using various transforms and to find system output using system impulse response and system 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 to 12)/ PSOs(1 to 3)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	Define signals and systems with its properties. Classify signals and check the periodicity, even and odd nature of the signal.	1, 2,		

CO-2	Represent LTI systems in time-domain using impulse response, differential/difference and block diagram approach.	1, 2		
CO-3	Represent periodic signal using Fourier series representation in both continuous and discrete time domain.	1, 2		5
CO-4	Represent non-periodic signal using Fourier transform representation and illustrate applications	1, 2		5
CO-5	Solve Z-transform and IZT using different methods.	1, 2		

PO's	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO-1	PSO-2	PSO-3
Mapping Level	3.0	3.0	-	-	1.0	2.5	-	-	-	-	-	-	-	-	-

Prerequisites: 1. Engg. Mathematics. 2. Network Analysis.

Contents:

Unit-I

Introduction: Definition of a signal and a system, classification of signals, basic operations on signals, elementary signals and systems viewed as interconnections of operations, properties of systems. **03 Hrs.**

Unit-II

Time-domain representation for LTI systems: Convolution, impulse response representation, properties of impulse response representation, differential, and difference equation representations. Block diagram representations. **03 Hrs.**

Unit-III

Fourier Series Representation of signal: Introduction, Fourier representations of periodic signal, Properties of Fourier series, Applications of Fourier series representation. **03 Hrs.**

Unit-IV

Fourier Transform Representation of signal: Introduction, Fourier presentations of non-periodic signal, Properties of Fourier transform, Applications of Fourier transform representation. **02 Hrs.**

Unit-V

Z-Transforms: Introduction, Z-transforms, properties of ROC, properties of Z-transforms, inversion of Z-transforms, transforms analysis of LTI systems, transfer function, stability and causality, unilateral Z-transform and its application to solve difference equations.

02 Hrs.

Reference Books:

1) Simon Haykin and Barry Van Veen, “Signals and Systems”, 2nd edition, John Wiley & sons, 2005.
2) Michel J Roberts, “Signals and systems: Analysis of signals through linear systems”, 2/e, Tata McGraw Hill, 2003.
3) Alan V. Oppenheim, Alan S. Willsky and S. Hamid Nawab, “Signals and Systems”, 2nd edition, Pearson Education Asia, 1997.
4) Ganeshrao &Tunga, ”Signals & Systems”, 2004.
5) Uday Kumar S. “Signals & Systems” 6th Edition, Prism Publication, 2017

22UBEK407 Biology for Engineers (1-0-0) 1

Contact Hours: 13

Course Learning Objective (CLO):

1. 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 (1-12) PSOs(1 to 3)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	Demonstrate an understanding of the diverse applications of biomolecules.	1	2,3	13
CO-2	Demonstrate an understanding of the architecture and functioning of the brain, eye, and heart as integral systems in the human body.	2,3	1	-
CO-3	Understand the structure, functions, and bioengineering approaches related to the lungs, kidneys, muscular system, and skeletal system.	13	2,3	1
CO-4	Understand nature-inspired materials and mechanisms.	13	2,3	1
CO-5	Understand the latest trends in bioengineering.	2,3	1	13

POs/PSOs	**PO -1**	**PO -2**	**PO -3**	**PO -4**	**PO -5**	**PO -6**	**PO -7**	**PO -8**	**PO -9**	**PO -10**	**PO -11**	**PO -12**	**PSO -1**	**PSO -2**	**PSO -3**
Mapping Level	1.8	2.4	2.4	-	-	-	-	-	-	-	-	-	2.0	-	-

Course content:

Unit-I

Biomolecules and their applications: Carbohydrates, Nucleic acids, Proteins, lipids, and Enzymes. **03Hrs**.

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. **02Hrs.**

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 Sunilkumar, N Geetha A. C.Udayashankar Lambert Academic Publishing, 2019.
6) Electronic Noses and Tongues in Food Science, Maria Rodriguez Mende, Academic Press, 2016

22UMBA401	Mathematics	(3 -0 -0) Audit

Contact Hours: 39

Course Learning Objectives (CLOs):

This course will enable students to use Laplace transform to solve differential equations. Analyze and Solve system of linear equation. Understand the concept of vector differentiation and vector integration.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12) PSOs(1 to 3)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1	**Transform** the given function using Laplace transforms and study their properties.	-	-	1,2
CO-2	**Apply** Laplace transform to solve differential equations.	-	-	1,2
CO-3	**Compute** the solution of system of equations. Evaluate Eigen values and Eigen vectors for a matrix.	-	1,2	
CO-4	**Study** vector calculus and **compute** gradient, divergence, curl of a single valued function**.**	-		1,2
CO-5	**Study** vector integration and **evaluate** Line integrals, Surface integrals and Volume integrals	-		1,2

POs	**PO -1**	**PO -2**	**PO -3**	**PO -4**	**PO -5**	**PO -6**	**PO -7**	**PO -8**	**PO -9**	**PO -10**	**PO -11**	**PO -12**	**PSO -1**	**PSO -2**	**PSO -3**
Mapping Level	1.2	1.2	-	-	-	-	-	-	-	-	-	-	-	-	-

Pre-requisites:

1. Differentiation of function
2. Integration of function.
3. Elementary row transformation of matrix.
4. Vector algebra.

Course Content:

Unit-I

Laplace Transforms:

Definition and Properties. Laplace transform of elementary functions. Laplace transform of $e^{at}f(t)$ Laplace transform of $t^n f(t)$, Laplace transform of $\frac{f(t)}{t}$, Laplace transforms of Periodic functions and unit-step function–problems. **08 Hrs.**

Unit-II

Inverse Laplace Transforms

Inverse Laplace transform -problems with standard, Convolution theorem (without proof) to find the inverse Laplace transform and problems. Solution of linear differential equations using Laplace transform. **08 Hrs.**

Unit-III

Elementary Linear Algebra:

Rank of a matrix - Row Echelon form. Test for consistency for system of linear equations. Solution of system of linear equations – Gauss-elimination method (consistency), Gauss-Seidel iterative method. Eigen values and Eigen vectors-Rayleigh's power method. **08 Hrs.**

Unit-IV

Vector Calculus:

Vector Differentiation: Scalar point function and vector point functions. Gradient, Directional Derivative; Curl and Divergence-physical interpretation. Solenoidal and irrotational vectors. Illustrative problems. **08 Hrs.**

Unit- V

Vector Integration:

Line integrals, Surface integrals and Volume integrals. Green's theorem, Gauss divergence theorem and Stoke's theorem (only statements). **07 Hrs.**

Text Books:

1) **B.S. Grewal**: Higher Engineering Mathematics, Khanna Publishers, 44th edition, 2017.

2) **Rajesh Verma & H. K. Das,** Higher Engineering Mathematics,,3rd edition. 2014.

Note: 1. Grades (i) PP (ii) NP
2. No semester End Examination
3. Audit (Bridge course)

1.The mandatory non–credit courses Additional Mathematics I and II prescribed for III and IV semesters respectively, to the lateral entry Diploma holders admitted to III semester of BE/B.Tech., programs, shall attend the classes during the respective semesters to complete all the formalities of the course and appear for the Continuous Internal Evaluation (CIE). In case, any student fails to register for the said course/fails to secure the minimum 40 % of the prescribed CIE marks, he/she shall be deemed to have secured an F grade. In such a case, the student has to fulfill the requirements during subsequent semester/s to appear for CIE.

2. These Courses shall not be considered for vertical progression, but completion of the courses shall be mandatory for the award of degree.

22UPYK408	Physical Education and Yoga	(0-0-2) Audit

Contact Hours: 24

Course Learning Objectives:

1. The course focuses on overall development and importance of Physical Education & Yoga in day to day life.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		**Mapping to POs(1-12)**		
		Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO1	Gaining the importance of Physical Education & yoga	12		8, 9
CO2	Understanding the benefits & preventive measures of health	12	6	8, 9
CO3	Gaining the knowledge of yoga	12		8, 9
CO4	Understanding the importance of Human Body conditioning & Sports training	12		8, 9
CO5	Get awareness of Modern technology in sports	12		5, 8, 9

POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Mapping Level	-	-	-	-	1	2	-	1	1	-	-	3

Contents

Unit-I

Introduction to Physical Education: Meaning and importance, definition, components, benefits of physical education. **04Hrs**

Unit-II

Health and Wellness, Anatomy and Physiology: Meaning and importance, definition, components, benefits, health habits, basics of diseases and preventive measures, mental health, physical health, social health, spiritual health. Meaning and definition, first aid, injuries and preventions. **05Hrs**

Unit-III

Introduction of Yoga: Origin and history of Yoga, meaning and definition, benefits, importance prayer Suryanamaskara,

Asana:- Ardha chakrasana, Vajrasana, Supta vajrasana, Dhanurasana.

Pranayama:- Surya Anuloma Viloma & Chandra Anuloma Viloma.

Mudras:- Jnana mudra & Vayu mudra. **05Hrs**

Unit-IV

Sports Training: Meaning and definitions, warming up, cooldown, methods of exercises, stretching, speed, endurance, flexibility, agility, Athletics, Table Tennis, Hockey, Cross country, Archery Rules and regulation of all games. **05Hrs**

Unit-V

Modern Technology in Sports and Games: Meaning and definitions, objectives, assisting umpires/ referees, hawk-eye technology, sports specific, computer software, technology in playfields, athletes clothing and equipment, graphics of sports and games, artificial intelligence. **05Hrs**

Reference Books:

1) Petipus, et al., Athlete's Guide to Career Planning, Human Kinetics, 1997
2) The Human Body in Health and Disease with Access 8th Edition 2023.
3) Anatomy and Physiology, Shri K.G. Nadgir College of Physical Education. Dharwad.
4) Health & Wellness Shri K.G. Nadgir College of Physical Education. Dharwad.
5) Nagendra HR., The art and science of Pranayama, 2009
6) Iyengar BKS., The illustrated Light on Yoga(English), 2005

CIE and SEE Evaluation (from 2023-24 batch)

Courses with LTP 3-0-0 and 4-0-0 or 2-2-0/3-2-0

Continuous Internal Evaluation (CIE):

- Two Internal Assessment and one Improvement test each of 20 marks and one hour duration.
- Two higher scores from three tests are taken representing 40 marks.
- Question Paper pattern for Internal Assessment: 3 questions of 10 marks each with maximum of two sub divisions. Q.3 is compulsory and one question to be answered from Q.1 and Q.2.
- Course Teacher Assessment (CTA): Minimum two components such as quiz, seminar, written assignment, any technical activity related to course each of 5marks. Total CTA marks-10
- CIE=40 (from tests)+10(from CTA) =50 marks

Semester End Examination (SEE):

- SEE is conducted for100 marks with 3 hours duration. It is reduced to 50 marks.
- Question Paper pattern for SEE: Five units with built in choice. Each question with maximum of three sub divisions.
- Two questions are to be set from each unit with built in choice, for example Q1 or Q2 in unit –I, Q 3 or Q 4 in unit-II and so on.
- A total of 5 full questions to be answered choosing one full question from each unit. All five units are to be answered compulsorily.
- Each question is of 20 marks.
- The Question paper is to be set for duration of 3 hours both for 3 and 4 credits courses.
- The Question paper is to be set for 100 marks for 3 and 4 credits courses.

ASC(IC)/PCC with LTP 2-0-2, 3-0-2 and 2-2-2

Continuous Internal Evaluation (CIE):

Theory CIE component:

- Two Internal Assessment and one Improvement test each of 20 marks and one hour duration.
- Two higher scores from three tests are taken representing 40 marks.
- Question Paper pattern for Internal Assessment: 3 questions of 10 marks each with maximum of two sub divisions. Q.3 is compulsory and one question to be answered from Q.1 and Q.2.

Course Teacher Assessment (CTA): Totally based on conduction of experiments as set by the course teacher.

Laboratory component assessment:

- 5 marks: for conduction, regularity, involvement, journal writing, etc. Minimum 75% of attendance is compulsory. If the performance is not satisfactory in laboratory the student shall be detained and required to reregister for the course as a whole whenever offered next.
- 5 marks: Lab Test. A Lab test as per the class time table has to be conducted at the end for50 marks and scale down to 5 marks.
- CIE for integrated course =40 (from IA tests)+10 (from CTA i.e. lab component) =50 marks.
- There will not be any remuneration for Final Lab Test since it is CTA of integrated course.
- Copy of the Marks list to be sent to the concerned course instructor immediately after the completion of test for that batch. Original Marks list to be maintained in the department.
- CIE=40(from tests)+10(from CTA i.e. lab component) =50 marks

Semester End Examination (SEE):

- SEE is conducted for100 marks with 3 hours duration. It is reduced to 50 marks.
- Question Paper pattern for SEE: Five units with built in choice. Each question with maximum of three sub divisions.
- Two questions are to be set from each unit with built in choice, for example Q1 or Q2 in unit –I, Q 3 or Q 4 in unit-II and so on.
- A total of 5 full questions to be answered choosing one full question from each unit. All five units are to be answered compulsorily.
- Each question is of 20 marks.
- The Question paper is to be set for duration of 3 hours both for 3 and 4 credits courses.
- The Question paper is to be set for 100 marks for 3 and 4 credits courses.

AEC/HSMS/UHV Courses with LTP 1-0-0:

Continuous Internal Evaluation (CIE)

- Two Internal Assessment and one Improvement test each of 20 marks and one hour duration.
- Two higher scores from three tests are taken representing 40 marks.
- Question Paper pattern for Internal Assessment: MCQ 20 questions

- Course Teacher Assessment (CTA): Minimum two components such as quiz, seminar, written assignment, any technical activity related to course etc. each of 5marks. Total CTA marks-10
- CIE=40(from tests)+10(from CTA) =50 marks

Semester End Examination (SEE):

- SEE is conducted for 50 marks of 1 hour duration. There will be 50 MCQs.
- Question Paper pattern for SEE: The question paper will contain 12 MCQ questions drawn from each Unit.
- Students have to answer maximum of 10 questions from each unit.
- All five units are to be answered compulsorily.

For NSS/Physical Education/Yoga Audit Courses with LTP 0-0-2
Continuous Internal Evaluation (CIE)

- All students have to register for any one course in each semester of III to VI with concerned course instructor.
- The department must make a faculty coordinator for the above audit courses and the details of the students must be maintained.
- The concerned course instructor must define the set of activities and its schedule of the conduction in NSS, PE and Yoga by taking approval from Dean Academic Program.
- The course instructor has to conduct the events as per the schedule and maintain the attendance for the same. 75% attendance is mandatory.
- The course instructor must assess the students by conducting the MCQ test for 50 marks to be conducted during the improvement test for other courses.
- The course instructor must send the marks and attendance register to the respective departments.
- The faculty coordinator of the department must maintain the same and arrange for sending the marks to CoE.