J. S. UNIVERSITY SHIKOHABAD

EVALUATION SCHEME & SYLLABUS
FOR

B. TECH. Fourth (IV) YEAR

ELECTRICAL & ELECTRONICS ENGINEERING

[Effective from the Session: 2021-22]

ELECTRICAL & ELECTRONICS ENGINEERING

EVALUATION SCHEME - B.TECH 4th YEAR

SEMESTER- VII													
Sl. No.	Subject Codes	Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1	BTEN701	RURAL DEVELOPMENT ADMINISTRATION& PLANNING	3	0	0	30	20	50		100		150	3
2		**Department Elective - IV**	**3**	**0**	**0**	**30**	**20**	**50**		**100**		**150**	**3**
3		**Department Elective - V**	**3**	**0**	**0**	**30**	**20**	**50**		**100**		**150**	**3**
		OPEN Elective-III	3	0	0	30	20	50		100		150	3
5	BTEN702	Industrial Automation & PLC Lab	0	0	2				25		25	50	1
6	BTEN751	Mini Project or Internship Assessment*	0	0	2				50			50	1
7	BTEN-752	Project I	0	0	8				150			150	4
8													
		TOTAL	**12**	**0**	**12**							**850**	**18**

*The Mini Project or internship (4 - 6 weeks) conducted during summer break after VI semester and will be assessed during VII semester.

BTEN

Department Elective - IV	**Department Elective - V**
BTEN703: Power System Operation & Control BTEN704: Advanced Micro processors & Micro Controllers BTEN705: Energy Conservation and Auditing BTEN706: HVDC & AC	BTEN707: Electric & Hybrid Vehicles BTEN708: Electric drives BTEN709: Power System Protection BTEN710: Deregulated Power

OPEN ELECTIVE –III

BTOE-081	FUNDAMENTALS OF DRONE TECHNOLOGY
BTOE-082	CLOUD COMPUTING
BTOE-083	BIO MEDICAL SIGNAL PROCESSING
BTOE-084	ENTREPRENEURSHIP DEVELOPMENT
BTOE-085	INTRODUCTION TO SMART GRID
BTOE-086	QUALITY MANAGEMENT
BTOE-087	INDUSTRIAL OPTIMIZATION TECHNIQUES
BTOE-088	VIROLOGY
BTOE-089	NATURAL LANGUAGE PROCESSING
BTOE-090	**HUMAN VALUES IN MADHYASTH DARSHAN

SEMESTER- VIII

Sl. No.	Subject Codes	Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1	BTEN801	Project Management& Entrepreneurship	3	0	0	30	20	50		100		150	3
2		**OPEN Elective-** IV	3	0	0	30	20	50		100		150	3
3	**BTEN803**	**SATELLITE COMMUNANICATION**	**3**	**0**	**0**	**30**	**20**	**50**		**100**		**150**	**3**
4	BTEN804	Project II	0	0	18				100		300	400	9
5													
		Total	**9**	**0**	**18**							**850**	**18**

OPEN ELECTIVE –IV

BTOE-091	ELECTRIC VEHICLES
BTOE-092	AUTOMATION AND ROBOTICS
BTOE-093	COMPUTERIZED PROCESS CONTROL
BTOE-094	DATA WAREHOUSING & DATA MINING
BTOE-095	DIGITAL AND SOCIAL MEDIA MARKETING
BTOE-096	MODELING OF FIELD-EFFECT NANO DEVICES
BTOE-097	MODELLING AND SIMULATION OF DYNAMIC SYSTEMS

[BTEN801] PROJECT MANAGEMENT& ENTREPRENEURSHIP

Unit I

Introduction to Entrepreneur: Concept, Characteristics, functions of an entrepreneur, Entrepreneur Vs Manager, Types of entrepreneur, Entrepreneurial Mind Set, Key attributes of an entrepreneur, desirable and acquirable traits and behaviors, Readiness of the entrepreneur: Right age, right time and right conditions, Myths and Realities of entrepreneurship. Entrepreneurship and Intrapreneurship: Similarities and variance, Developing Corporate Entrepreneurship. Women entrepreneurs:-Meaning, role, problems for women entrepreneurs, Rural entrepreneurship, social entrepreneurship, Entrepreneurship Development, Entrepreneurial support systems and role of government in Entrepreneurship Development..

Unit II

Entrepreneurial Motivation: Concept and Theories, Entrepreneurial Strategy: Generating and Exploiting New Entry Opportunities, Generation of new Entry Opportunity, entry Strategy, Risk reduction strategies for New Entry Exploitation Creativity and Business Idea Generation: Concept of creativity, ideas from trend analysis, sources of new ideas, Methods of generating new ideas, Creative problem solving, creativity and entrepreneurship. Entrepreneurial Innovation: Concept and types, Opportunity Recognition and opportunity assessment plan, product planning and development process..

Unit III

Protecting Ideas and Legal issues for the entrepreneur. Concept of IPR, Patents, Trademarks, Copyrights, Licensing, Product Safety, Other Legal Issues in Setting Up An Organisation. Business Plan Creating and Starting the Venture: Concept of Plan, Scope and Value, Writing the business plan, Using and implementing business plan. Succession Planning and Strategies for Harvesting and Ending Venture: Exit Strategy , succession of Business, Selling off, bankruptcy Reasons of failure of business plan, Reasons for the failure of entrepreneurial ventures.

Unit IV

Project Management: Concept, facets and Key Issues of project management. Generation and screening of project ideas, Project Analysis: Market and demand analysis, Technical analysis, Financial estimates and projection, Project Selection: Investment criteria, Risk analysis, Social Cost Benefit analysis. Project Financing: Financing of projects, Concept of Venture Capital in detail, Difference between Venture Capital and Private Equity. Project Implementation: Project planning and control, Network techniques for project management: PERT and CPM Models, Project Review: Post Audit and Administrative Aspects.

Text Book:

1. Corporate Social Responsibility: An Ethical Approach - Mark S. Schwartz
2. Katar Singh: Rural Development in India – Theory History and Policy
3. TodaroM.P. Economic Development in III World war
4. Arora R.C – Integrated Rural Development in India
5. Dhandekar V.M and Rath N poverty in India
6. A.N.Agarwal and KundanaLal: Rural Economy of India
7. B.K.Prasad: Rural Development-Sarup& Son's Publications.

Reference Book:

1. Innovation and Entrepreneurship by Drucker, P.F.; Harper and Row
2. Business, Entrepreneurship and Management: Rao, V.S.P. ;Vikas
3. Entrepreneurship: Roy Rajeev; OUP.
4. Text Book of Project Management: Gopalkrishnan, P. and Ramamoorthy, V.E.; McMillan
5. Project Management for Engineering, Business and Technology: Nicholas, J.M., and Steyn, H.; PHI
6. Project Management: The Managerial Process: Gray, C.F., Larson, E.W. and Desai, G.V.; MGH

1. CO-PO Matrix

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	1	2	2	2				1	2
CO2	2	1	2	1	2	2	2				1	2
CO3	2	1	2	2	3	2	1			1	1	2
CO4	1	1	1	2	3	1	1					2
CO5	2	2	1	2	3	1				1	1	2
Avg	**1.80**	**1.20**	**1.60**	**1.60**	**2.60**	**1.60**	**1.50**			**1.00**	**1.00**	**2.00**

[BTEN-803] SATELLITE COMMUNICATIONS

UNIT-I:

Communication Satellite: Orbit and Description: A brief History of Satellite Communication, Satellite Frequency bands, Satellite Systems, Applications, Orbital Period and Velocity, Effects of Orbital inclination, Azimuth and Elevation, Coverage and Slant range, Eclipse, Orbital perturbations , Placement of a Satellite in a Geo-Stationary Orbit.

UNIT-II:

Satellite Sub-Systems: Altitude and orbit control system, TT&C Sub-System, Altitude control Sub-System, Power Systems, Communication Subsystems, Satellite antenna Equipment. Satellite Link: Basic transmission theory, system noise temperature and G/T ratio, Basic Link Analysis, Interference Analysis, Design of satellite links for specified C/N, (with and without frequency Re-use), Link Budget.

UNIT-III:

Propagation effects: Introduction, Atmospheric Absorption, Cloud Attenuation, Tropospheric and Ionospheric Scintillation and Low angle fading, Rain Induced attenuation, rain induced cross polarization interference. Multiple Access: Frequency Division Multiple Access(FDMA), Intermodulation, Calculation of C/N. Time Division Multiple Access(TDMA), Frame structure, Burst structure, Satellite Switched TDMA Onboard processing, Demand Assignment Multiple Access (DAMA) – Types of Demand Assignment, Characteristics, CDMA Spread Spectrum Transmission and Reception

UNIT-IV:

Earth Station Technology: Transmitters, Receivers, Antennas, Tracking systems, Terrestrial Interface, Power Test methods, Lower Orbit Considerations. Satellite Navigation & Global Positioning Systems: Radio and Satellite Navigation, GPS Position Location principles, GPS Receivers, GPS C/A code accuracy, Differential GPS.

UNIT-V:

Satellite Packet Communications: Message Transmission by FDMA: M/G/1 Queue, Message Transmission by TDMA, PURE ALOHA-Satellite Packet Switching, Slotted Aloha, Packet Reservation, Tree Algorithm.

TEXT BOOKS:

1. Satellite Communications- Timothy Pratt, Charles Bostian and Jeremy Allnutt, WSE, Wiley Publications, 2nd Edition, 2003, John Wiley & Sons. 2. Satellite Communication Engineering- Wilbur L. Pritchand, Robert A Nelson and Henri G.Suyderhoud, 2nd Edition, Pearson Publications. 3. Digital Satellite Communications-Tri. T.Ha, 2nd Edition, 1990, Mc. Graw Hill. 2

REFERENCE BOOKS:

1. Satellite Communications- Dennis Roddy, 2nd Edition, 1996, McGraw Hill. 2. Satellite Communications:

Design Principles- M. Richharia, 2nd Edition,BS Publications, 2003. 3. Digital Satellite Communications-Tri. T. Ha,2nd Ed.,MGH,1990. 4. Fundamental of Satellite Communications- K. N Raja Rao, PHI, 2004

2. CO-PO Matrix												
Course Outcome	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	1	2	1	2	2	2				1	2
CO2	2	1	2	1	2	2	2				1	2
CO3	2	1	2	2	3	2	1			1	1	2
CO4	1	1	1	2	3	1	1					2
CO5	2	2	1	2	3	1				1	1	2
Avg	**1.80**	**1.20**	**1.60**	**1.60**	**2.60**	**1.60**	**1.50**			**1.00**	**1.00**	**2.00**

BTEN702]INDUSTRIAL AUTOMATION & PLC LAB [L T P: 0 0 2]

List of Experiments: minimum 10 nos. of experiments to be performed from following sets,

A) Industrial Automation:

1. Study hardware and software platforms for DCS
2. Simulate analog and digital function blocks
3. Study, understand and perform experiments on timers and counters
4. Logic implementation for traffic Control Application
5. Logic implementation for Bottle Filling Application
6. Tune PID controller for heat exchanger using DCS
7. FBD for auto-clavable laboratory fermenter
8. Develop graphical user interface for the fermenter plant

B) PLC

1. Study hardware and software used in PLC
2. Implementation Logic Gates
3. Implementation of DOL Starter
4. Implementation of On-Delay Timer
5. Implementation of Off-Delay Timer
6. Implementation of Up-Down Counter
7. Implementation of PLC Arithmetic Instructions
8. Implementation of PID Controller

Note: - virtual lab links:

For Industrial Automation:

http://ial-coep.vlabs.ac.in/List%20of%20experiments.html?domain=Electrical%20Engineering

For PLC:

http://plc-coep.vlabs.ac.in/List%20of%20experiments.html?domain=Electrical%20Engineering

1. CO-PO Matrix

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	1	2	2	2				1	2

CO2	2	1	2	1	2	2	2				1	2
CO3	2	1	2	2	3	2	1			1	1	2
CO4	1	1	1	2	3	1	1					2
CO5	2	2	1	2	3	1				1	1	2
Avg	**1.80**	**1.20**	**1.60**	**1.60**	**2.60**	**1.60**	**1.50**			**1.00**	**1.00**	**2.00**

DEPARTMENT ELECTIVE – IV

[L T P: 3 0 0]

POWER SYSTEM OPERATION & CONTROL(BTEN703)

Pre-requisites of the course: Power System-I, Power System-II

Course Outcome		Knowledge Level
Upon the completion of the course, the student will be able to:		
CO1	Describe the significance of Power System Operation and Control.	**K1**
CO2	Describe Real power-frequency interaction and explicate the concept of designing a power-frequency controller.	**K2**
CO3	Illustrate Reactive power-voltage interaction and the control actions to be implemented for maintaining the voltage profile against varying system load.	**K3**
CO4	Determine the necessary variables for an operating state to obtain the economic operation.	**K3**
CO5	Describe power system security and identification of Linear and non-linear models	**K2**

UNIT-I: Introduction: Structure of power systems, significance of voltage and frequency control. Power system control center and real time computer control, SCADA and EMS functions, system monitoring-RTU, PMU- concept of synchrophasor, data acquisition and controls. Power scenario in Indian grid, National and Regional load dispatching centers

UNIT-II: Load Frequency Control: Concept of load frequency control, Load frequency control of single area system: Turbine speed governing system and modeling, block diagram representation of single area system, steady state analysis, dynamic response, control area concept, P-I control, load frequency control and economic dispatch control. Load frequency control of two area system: Tie line power modeling, block diagram representation of two area system, static and dynamic response

UNIT-III: Automatic Voltage Control: Schematic diagram and block diagram representation, different types of Excitation systems & their controllers, static and dynamic analysis of AVR

Voltage and Reactive Power control: Concept of voltage control, methods of voltage control by tap changing transformer. Shunt Compensation, series compensation, phase angle compensation, concept of voltage stability in power system

UNIT-IV: Economic Operation of Power System- Concept and problems of unit commitment Input-output characteristics of thermal and hydro-plants System constraints, optimal operation of thermal units without and with transmission losses (no derivation of transmission loss coefficients), penalty factor, incremental transmission loss, Hydrothermal scheduling long and short terms, Concept of optimal power flow, Formulation

Unit – V: Power System Security- Three state model, operating states, state transition, Distribution factors- Generation Shift Distribution Factor, Outage Distribution Factor- Derivation through DC load flow

State Estimation: Detection and identification, Linear and non-linear models.

Text Books:

1. D.P. Kothari & I.J. Nagrath, "Modern Power System Analysis" Mc Graw Hill, 3rd Edition.
2. P.S.R. Murty, "Operation and control in Power Systems" B.S. Publications.

3. Olle. I. Elgerd, "Electric Energy systems theory- An Introduction", Tata Mc Graw Hill publishing Ltd, New Delhi, 2008
4. A. J. Wood & B.F. Wollenburg, " Power Generation, Operation and Control " John Wiley & Sons.

Reference Books:

1. P. Kundur, " Power System Stability and Control Mc Graw Hill.
2. Abhijit Chakrabarti and Sunita Halder, 'Power System Analysis Operation and Control', PHI learning Pvt. Ltd., New Delhi, Third Edition, 2010.

1. CO-PO Matrix

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	1	2	2	2				1	2
CO2	2	1	2	1	2	2	2				1	2
CO3	2	1	2	2	3	2	1			1	1	2
CO4	1	1	1	2	3	1	1					2
CO5	2	2	1	2	3	1				1	1	2
Avg	**1.80**	**1.20**	**1.60**	**1.60**	**2.60**	**1.60**	**1.50**			**1.00**	**1.00**	**2.00**

(BTEN704)ADVANCED MICRO PROCESSORS & MICRO CONTROLLERS

Pre-requisites of course: Digital Electronics

	Course Outcomes:	Knowledge Level, KL
	Upon the completion of the course, the student will be able to:	
CO1	Explain the Architecture of 8086, memory segmentation and its mode.	K2
CO2	Describe the Instruction set of 8086, and develop various type of programs.	K2
CO3	Illustrate memory interfacing diagram , and explain various type of interfacing	k3
CO4	Illustrate various modes of processor.	K3
CO5	Explain the architecture of MSP430 and Develop GPIO controlling Program.	K2

UNIT1

8086 architecture-functional diagram, register organization, memory segmentation, programming model, memory address, physical memory organization, pins description, maximum mode and minimum mode signal descriptions.

UNIT2

Instruction formats, addressing modes, instruction set of 8086, simple programs involves data transfer operation, arithmetic operation, logical operation, branch operation, machine control operation, string manipulations, stack and subroutine operations.

UNIT3

Memory interfacing to 8086. Interrupt structure of 8086, interrupt handling, vector interrupt table and interrupt Service routine. Interfacing programmable peripheral interface 8255, Timer IC 8253 and Interrupt controller 8259 to 8086.

UNIT4

Mode of operation of higher order processors: Real mode and protected mode, Real mode and protected mode memory addressing, access right byte, Memory paging, System descriptors, Multi-Tasking & TSS, Block Diagram 0f 80286, ARM Processor

UNIT5

MSP430 Microcontroller: block diagram, on-chip peripherals (analog and digital), and Register sets. Instruction set, instruction formats, addressing modes of MSP microcontroller. Memory Mapped Peripherals, programming System registers, I/O pin multiplexing, pull up/down registers, GPIO control. Interrupts and interrupt programming.

Text Book:

1. Ray, A.K. &Burchandi, K.m., "Advanced Microprocessors and Peripherals: Architeacture, Programming and Interfacing" Tata Mc.Graw Hill.
2. Renu Sing &B.P.Singh, "Advanced Microprocessors and Microcontrollers" New Age
3. International. 3. Krishna Kant,"Microprocessors and Microcontrollers" PHI Learning. 4. Brey, Barry B. "The INTEL Microprocessors" Pearson Education.
4. John H Davies, "MSP430 Microcontroller Basics" Newnes Publication.

Reference Book:

1. TI MSP430x5xx and MSP430x6xx Family User's Guide.

1. CO-PO Matrix												
Course Outcome	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	1	2	1	2	2	2				1	2
CO2	2	1	2	1	2	2	2				1	2
CO3	2	1	2	2	3	2	1			1	1	2
CO4	1	1	1	2	3	1	1					2
CO5	2	2	1	2	3	1				1	1	2
Avg	**1.80**	**1.20**	**1.60**	**1.60**	**2.60**	**1.60**	**1.50**			**1.00**	**1.00**	**2.00**

[BTEN705] ENERGY CONSERVATION AND AUDITING

Pre-requisites of course: Basic Electrical Engineering, Power System-I & II

Course Outcomes:		Knowledge Level, KL
Upon the completion of the course, the student will be able to:		
CO1	Identify and assess the energy conservation/saving opportunities in different electric system and understand related legislations.	**K1**
CO2	Identify and assess the energy saving behavior of utilities through implementation of DSM and EMIS.	**K1**
CO3	Explain energy audit & management and to prepare energy audit report for different energy conservation instances.	**K2**
CO4	Illustrate the energy audit for Mechanical Utilities.	**K3**
CO5	Describe cost-effective measures towards improving energy efficiency and energy conservation by implementation of energy efficient technologies.	**K2**

UNIT-1: Energy Scenario: Classification of Energy, Indian energy scenario, Sectorial energy consumption (domestic, industrial and other sectors), energy needs of growing economy, energy intensity, long term energy scenario, energy pricing, energy security, energy conservation and its importance, energy strategy for the future.

Energy Conservation Act 2001 and related policies: Energy conservation Act 2001 and its features, notifications under the Act, Schemes of Bureau of Energy Efficiency (BEE) including Designated consumers, State Designated Agencies, Electricity Act 2003, Integrated energy policy, National action plan on climate change, ECBC code for Building Construction.

UNIT-2: Demand Side Management (DSM): Concept and Scope of Demand Side Management, Difference between Energy Efficiency and DSM, Evolution of Demand Side Management, DSM Strategy, Planning, Implementation and its application, Customer Acceptance & its implementation issues, National and International Experiences with DSM, UDAY scheme and other government initiatives for DISCOMs.

Energy Monitoring and Targeting: Defining monitoring & targeting, elements of monitoring & targeting, data and information-analysis, techniques –energy consumption, production, cumulative sum of differences (CUSUM). Energy Management Information Systems (EMIS)

UNIT-3: Energy Audit: Aim of energy Audit, Strategies of Energy Audit, Energy management

Team Consideration in implementing energy conservation Programme, Process flow diagram, Energy Audit report format, Benchmarking and Energy Performance, Instruments for energy audit, Economic analysis.

UNIT-4: System Audit of Mechanical Utilities: Pumps, types and application, unit's assessment, improvement option, parallel and series operating pump performance. Energy Saving in Pumps & Pumping Systems. Bloomers (Blowers) types & application, its performance assessment, series & parallel operation applications & advantages. Energy Saving in Blowers Compressors, types & applications, specific power consumption, compressed air system & economic of system changes. Energy Saving in Compressors & Compressed Air Systems Cooling towers, its types and performance assessment & limitations, water loss in cooling tower. Case studies related to Energy Audit & Management in Industries

UNIT-5: Energy Efficient Technology: Need for Energy Efficient Devices, Life Cycle Assessment, Comparison between simple pay-back and life cycle cost assessment, Energy Efficient Motors-motor losses and loss reduction techniques, determining and comparing motor efficiencies, motor efficiency testing standards, BIS specification for Energy Efficient Motors, efficiency as a function of load, Energy Efficient Lighting Sources-compact fluorescent lamp, light emitting diode, LED lamp, role of voltage on the efficiency of lighting system, Importance of Automatic power factor controllers, Variable Frequency Drives.

Reference Books:

1. Energy Conservation Guidebook,Dale R Patrick, Stephen W Fardo, 2nd Edition, CRC Press
2. Handbook of Energy Audits, Albert Thumann, 6th Edition, The Fairmont Press
3. Energy Management Handbook, W.C. Turner, John Wiley and Sons, A Wiley Inter science publication
4. Carbon Capture and Sequestration: Integrating Technology, Monitoring, and Regulation edited by E J Wilson and D Gerard, Blackwell Publishing
5. Heating and Cooling of Buildings -Design for Efficiency, J. Krieder and A. Rabl, McGraw Hill Publication, 1994.

1. CO-PO Matrix												
Course Outcome	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	1	2	1	2	2	2				1	2
CO2	2	1	2	1	2	2	2				1	2
CO3	2	1	2	2	3	2	1			1	1	2
CO4	1	1	1	2	3	1	1					2
CO5	2	2	1	2	3	1				1	1	2
Avg	**1.80**	**1.20**	**1.60**	**1.60**	**2.60**	**1.60**	**1.50**			**1.00**	**1.00**	**2.00**

[BTEN706]HVDC & AC TRANSMISSION

Pre-requisites of the course: Power System-I & II

	Course Outcomes :	Knowledge Level, KL
CO1	Describe the comparison of EHVAC and HVDC transmission while understanding various issues related to transmission.	K1
CO2	Calculate and study the corona loss and its impacts. Cite examples of the causes of switching overvoltage, Ferro-resonance.	K3
CO3	Explain the generation and measurement circuits for impulse, high DC & AC voltages. While considering the design parameters evaluate the effect on the performance of the EHV lines.	K2
CO4	Classify the DC links and choice of converter configuration to investigate the impact of inductance on operation of converters and identify different control schemes as well as starting and stopping methods of DC links.	K4
CO5	Describe the converter faults, protections including MTDC types and applications.	K2

UNIT-I: EHV transmission, standard transmission voltage, comparison of EHV AC & DC transmission systems and their applications & limitations, surface voltage gradients in conductor, distribution of voltage gradients on sub-conductors, mechanical considerations of transmission lines, modern trends in EHV AC and DC transmission, UHVAC transmission system.

UNIT-II: EHV AC Transmission: Corona loss formulas, corona current, audible noise – generation and characteristics corona pulses their generation and properties, radio interference (RI) effects, over voltage due to switching, ferro-resonance, reduction of switching surges on EHV system, principle of half wave transmission.

UNIT-III: Extra High Voltage Testing: Characteristics and generation of impulse voltage, generation of high AC and DC voltages, measurement of high voltage by sphere gaps and potential dividers.

Consideration for Design of EHV Lines: Design factors under steady state limits, EHV line insulation design based upon transient over voltages. Effects of pollution on performance of EHV lines.

UNIT-IV:EHV DC Transmission – I: Types of dc links, converter station, choice of converter configuration and pulse number, effect of source inductance on operation of converters, working principle and characteristics of a 6 pulse converter with two & three valve conduction mode, three valve conduction mode and three and four valve conduction mode, Principle of DC link control, converter controls characteristics, firing angle control, current and excitation angle control, power control, starting and stopping of DC link.

UNIT-V:EHV DC Transmission – II: Converter faults, protection against over currents and over voltages, smoothing reactors, generation of harmonics, AC and DC filters, Multi Terminal DC systems (MTDC): Types, control, protection and applications.

Text Books:

1. R. D. Begamudre, "Extra High Voltage AC Transmission Engineering" Wiley Eastern.
2. K. R. Padiyar, "HVDC Power Transmission Systems: Technology and System Reactions" New Age International.
3. J. Arrillaga, "High Voltage Direct Current Transmission" IFFE Power Engineering Series 6, PeterPeregrinus Ltd, London.
4. M. S. Naidu & V. Kamaraju, "High Voltage Engineering" McGraw Hill.

Reference Books:

1. M. H. Rashid,"Power Electronics: Circuits, Devices and Applications" Prentice Hall of India.
2. S. Rao, "EHV AC and HVDC Transmission Engineering and Practice" Khanna Publisher.
3. EPRI, Transmission Line Reference Book, 345 KV and above" Electric Power Research Institute. PaloAlto, California, 1982.

1. CO-PO Matrix

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	1	2	2	2				1	2
CO2	2	1	2	1	2	2	2				1	2
CO3	2	1	2	2	3	2	1			1	1	2
CO4	1	1	1	2	3	1	1					2
CO5	2	2	1	2	3	1				1	1	2
Avg	**1.80**	**1.20**	**1.60**	**1.60**	**2.60**	**1.60**	**1.50**			**1.00**	**1.00**	**2.00**

(BTEN711)POWER QUALITY AND FACTS

Pre-requisites of the course: Power System-I & II

Course Outcome		Knowledge Level
Upon the completion of the course, the student will be able to:		
CO1	Classify the power quality issues in electrical distribution network	K2
CO2	Describe the sources of voltage sag and protective devices including voltage regulators, active series compensator and UPS.	K1
CO3	Describe the different phenomenon causing electrical transients and devices for over voltage protection.	K2
CO4	Explain the working and application of different type of FACT devices like SSC, SVC, TSC, SSS, TCSC, UPFC.	K2
CO5	Explain the causes of harmonics, its effect on motor ,capacitor, cables and mitigation techniques.	K2

Unit-I: Introduction to Power Quality:

Terms and definitions of transients, Long duration Voltage Variations: under Voltage, Under Voltage and Sustained Interruptions; Short Duration Voltage Variations: interruption, Sag, Swell; Voltage Imbalance; Notching D C offset, waveform distortion; voltage fluctuation; power frequency variations.

Unit-II: Voltage Sag:

Sources of voltage sag: motor starting, arc furnace, fault clearing etc; estimating voltage sag performance and principle of its protection; solutions at end user level- Isolation Transformer, Voltage Regulator, Static UPS, Rotary UPS, and Active Series Compensator.

Unit-III: Electrical Transients:

Sources of Transient Over voltages- Atmospheric and switching transients- motor starting transients, pf correction capacitor switching transients, ups switching transients, neutral voltage swing etc; devices for over voltage protection.

Unit-IV: FACT Systems:

Introduction – Terms & Definition, Fact Controllers, Type of FACT devices i.e. SSC, SVC, TSC, SSSC, TCSC, UPFC Basic relationship for power flow control.

Unit- V: Harmonics:

Causes of harmonics; current and voltage harmonics: measurement of harmonics; effects of harmonics on – Transformers, AC Motors, Capacitor Banks, Cables, and Communication Lines etc., Harmonic Mitigation Techniques.

Text Books:

1. Roger C Dugan, McGrahan, Santoso&Beaty, “Electrical Power System Quality” McGraw Hill
2. Arindam Ghosh & Gerard Ledwich, “Power Quality Enhancement Using Custom Power Devices” Kluwer Academic Publishers
3. C. Sankaran, “Power Quality” CRC Press.
4. S. Sivanagaraju& S. Satyanarayana, “Electric Power Transmission and Distribution” Pearson Education
5. Narain G. Hingorani& Laszlo Gyugyi “Understanding FACTS: Concepts and Technology of Flexible AC Transmission Systems” Wiley

1. CO-PO Matrix												
Course Outcome	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	1	2	1	2	2	2				1	2
CO2	2	1	2	1	2	2	2				1	2
CO3	2	1	2	2	3	2	1			1	1	2
CO4	1	1	1	2	3	1	1					2
CO5	2	2	1	2	3	1				1	1	2
Avg	**1.80**	**1.20**	**1.60**	**1.60**	**2.60**	**1.60**	**1.50**			**1.00**	**1.00**	**2.00**

DEPARTMENT ELECTIVE – V

[L T P: 3 0 0]

ELECTRIC & HYBRID VEHICLES(BTEN707)

Pre-requisites of the course: Power System-I & II, Power Electronics, Electrical Machines-I & II

Course Outcome		Knowledge Level
Upon the completion of the course, the student will be able to:		
CO1	Describe the importance of hybrid and electric vehicles, its characterization and mathematical model for performance.	**K1**
CO2	Explain basic concept of hybrid traction, drive-train topologies and regenerative braking in electric vehicles.	**K2**
CO3	Explain the components used in hybrid and electric vehicles and different motor drives.	**K2**
CO4	Illustrate the sizing of propulsion motor, power electronics and selection of storage technology.	**K3**
CO5	Describe the energy management and different strategies used in hybrid and electric vehicle.	**K2**

Unit I: History of hybrid and electric vehicles, Social and environmental importance of hybrid and electric vehicles, Impact of modern drive-trains on energy supplies, Basics of vehicle performance, vehicle power source characterization, Transmission characteristics, Mathematical models to describe vehicle performance. Basic concept of hybrid traction, Introduction to various hybrid drive-train topologies, Power flow control in hybrid drive-train topologies, Fuel efficiency analysis.

Unit II: Basic concept of hybrid traction, Introduction to various hybrid drive-train topologies, Power flow control in hybrid drive-train topologies, Fuel efficiency analysis, braking fundamentals and regenerative braking in EVs.

Unit III: Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Introduction Motor drives, configuration and control of Permanent Magnet Motor Drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency.

Unit IV: Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power electronics Selecting the energy storage technology, Communications, supporting subsystems.

Unit V: Introduction to energy management and their strategies used in hybrid and electric vehicle Classification of different energy management strategies Comparison of different energy management strategies Implementation issues of energy strategies. Plug-in electric vehicles, Vehicle to grid (V2G) and G2V fundamentals.

Text Books

1. Mehrdad Ehsani, Yimin Gao, Ali Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals", CRC Press, 2010.
2. James Larminie, "Electric Vehicle Technology Explained", John Wiley & Sons, 2003
3. Iqbal Hussain, "Electric & Hybrid Vehicles – Design Fundamentals", Second Edition, CRC Press, 2011

Reference Books

1. Hybrid Vehicles and the future of personal transportation, Allen Fuhs, CRC Press, 2011.
2. Vehicle Power Management: Modeling, Control and Optimization, Xi Zhang, Chris Mi, Springer, 2011.

1. CO-PO Matrix												
Course Outcome	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	1	2	1	2	2	2				1	2
CO2	2	1	2	1	2	2	2				1	2
CO3	2	1	2	2	3	2	1			1	1	2
CO4	1	1	1	2	3	1	1					2
CO5	2	2	1	2	3	1				1	1	2
Avg	**1.80**	**1.20**	**1.60**	**1.60**	**2.60**	**1.60**	**1.50**			**1.00**	**1.00**	**2.00**

ELECTRIC DRIVES(BTEN708)

Pre-requisites of the course: Power Electronics, Electrical Machines-I & II

Course Outcome		**Knowledge Level**
Upon the completion of the course, the student will be able to:		
CO1	Describe the operation of electric drives and its classification.	**K1**
CO2	Explain the electric drive stability and selection of motor power rating.	**K2**
CO3	Illustrate electric braking and its dynamics.	**K3**
CO4	Describe the types of DC drives and its control.	**K2**
CO5	Describe the types of AC drives and its control.	**K2**

UNIT-I: Fundamentals of Electric Drive:
Electric Drives and its parts, advantages of electric drives, Classification of electric drives, Speed-torque conventions and multi-quadrant operations, Constant torque and constant power operation, Types of load, Load torque: components, nature and classification.

UNIT-II: Dynamics of Electric Drive:
Dynamics of motor-load combination, Steady state stability of Electric Drive, Transient stability of electric Drive
Selection of Motor Power rating:
Thermal model of motor for heating and cooling, classes of motor duty, determination of motor power rating for continuous duty, short time duty and intermittent duty., Load equalization.

UNIT-III: Electric Braking:
Purpose and types of electric braking, braking of dc, three phase induction and synchronous motors
Dynamics During Starting and Braking: Calculation of acceleration time and energy loss during starting of dc shunt and three phase induction motors, methods of reducing energy loss during starting. Energy relations during braking, dynamics during braking.

UNIT-IV: Power Electronic Control of DC Drives:
Single phase and three phase controlled converter fed separately excited dc motor drives (continuous conduction only), dual converter fed separately excited dc motor drive, rectifier control of dc series motor. Supply harmonics, power factor and ripples in motor current Chopper control of separately excited dc motor and dc series motor.
UNIT-V: Power Electronic Control of AC Drives:
Three Phase induction Motor Drive: Static Voltage control scheme, static frequency control scheme (VSI, CSI, and cyclo – converter based) static rotor resistance and slip power recovery control schemes.
Three Phase Synchronous motor: Self controlled scheme
Special Drives: Switched Reluctance motor, Brushless dc motor. Selection of motor for particular applications

Text Books:
1. G.K. Dubey, “Fundamentals of Electric Drives”, Narosa publishing House.
2. S.K.Pillai, “A First Course on Electric Drives”, New Age International.

Reference Books:
1 M.Chilkin, “Electric Drives”, Mir Publishers, Moscow.
2 Mohammed A. El-Sharkawi, “Fundamentals of Electric Drives”, Thomson Asia, Pvt. Ltd. Singapore.
3 N.K. De and Prashant K.Sen, “Electric Drives”, Prentice Hall of India Ltd.
4 V.Subrahmanyam, “Electric Drives: Concepts and Applications”, McGraw Hill.

1. CO-PO Matrix												
Course Outcome	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	1	2	1	2	2	2				1	2
CO2	2	1	2	1	2	2	2				1	2
CO3	2	1	2	2	3	2	1			1	1	2
CO4	1	1	1	2	3	1	1					2
CO5	2	2	1	2	3	1				1	1	2
Avg	**1.80**	**1.20**	**1.60**	**1.60**	**2.60**	**1.60**	**1.50**			**1.00**	**1.00**	**2.00**

POWER SYSTEM PROTECTION(BTEN709)

Pre-requisites of the course: Power System-I, Power System-II

Course Outcome		Knowledge Level
Upon the completion of the course, the student will be able to:		
CO1	Describe the relays and different protective schemes.	**K1**
CO2	Explain Relay types and its application.	**K2**
CO3	Describe types of faults and protection scheme for major components of power system.	**K2**
CO4	Describe the circuit breaker operation, testing and types.	**K2**
CO5	Explain the electronic relay, microprocessor and computer based protection schemes.	**K2**

Unit-I: Protection Scheme

Need for Protective systems, Evolution of protective relays - Zones of protection - Primary and Back -up Protection - Essential qualities of Protection - Classification of Protective schemes -Automatic reclosing –current transformer for Protection - potential transformer - summation transformer -phase – sequence current - segregating network

Unit-II: Relays:

Electromagnetic, attracted and induction type relays, thermal relay, gas actuated relay, design considerations of electromagnetic relay. Relay Application and Characteristics: Amplitude and phase comparators, over current relays, directional relays, distance relays, differential relay Static Relays: Comparison with electromagnetic relay, classification and their description, over current relays, directional relay, distance relays, differential relay.

Unit-III: Protection of Components

Types & detection of faults and their effects, alternator protection scheme (stator, rotor, reverse power protection etc.) - Power transformer protection (external and internal faults protection), generator- transformer unit protection scheme, bus bar protection - Transmission line protection (current/time grading, distance), Pilot relaying schemes, power line carrier protection.

Unit-IV: Circuit Breaking

Properties of arc, arc extinction theories, re-striking voltage transient, current chopping, resistance switching, capacitive current interruption, short line interruption, circuit breaker ratings. Testing of Circuit Breaker: Classification, testing station and equipment, testing procedure, direct and indirect testing, selection of circuit breakers. constructional features and operation of Bulk Oil, Minimum Oil, Air Blast, SF6, Vacuum and d. c. circuit breakers.

UNIT V- Modern Trends in Protection

Electronic relays - static relays functional circuits: comparators, level detectors, logic and training circuits, microprocessor and computer based protection schemes - software development for protection, security and reliability.

Text Books:

1. S. S. Rao, “Switchgear and Protection”, Khanna Publishers.
2. B. Ravindranath and M. Chander, Power system Protection and Switchgear, Wiley Eastern Ltd.
3. B. Ram and D. N. Vishwakarma, “Power System Protection and Switchgear”, Mc. Graw Hill

1. CO-PO Matrix												
Course Outcome	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	1	2	1	2	2	2				1	2
CO2	2	1	2	1	2	2	2				1	2
CO3	2	1	2	2	3	2	1			1	1	2
CO4	1	1	1	2	3	1	1					2
CO5	2	2	1	2	3	1				1	1	2
Avg	**1.80**	**1.20**	**1.60**	**1.60**	**2.60**	**1.60**	**1.50**			**1.00**	**1.00**	**2.00**

BTEN7010]DEREGULATED POWER SYSTEM

Pre-requisites of the course: Power System-I & II

Course Outcome		Knowledge Level
Upon the completion of the course, the student will be able to:		
CO1	Describe the deregulation, unbundling of electric utilities and its benefits.	**K1**
CO2	Explain the operational planning activities of independent system operator in pool & bilateral markets and describe competitive bidding.	**K2**
CO3	Explain the open access of transmission line and management of security & congestion in deregulation.	**K2**
CO4	Describe the different types of Electric traction, system of track electrification and its related mechanics	**K2**
CO5	Illustrate the Reliability Analysis of Generation, transmission and distribution and the regulation of the market.	**K3**

UNIT-I: Deregulation, Reconfiguring Power systems, unbundling of electric utilities, Background to deregulation and the current situation around the world, benefits from a competitive electricity market after effects of deregulation

UNIT-II: Role of the independent system operator, Operational planning activities of ISO: ISO in Pool markets, ISO in Bilateral markets, Operational planning activities of a GENCO: Genco in Pool and Bilateral markets, market participation issues, competitive bidding.

UNIT-III: Power wheeling, Transmission open access, pricing of power transactions, security management in deregulated environment, and congestion management in deregulation

UNIT-IV: General description of some ancillary services, ancillary services management in various countries, and reactive power management in some deregulated electricity markets.

UNIT-V: Reliability Analysis*:* Interruption criterion, stochastic components, component models, Calculation methods, Network model: stochastic networks, series and parallel connections, minimum cut sets, reliability cost. Generation, transmission and distribution reliability, Reliability and deregulation: conflict, reliability analysis, effects on the actual reliability, regulation of the market.

Text Books:

1. K. Bhattacharya, MHT Bollen and J.C Doolder, “Operation of Restructured Power Systems”, KluwerAcademic Publishers, USA, 2001.
2. Lei Lee Lai, “Power System restructuring and deregulation”, John Wiley and Sons, UK. 2001.
3. Fred I Denny and David E. Dismukes, “Power System Operations and Electricity Markets”, CRCPress, LLC, 2002.

1. CO-PO Matrix												
Course Outcome	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	1	2	1	2	2	2				1	2
CO2	2	1	2	1	2	2	2				1	2
CO3	2	1	2	2	3	2	1			1	1	2
CO4	1	1	1	2	3	1	1					2
CO5	2	2	1	2	3	1				1	1	2
Avg	**1.80**	**1.20**	**1.60**	**1.60**	**2.60**	**1.60**	**1.50**			**1.00**	**1.00**	**2.00**

4.

(BTEN711)UTILIZATION OF ELECTRICAL ENERGY & ELECTRIC TRACTION

Pre-requisites of the course: Basic Electrical Engineering, Electrical Machines-I & II

Course Outcome		Knowledge Level
Upon the completion of the course, the student will be able to:		
CO1	Describe the methods of electric heating and their advantages.	**K1**
CO2	Explain the types of Electric welding and the principle of Electro-deposition, laws of electrolysis and its applications	**K2**
CO3	Explain the laws of illumination and explain the principle of refrigeration and air-conditioning.	**K2**
CO4	Describe the different types of Electric traction, system of track electrification and its related mechanics	**K2**
CO5	Describe the salient features of traction drive and concept of energy saving using power electronic control of AC and DC drives	**K2**

Unit-I: Electric Heating: Advantages and methods of electric heating, Resistance heating, Electric arc heating, Induction heating and Dielectric heating

Unit-II: Electric Welding: Electric Arc Welding Electric Resistance Welding Electronic welding controls Electrolyte Process: Principles of electro deposition, Laws of electrolysis, and applications of electrolysis

Unit-III: Illumination: Various definitions, Laws of illumination, requirements of good lighting Design of indoor lighting and outdoor lighting systems Refrigeration and Air Conditioning: Refrigeration systems, domestic refrigerator, water cooler Types of air conditioning, Window air conditioner

Unit-IV: Electric Traction – I: Types of electric traction, Review of existing electric traction systems in India, systems of track electrification Traction mechanics- types of services, speed time curve and its simplification, average and schedule speeds Tractive effort, specific energy consumption, mechanics of train movement, coefficient of adhesion and its influence

Unit-V: Electric Traction – II: Salient features of traction drives Series – parallel control of dc traction drives (bridge transition) and energy saving Power Electronic control of dc and ac traction drives Diesel electric traction.

Text Books:

1. H. Partab, "Art and Science of Electrical Energy" Dhanpat Rai & Sons.
2. J.B. Gupta, "Utilization of Electric Power and Electric Traction", Kataria & Sons publishers, Delhi,IX Edtion, 2004.
3. C.L. Wadhwa, "Generation, Distribution and Utilization of electrical Energy", New AgeInternational (P) Limited Publishers, 3rd Edition, 2010.

Reference Books:

1. H. Partab, " Modern Electric Traction" Dhanpat Rai & Sons.
2. G.K. Dubey, "Fundamentals of Electric Drives" Narosa Publishing House.

1. CO-PO Matrix

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	1	2	2	2				1	2
CO2	2	1	2	1	2	2	2				1	2
CO3	2	1	2	2	3	2	1			1	1	2
CO4	1	1	1	2	3	1	1					2
CO5	2	2	1	2	3	1				1	1	2
Avg	**1.80**	**1.20**	**1.60**	**1.60**	**2.60**	**1.60**	**1.50**			**1.00**	**1.00**	**2.00**

OPEN ELECTIVE-III

OPEN ELECTIVES III [BTOE-081]FUNDAMENTALS OF DRONE TECHNOLOGY

Course Objective : Students undergoing this course are expected to

1. To make the students to understand the basic concepts of UAV drone systems.
2. To introduce the stability and control of an aircraft.
3. Analyze the different types of UAVs and their components.
4. Explore the applications of UAVs in various industries.
5. Develop skills in designing, building, and operating UAVs.

Subject Code	FUNDAMENTALS OF DRONE TECHNOLOGY (UNMANNED AERIAL VEHICLES)	L:T:P	Credits
BTME-081		3:1:0	03

Course Outcome (CO): The Students will be able to	
CO1	Ability to design UAV drone system
CO2	To understand working of different types of engines and its area of applications.
CO3	To understand static and dynamic stability dynamic instability and control concepts
CO4	To know the loads taken by aircraft and type of construction and also construction materials in them.

SYLLABUS
UNIT–I

Introduction to Drones: Introduction to Unmanned Aircraft Systems, History of UAV drones, classification of drones, System Composition, applications.
UNIT-II Design of UAV Drone Systems: Introduction to Design and Selection of the System, Aerodynamics and Airframe Configurations, Characteristics of Aircraft Types, Design Standards and Regulatory Aspects-India Specific, Design for Stealth.
UNIT-III Avionics Hardware of Drones: Autopilot, AGL-pressure sensors-servos-accelerometer –gyros-actuators- power supply-processor, integration, installation, configuration.
UNIT-IV Communication, Payloads and Controls: Payloads, Telemetry, Tracking, controls-PID feedback, radio control frequency range, modems, memory system, simulation, ground test-analysis-trouble shooting.
UNIT-V Navigation and Testing: Waypoints navigation, ground control software, System Ground Testing, System In-flight Testing, Future Prospects and Challenges.

BOOKS AND REFERENCES
1. Reg Austin "Unmanned Aircraft Systems UAV design, development and deployment", Wiley, 2010. 2. Robert C. Nelson, Flight Stability and Automatic Control, McGraw-Hill, Inc, 1998. 3. Kimon P. Valavanis, "Advances in Unmanned Aerial Vehicles: State of the Art and the Road to Autonomy", Springer, 2007 4. Paul G Fahlstrom, Thomas J Gleason, "Introduction to UAV Systems", UAV Systems, Inc, 1998 5. Dr. Armand J. Chaput, "Design of Unmanned Air Vehicle Systems", Lockheed Martin Aeronautics.

[BTME-082]CLOUD COMPUTING

Course Objective : Students undergoing this course are expected to

1. Develop an understanding of cloud computing concepts and architecture.
2. Learn the different cloud service models and deployment models.
3. Analyze cloud computing security and privacy concerns.
4. Explore cloud computing scalability and virtualization techniques.
5. Develop skills in implementing cloud-based solutions.

Subject Code	CLOUD COMPUTING	L:T:P	Credits
BTME-802		3:1:0	03

Course Outcome (CO): The Students will be able to	
CO1	describe the fundamental concepts and architectures of cloud computing.
CO2	identify and evaluate cloud service models and deployment models.
CO3	analyze cloud computing security and privacy concerns.
CO4	design and implement cloud-based solutions.
CO5	apply cloud computing scalability and virtualization techniques.

SYLLABUS

UNIT–I

Introduction: Cloud Computing – Definition of Cloud – Evolution of Cloud Computing – Underlying Principles of Parallel and Distributed, History of Cloud Computing - Cloud Architecture - Types of Clouds -Business models around Clouds – Major Players in Cloud Computing-issues in Clouds - Eucalyptus - Nimbus - Open Nebula, CloudSim.

UNIT-II

Cloud Services: Types of Cloud services: Software as a Service-Platform as a Service –Infrastructure as a Service - Database as a Service - Monitoring as a Service –Communication as services. Service providers- Google, Amazon, Microsoft Azure, IBM, Sales force.

UNIT-III

Collaborating Using Cloud Services: Email Communication over the Cloud - CRM Management – Project Management-Event Management -Task Management – Calendar - Schedules - Word Processing – Presentation – Spreadsheet - Databases – Desktop - Social Networks and Groupware.

UNIT-IV

Virtualization for Cloud: Need for Virtualization – Pros and cons of Virtualization – Types of Virtualization –System VM, Process VM, Virtual Machine monitor – Virtual machine properties - Interpretation and binary translation, HLL VM - supervisors – Xen, KVM, VMware, Virtual Box, Hyper-V.

UNIT-V

Security, Standards and Applications: Security in Clouds: Cloud security challenges – Software as a Service Security, Common Standards: The Open Cloud Consortium – The Distributed management Task Force – Standards for application Developers – Standards for Messaging – Standards for Security, End user access to cloud computing, Mobile Internet devices and the cloud.

Hadoop – Map Reduce – Virtual Box — Google App Engine – Programming Environment for Google App Engine

BOOKS AND REFERENCES

1. David E.Y. Sarna, “Implementing and Developing Cloud Application”, CRC press 2011.
2. Lee Badger, Tim Grance, Robert Patt-Corner, Jeff Voas, NIST, Draft cloud computing synopsis and recommendation, May 2011.
3. Anthony T Velte, Toby J Velte, Robert Elsenpeter, “Cloud Computing: A Practical Approach”, McGraw Hill 2010.

4. Haley Beard, “Best Practices for Managing and Measuring Processes for On-demand Computing, Applications and Data Centers in the Cloud with SLAs”, Emereo Pty Limited, July 2008.

[BTOE-083] BIOMEDICAL SIGNAL PROCESSING

Course Objective : Students undergoing this course are expected to

1. Develop an understanding of biomedical signals and their characteristics.
2. Learn the different methods of signal processing and analysis.
3. Analyze the different biomedical signal processing techniques.
4. Explore the applications of biomedical signal processing in healthcare.
5. Develop skills in designing and implementing biomedical signal processing algorithms.

Subject Code	BIOMEDICAL SIGNAL PROCESSING	L:T:P	Credits
BTME-802		3:1:0	03

Course Outcome (CO): The Students will be able to	
CO1	understand the characteristics of biomedical signals.
CO2	apply signal processing techniques to biomedical data.
CO3	analyze and evaluate different biomedical signal processing techniques.
CO4	design and implement biomedical signal processing algorithms.
CO5	apply biomedical signal processing techniques to healthcare applications.

SYLLABUS

UNIT–I

Introduction to Bio-Medical Signals: Classification, Acquisition and Difficulties during Acquisition. Basics of Electrocardiography, Electroencephalography, Electromyography & electro-retinography Role of Computers in the Analysis, Processing, Monitoring & Control and image reconstruction in bio-medical field.

UNIT–II

ECG: Measurement of Amplitude and Time Intervals, QRS Detection (Different Methods), ST Segment Analysis, Removal of Baseline Wander and Power line Interferences, Arrhythmia Analysis, Portable Arrhythmia Monitors

UNIT–III

Data Reduction: TurningPoint algorithm, AZTEC Algorithm, Fan Algorithm, Huffman and Modified Huffman Coding, Run Length. Coding.

UNIT–IV

EEG: Neurological Signal Processing, EEG characteristic, linear prediction theory, Sleep EEG, Dynamics of Sleep/Wake transition. Study of pattern of brain waves, Epilepsy-Transition, detection and Estimation. EEG Analysis By Spectral Estimation: The Bt Method, Periodogram, Maximum Entropy Method & AR Method, Moving Average Method. The ARMA Methods, Maximum Likelihood Method.

UNIT–V

EP Estimation: by Signal Averaging, Adaptive Filtering:- General Structures of Adaptive filters, LMS Adaptive Filter, Adaptive Noise Cancelling, Wavelet Detection:- Introduction, Detection By Structural features, Matched Filtering, Adaptive Wavelet Detection, Detection of Overlapping Wavelets.

.

BOOKS AND REFERENCES
1. Willis J. Tomkin, “Biomedical Digital Signal Processing”, PHI.
2. D. C. Reddy, “Biomedical Signal Processing”, McGraw Hill
3. Crommwell Weibel and Pfeifer, “Biomedical Instrumentation and Measurement”, PHI
4. Arnon Cohen, “Biomedical Signal Processing (volume-I)”, Licrc Press\
5. Rangaraj M. Rangayyan, “Biomedical Signal Analysis A Case Study Approach”, John Wiley and Sons Inc.
6. John G. Webster, “Medical instrumentation Application and Design”, John Wiley & Sons Inc

[BTOE-084]ENTREPRENEURSHIP DEVELOPMENT

Course Objective : Students undergoing this course are expected to

1. Understand the concept and importance of entrepreneurship.
2. Learn the skills and competencies required for entrepreneurship.
3. Develop a business plan for a startup venture.
4. Understand the legal and regulatory framework for entrepreneurship.
5. Analyze and evaluate the success factors for entrepreneurship.

Subject Code	ENTREPRENEURSHIP DEVELOPMENT	L:T:P	Credits
BTME-084		3:1:0	03

Course Outcome (CO): The Students will be able to	
CO1	identify and evaluate entrepreneurial opportunities.
CO2	develop the skills and competencies required for entrepreneurship.
CO3	create a comprehensive business plan for a startup venture.
CO4	Understanding of the legal and regulatory framework for entrepreneurship.
CO5	analyze and evaluate the success factors for entrepreneurship.

SYLLABUS

UNIT–I

Entrepreneurship- definition. growth of small scale industries in developing countries and their positions vis-a-vis large industries; role of small scale industries in the national economy; characteristics and types of small scale industries; demand based and resources based ancillaries and sub-control types. Government policy for small scale industry; stages in starting a small scale industry.

UNIT–II

Project identification- assessment of viability, formulation, evaluation, financing, field-study and collection of information, preparation of project report, demand analysis, material balance and output methods, benefit cost analysis, discounted cash flow, internal rate of return and net present value methods.

UNIT–III

Accountancy- Preparation of balance sheets and assessment of economic viability, decision making, expected costs, planning and production control, quality control, marketing, industrial relations, sales and purchases, advertisement, wages and incentive, inventory control, preparation of financial reports, accounts and stores studies.

UNIT–IV

Project Planning and control: The financial functions, cost of capital approach in project planning and control. Economic evaluation, risk analysis, capital expenditures, policies and practices in public enterprises. profit planning and programming, planning cash flow, capital expenditure and operations. control of financial flows, control and communication.

UNIT–V

Laws concerning entrepreneur viz, partnership laws, business ownership, sales and income taxes and workman compensation act. Role of various national and state agencies which render assistance to small scale industries.

BOOKS AND REFERENCES

1. Forbat, John, “Entrepreneurship” New Age International.
2. Havinal, Veerbhadrappa, “Management and Entrepreneurship” New Age International
3. Joseph, L. Massod, “Essential of Management", Prentice Hall of India

[BTOE-085]INTRODUCTION TO SMART GRID

Course Objective : Students undergoing this course are expected to

1. Understand the concept and significance of Smart Grid.
2. Learn about the components and infrastructure of Smart Grid.
3. Study the communication and control technologies used in Smart Grid.
4. Understand the challenges and opportunities associated with Smart Grid implementation.
5. Analyze the impact of Smart Grid on the power industry and society.

Subject Code	INTRODUCTION TO SMART GRID	L:T:P	Credits
BTME-802		3:1:0	03

Course Outcome (CO): The Students will be able to	
CO1	Understand the concept and significance of Smart Grid.

CO2	Learn about the components and infrastructure of Smart Grid.
CO3	Study the communication and control technologies used in Smart Grid.
CO4	Understand the challenges and opportunities associated with Smart Grid implementation.
CO5	Analyze the impact of Smart Grid on the power industry and society.

SYLLABUS

UNIT–I

Introduction: Introduction to Smart Grid: Evolution of Electric Grid, Concept of Smart Grid, Definitions, Need of Smart Grid, Functions of Smart Grid, Opportunities & Barriers of Smart Grid, Difference between conventional & smart grid, Concept of Resilient & Self Healing Grid, Present development & International policies in Smart Grid. Case study of Smart Grid. CDM opportunities in Smart Grid.

UNIT–II

Smart Grid Technologies: Introduction to Smart Meters, Real Time Prizing, Smart Appliances, Automatic Meter Reading (AMR), Outage Management System (OMS), Plug in Hybrid Electric Vehicles (PHEV), Vehicle to Grid, Smart Sensors, Home & Building Automation.

UNIT–III

Smart Grid Technologies: Smart Substations, Substation Automation, Feeder Automation, Geographic Information System (GIS), Intelligent Electronic Devices (IED) & their application for monitoring & protection, Smart storage like Battery, SMES, Pumped Hydro, Compressed Air Energy Storage, Wide Area Measurement System (WAMS), Phase Measurement Unit (PMU), PMUs application to monitoring & control of power system.

UNIT–IV

Microgrids and Distributed Energy Resources: Concept of microgrid, need & application of microgrid, formation of microgrid, Issues of interconnection, protection & control of microgrid, Plastic & Organic solar cells, thin flim solar cells, Variable speed wind generators, fuel cells, microturbines, Captive power plants, Integration of renewable energy sources.

UNIT–V

Power Quality Management in Smart Grid: Power Quality & EMC in Smart Grid, Power Quality issues of Grid connected Renewable Energy Sources, Power Quality Conditioners for Smart Grid, Web based Power Quality monitoring

BOOKS AND REFERENCES

1. Ali Keyhani, Mohammad N. Marwali, Min Dai, “Integration of Green and Renewable Energy in Electric Power Systems”, Wiley.
2. Clark W. Gellings, “The Smart Grid: Enabling Energy Efficiency and Demand Response”, CRC Press.
3. Janaka Ekanayake, Nick Jenkins, KithsiriLiyanage, Jianzhong Wu, Akihiko Yokoyama, “Smart Grid:
4. Technology and Applications”, Wiley.
5. Jean Claude Sabonnadiere, NouredineHadjsaid, “Smart Grids”, Wiley Blackwell 19. 6. Stuart Borlase, “Smart

Grids (Power Engineering)", CRC Press.
6. Andres Carvallo, John Cooper, "The Advanced Smart Grid: Edge Power Driving Sustainability",Artech House Publishers July 2011.
7. James Northcote, Green, Robert G. Wilson "Control and Automation of Electric Power Distribution Systems (Power Engineering)", CRC Press.
8. MladenKezunovic, Mark G. Adamiak, Alexander P. Apostolov, Jeffrey George Gilbert "SubstationAutomation (Power Electronice and Power Systems)", Springer
9. R.C. Dugan, Mark F. McGranghan, Surya Santoso, H. Wayne Beaty, "Electrical Power System Quality", 2nd Edition, McGraw Hill Publication.

[BTOE-086]QUALITY MANAGEMENT

Course Objective : Students undergoing this course are expected to

1. Understand quality concepts and quality management systems.
2. Learn statistical process control techniques and quality improvement tools.

3. Gain knowledge on Six Sigma, TQM, and Lean methodologies.
4. Understand the role of leadership in quality management.
5. Develop skills in quality audits, supplier management, and documentation.

Subject Code	QUALITY MANAGEMENT	L:T:P	Credits
BTME-802		3:1:0	03

Course Outcome (CO): The Students will be able to	
CO1	Ability to implement quality management systems in organizations.
CO2	Competence in using statistical process control and quality improvement tools.
CO3	Analyze and improve processes using Six Sigma, TQM, and Lean methodologies.
CO4	Understanding of the importance of leadership in ensuring quality.
CO5	Conduct quality audits, manage suppliers, and maintain documentation.

SYLLABUS

UNIT–I

Quality Concepts: Evolution of Quality Control, concept change, TQM Modern concept, Quality concept in design, Review of design, Evolution of proto type. Control on Purchased Product: Procurement of various products, evaluation of supplies, capacity verification, Development of sources, procurement procedure. Manufacturing Quality: Methods and techniques for manufacture, inspection and control of product, quality in sales and services, guarantee, analysis of claims.

UNIT–II

Quality Management: Organization structure and design, quality function, decentralization, designing and fitting, organization for different type products and company, economics of quality value and contribution, quality cost, optimizing quality cost, seduction program. Human Factor in quality Attitude of top management, cooperation of groups, operators attitude, responsibility, causes of apparatus error and corrective methods.

UNIT–III

Control Charts, Theory of control charts, measurement range, construction and analysis of R charts, process capability study, use of control charts. Attributes of Control Chart, Defects, construction and analysis of charts, improvement by control chart, variable sample size, construction and analysis of C charts

UNIT–IV

Defects diagnosis and prevention defect study, identification and analysis of defects, correcting measure, factors affecting reliability, MTTF, calculation of reliability, building reliability in the product, evaluation of reliability, interpretation of test results, reliability control, maintainability, zero defects, quality circle.

UNIT–V

ISO-9000 and its concept of Quality Management, ISO 9000 series, Taguchi method, JIT in some details.

BOOKS AND REFERENCES

1. Lt. Gen. H. Lal, “Total Quality Management”, Eastern Limited, .
2. Greg Bounds, “Beyond Total Quality Management”,McGraw Hill
3. Menon, H.G, “TQM in New Product manufacturing”,McGraw Hill

[BTOE-087]INDUSTRIAL OPTIMIZATION TECHNIQUES

Course Objective : Students undergoing this course are expected to

1. Learn the fundamentals of optimization techniques used in industry.
2. Understand the optimization techniques for linear and nonlinear systems.
3. Understand the concept of simulation modeling for optimization.
4. Study various metaheuristic techniques for optimization.
5. Learn about industrial applications of optimization techniques.

Subject Code	INDUSTRIAL OPTIMIZATION TECHNIQUES	L:T:P	Credits
BTOE-802		3:1:0	03

Course Outcome (CO): The Students will be able to	
CO1	Learn the fundamentals of optimization techniques used in industry.
CO2	Understand the optimization techniques for linear and nonlinear systems.
CO3	Understand the concept of simulation modeling for optimization.
CO4	Study various metaheuristic techniques for optimization.
CO5	Learn about industrial applications of optimization techniques.

SYLLABUS

UNIT–I

Linear Programming: Historical development of optimization, engineering application of optimization, formulation of design problems as a mathematical

programing problem. Graphical method of solution, Simplex method, Dual Simplex method and its application in engineering.

Transportation and Assignment: Introduction, Mathematical formulations, optimal solution of transportation model. Assignment problems: mathematical formulation, solution of Assignment models (Hungarian method), variation of the Assignment problem, the travelling sales man problem and their application in Engineering.

UNIT–II

Sequencing and Network Analysis: Introduction of sequencing, General assumptions, n Jobs through 2 machines, n jobs through 3 machines, n jobs through m machines, 2 jobs through m machines and their applications in Engineering.

Network Analysis: Introduction, Network logic (Network or arrow diagram), Rules for drawing network diagrams, time analysis, forward and backward computation CPM and PERT, and their applications in Engineering.

UNIT–III

Theory of Games and Queueing Models: Introduction, 2 person zero sum games, Maximin and minimax principle, game with saddle point and without saddle point,

Principle of dominance, Rectangular games, graphical solution of 2xn or mx2 games.

Queuing model: Introduction, Application of Queuing model, generalized Poisson queuing model, single server models and multiple channel Queuing modeland their applications in Engineering.

UNIT–IV

Dynamic Programming and Simulation: Introduction Formulation of Dynamic Programming Problem, Dynamic Programming Algorithm, Forward recursions, Capital Budgeting Problem, Cargo-loading Problem. Solution of LPP by DPP

Simulation: Introduction, definition and types of simulation, need for Simulation advantage and disadvantage, application of simulation, simulation procedure, Monte Carlo simulation and their applications in Engineering.

UNIT–V

Inventory Control and Replacement Models: Introduction, types of inventories, Inventory cost, Deterministic and probabilistic (nondeterministic) inventory models and their application in engineering.

Replacement models: Introduction, definition, Replacement of items that deteriorate, Replacement of items that fail suddenly, Equipment Renewal Problem, Individual and Group Replacement policies & their applications in Engineering

BOOKS: REFERENCE

1. Singiresu S. Rao. “Engineering Optimization” Theory and Practice”. New Age International, New Delhi.
2. R. Panneerselvam. “Operations Research “. Prentice- Hall of India, New Delhi
3. Eliezer Naddor. “Inventory Systems”. John Wiley & Sons, Inc. New York
4. H.A. Taha: Operations Research – An Introduction, Macmillan Publishing Company, Inc., New York.
5. K. Swarup, P.K. Gupta, M. Mohan: “Operations Research”, Sultan Chand and Sons, New Delhi.
6. P.K. Gupta, D.S. Hira: “Operations Research” – An Introduction, S. Chand & Company Limited, New Delhi.
7. S.S. Rao: “Optimization Theory and Applications”, Wiley Eastern Ltd., New Delhi.
8. J.K. Sharma: “Operations Research: Theory and Applications”, Mac Millan India

[BTOE-088]VIROLOGY

Course Objective : Students undergoing this course are expected to

1. Understand the role of viruses in causing diseases.
2. Understand how viruses affect animals and humans.
3. Learn about Small DNA viruses: parvo- and polyoma viruses, and Large DNA viruses: Herpes-adeno-, and poxviruses.
4. Comprehend Retroviruses: structure, classification, life cycle; reverse transcription, HIV, viral pathogenesis, and AIDS.
5. Understand the conventional and modern approaches to vaccine production.

Subject Code	VIROLOGY	L:T:P	Credits
BTME-088		3:1:0	03

3. **Course Outcome (CO):** The Students will be able to	
CO1	Understand the diversity, components, and history of viruses.
CO2	Analyze the consequences of virus infection on host macromolecules.
CO3	Demonstrate knowledge of viral diagnostic techniques and counter attack mechanisms.
CO4	Identify and classify different types of viruses and their pathogenesis.
CO5	Evaluate antiviral therapies and modern approaches to virus control.

SYLLABUS

UNIT–I

General Concepts: Virus history, Diversity, shapes, sizes and components of genomes. Isolation and purification of viruses and components.

UNIT–II

Consequences of virus infection to animals and human. Viral infection: affect on host macromolecules. Viral infection: establishment of the antiviral state. Viruses counter attack mechanisms. Viral diagnostic techniques: Rapid Antigen testing, RTPCR

UNIT–III

Classification of viruses and nomenclatures. +strand RNA viruses-Picorna viruses. Flavi viruses- West Nile virus and Dengue virus. Corona viruses- SARS pathogens. Small DNA viruses: parvo- and polyoma viruses. Large DNA viruses: Herpes-adeno-, and poxviruses. Miscellaneous viruses.

UNIT–IV

–ve strand RNA viruses Paramyxo viruses. Orthomyxo viruses: Influenza pathogenesis and Bird flu. Rhabdo viruses: Rabies pathogenesis.. dsRNA viruses- Reo viruses. Retroviruses: structure, classification, life cycle; reverse transcription. Retroviruses: HIV, viral pathogenesis and AIDS.

UNIT–V

Antivirals and viral vaccines Viral Vaccines Conventional vaccines-killed and attenuated, modern vaccinesrecombinant proteins, subunits, DNA vaccines, peptides, immunemodulators (cytokines), vaccine delivery and adjuvants, large scale manufacturing- QA/QC issues. Antivirals Interferons, designing and screening of antivirals, mechanism of action, antiviral libraries, antiretrovirals- mechanism of action and drug resistance. Modern approaches of virus control Anti-sense RNA, siRNA, ribozymes.

.

BOOKS AND REFERENCES

1. Antiviral Agents, Vaccines and immunotherapies. Stephen K. Tyring. ISBN 9780367393748 CRC
2. Basic Virology – Edward K Wanger. Blackwell Publication
3. Fundamentals of molecular virology – Acheson and Nicholas H,2011
4. Principles of Virology 2nd edition by S.J.Flint, L.W.Enquist, R.M.Krug,V.R. Racaniello, and A.M.Skalka ASM Press
5. Medical Virology 4th edition by David O.White and Frank J. Fenner. Academic Press

:

[BTOE-089]NATURAL LANGUAGE PROCESSING

Course Objective : Students undergoing this course are expected to

1. Introduce basic concepts in natural language processing (NLP).
2. Understand various approaches to language modeling and text representation.
3. Learn about the techniques used in semantic analysis and generation.
4. Explore advanced NLP topics, such as machine translation and summarization.
5. Apply NLP techniques to real-world problems and evaluate performance.

Subject Code	NATURAL LANGUAGE PROCESSING	L:T:P	Credits
BTOE-089		3:1:0	03

Course Outcome (CO): The Students will be able to	
CO1	Develop an understanding of NLP concepts and techniques.
CO2	Learn to analyze and represent natural language text.
CO3	Gain proficiency in techniques for semantic analysis and generation.
CO4	Understand the challenges involved in advanced NLP tasks.
CO5	Apply NLP techniques to solve real-world problems effectively.

SYLLABUS
UNIT–I Introduction to Natural Language Understanding: The study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different levels of Language Analysis, Representations and Understanding, Organization of Natural language Understanding Systems, Linguistic Background: An outline of English syntax.
UNIT–II Introduction to semantics and knowledge representation, some applications like machine translation, database interface.
UNIT–III Grammars and Parsing: Grammars and sentence Structure, Top-Down and Bottom-Up Parsers, Transition Network Grammars, Top- Down Chart Parsing. Feature Systems and Augmented Grammars: Basic Feature system for English, Morphological Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks.
UNIT–IV Grammars for Natural Language: Auxiliary Verbs and Verb Phrases, Movement Phenomenon in

Language, Handling questions in Context-Free Grammars. Human preferences in Parsing, Encoding uncertainty, Deterministic Parser.

UNIT–V

Ambiguity Resolution: Statistical Methods, Probabilistic Language Processing, Estimating Probabilities, Part-of Speech tagging, Obtaining Lexical Probabilities, Probabilistic Context-Free Grammars, Best First Parsing. Semantics and Logical Form, Word senses and Ambiguity, Encoding Ambiguity in Logical Form.

BOOKS AND REFERENCES

1. Akshar Bharti, Vineet Chaitanya and Rajeev Sangal, "NLP: A Paninian Perspective", Prentice Hall, New Delhi.
2. James Allen, "Natural Language Understanding", Pearson Education.
3. D. Jurafsky, J. H. Martin, "Speech and Language Processing", Pearson Education.
4. L. M. Ivansca, S. C. Shapiro, "Natural Language Processing and Language Representation", AAAI Press, 2000.
5. 5. T. Winograd, Language as a Cognitive Process, Addison-Wesley.

[BTOE-090]HUMAN VALUES IN MADHYASTH DARSHAN

Course Objective : Students undergoing this course are expected to

1. Introduce students to the philosophy of Madhyasth Darshan.
2. Understand the concept of nature and its different classifications.
3. Recognize the interconnectedness of humans and nature.
4. Explore the principles of realizing human goals and prosperity.
5. Examine the conduct of a realized human being and its implications.

Subject Code	HUMAN VALUES IN MADHYASTH DARSHAN	L:T:P	Credits
BTOE-090		3:1:0	03

Course Outcome (CO): The Students will be able to	
CO1	Understand the basics and importance of Madhyasth Darshan.
CO2	Analyze the submergence of nature in space and its evolution.
CO3	Recognize human beings as an indivisible part of nature and their purpose.
CO4	Apply natural, social, and psychological principles for achieving human goals.
CO5	Develop conduct based on Madhyasth Darshan for a happy life and solving present-day problems.

SYLLABUS

UNIT–I

Introduction to Madhyasth Darshan and its Basics,Need to study Madhyasth Darshan; introduction, basic formulations of the darshan; the complete expanse of study and the natural outcome of living according to the darshan.

UNIT–II

Submergence of Nature in Space

The ever-present existence in the form of nature submerged in space; nature classified into two categories – material and consciousness, and four orders; the form, property, natural characteristic and self-organization of the four orders, General direction and process of evolution in the nature/ existence.

UNIT–III

Human Being as an indivisible part of Nature

Human being as an indivisible part of nature; various types (five classes) of human beings; human being in the combination of self and body; purpose of self as realization, prosperity for the body; need of behavior and work for attaining the goals of realization and prosperity

UNIT–IV

Fulfillment of human goal of realization and prosperity

Following natural, social and psychological principles for actualizing the human goal; form of conducive society and order for such practices, study process- achieving realization through self-study and practice while living in such a society (social order).

UNIT–V

Human Conduct based on Madhyasth Darshan

Description of such a realized self, continuity of happiness, peace, satisfaction and bliss through realization, conduct of a realized human being. Possibility of finding solutions to present day problems (such as inequality of rich and poor, man and woman etc.) in the light of it.

BOOKS AND REFERENCES

1. Nagraj, A., “Manav Vyavahar Darshan”, Jeevan Vidya Prakashan, 3rd edition, 2003
2. Nagraj, A., “Vyavaharvadi Samajshastra”, Jeevan Vidya Prakashan, 2nd edition, 2009.
3. Nagraj, A., “Avartanasheel Arthashastra”, Jeevan Vidya Prakashan, 1st edition, 1998.

4. Class notes on “Human Values in Madhyasth Darshan” available on www.uhv.org.in
5. PPTs for “Human Values in Madhyasth Darshan” available on www.uhv.org.in
6. Video lectures on “Human Values in Madhyasth Darshan” on AKTU Digital Education
7. (https://www.youtube.com/watch?v=l4x26FPFJYs&t=1558s)

OPEN ELECTIVES IV

[BTOE-091]ELECTRIC VEHICLES

Course Objective : Students undergoing this course are expected to

1. Understand the concept and history of electric vehicles.
2. Learn about the components and architecture of electric vehicles.
3. Analyze different types of EV motors and their comparison.
4. Understand EV batteries and their selection for EVs.
5. Learn about charging system design and its internal components.

Subject Code	ELECTRIC VEHICLES	L:T:P	Credits
BTOE-091		3:1:0	03

Course Outcome (CO): The Students will be able to	
CO1	Analyze recent developments and trends in EV technology.
CO2	Compare EVs and IC engine vehicles.
CO3	Understand the computing needs for autonomy in electric vehicles.
CO4	Analyze BMS global price trends and efficiency.
CO5	Design and plan EV charging facilities and integrate energy storage.

SYLLABUS

UNIT–I

Introduction of Electric Vehicles: Concept of Electrified transportation, Past, present status of electric vehicles, Recent developments and trends in electric vehicles, Comparison of EVs and IC Engine vehicles, Understanding electric vehicle components, Basic EV components and architecture, Autonomy and vehicle computing needs.

UNIT–II

Electric Motor Drives for EV applications: Concept of EV motors, Classification of EV motors,

Comparison of Electric motors for EV applications, Recent EV motors, BLDC and SRM, axial flux motor. Introduction to power electronics converters, DC-DC converter, speed control of dc motor, BLDC motor driving schemes.

UNIT–III

EV Batteries and Battery Management System: EV batteries, Lead Acid batteries – Basics, Characteristics, Lithium batteries- Basics, Characteristics, Selection of battery for EVs, Smart battery pack design, Mechanical and reliability aspects of Li Ion packs, UN38 regulation familiarity, Cell balancing in Li Ion, Battery second life and usage in BESS (energy storage systems). BMS - Global price trends, volumetric and gravimetric efficiency trends

UNIT–IV

Charging system design technology for EV applications:

Charging system design considerations, AC & DC Charging, Charging methods, On-board/Off-board chargers,Vehicle to charger communication system, OCPP familiarity cloud and device side, metrology, billing and authentication types, understand the computing needs in a charging system, Understand internal major block diagrams and subsystems of low and high power chargers. IEC61850 and 61851 familiarities, IEC61000, 60950/51, IEC62196 key highlights.

UNIT–V

EV Charging Facility Planning: Identification of EV demand, Impact of EV charging on power grid, Energy generation scheduling, different power sources, centralized charging schemes, Energy storage integration into micro-grid, Overview and applicability of AI for the EV ecosystem, design of V2G aggregator, case studies.

BOOKS AND REFERENCES

1. C.C.Chan, K.T.Chau. Modern Electric Vehicle Technology, Oxford University Press, NY 2001
2. M.Ehsani, Y.Gao, S.E.Gay, A.Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles – Fundamentals, Theory and Design, CRC Press, 2004
3. James Larminie, John Lowry. Electric Vehicle Technology Explained. Wiley 2012
4. NPTEL Course on Electric Vehicles – Part 1 by Dr. Amit Jain, IIT Delhi
5. Tests on Lithium-ion batteries. Available at: https://www.lithium-batterie-service.de/en/un-38.3-test-series
6. Handbook on Battery Energy Storage Systems- ADB, 2018

[BTOE-092]AUTOMATION AND ROBOTICS

Course Objective : Students undergoing this course are expected to

1. Introduce concepts, types, and principles of automation in manufacturing.
2. Study elements of fluid power and its application in pneumatics and hydraulics systems.
3. Analyze and design automated flow lines, single and mixed model production lines, and CNC machine tools.
4. Understand robot classification, components, kinematics, and power transmission systems.
5. Learn robot simulation methods, programming, applications in manufacturing, and cell design.

Subject Code	AUTOMATION AND ROBOTICS	L:T:P	Credits
BTOE-092		3:1:0	03

Course Outcome (CO): The Students will be able to	
CO1	Understand the advantages, goals, and laws of automation and elements of fluid power.
CO2	Identify the classification and types of automatic transfer machines and design production lines.
CO3	Apply CNC machine tools and analyze robot kinematics, power transmission, and end effectors.
CO4	Implement robot simulation methods and program robots for manufacturing operations.
CO5	Design and control robot cells for various applications and understand their limitations.

SYLLABUS

UNIT–I

Automation: Definition, Advantages, goals, types, need, laws and principles of Automation. Elements of Automation. Fluid power and its elements, application of fluid power, Pneumatics vs. Hydraulics, benefit and limitations of pneumatics and hydraulics systems, Role of Robotics in Industrial Automation.

UNIT–II

Manufacturing Automation: Classification and type of automatic transfer machines; Automation in part handling and feeding, Analysis of automated flow lines, design of single model, multimode and mixed model production lines. Programmable Manufacturing Automation CNC machine tools, Machining centers, Programmable robots, Robot time estimation in manufacturing operations.

UNIT–III

Robotics: Definition, Classification of Robots - Geometric classification and Control classification, Laws of Robotics, Robot Components, Coordinate Systems, Power Source. Robot anatomy, configuration of robots, joint notation schemes, work volume, manipulator kinematics, position representation, forward and reverse transformations, homogeneous transformations in robot kinematics, D-H notations, kinematics equations, introduction to robot arm dynamics.

UNIT–IV

Robot Drives and Power Transmission Systems: Robot drive mechanisms: Hydraulic/Electric/Pneumatics, servo & stepper motor drives, Mechanical transmission method: Gear transmission, Belt drives, Rollers, chains, Links, Linear to Rotary motion conversion, Rotary-to-Linear motion conversion, Rack and Pinion drives, Lead screws, Ball Bearings. Robot end Effectors: Classification of End effectors – active and passive grippers, Tools as end effectors, Drive system for rippers. Mechanical, vacuum and magnetic grippers. Gripper force analysis and gripper design.

UNIT–V

Robot Simulation: Methods of robot programming, Simulation concept, Off-line programming, advantages of offline programming. Robot Applications: Robot applications in manufacturing-Material transfer and machine loading/unloading, Processing operations like Welding & painting, Assembly operations, Inspection automation, Limitation of usage of robots in processing operation. Robot cell design and control, Robot cell layouts-Multiple robots & Machine interference.

BOOKS AND REFERENCES

1. An Introduction to Robot Technology, by Coifet Chirroza, Kogan Page.
2. Robotics for Engineers, by Y. Koren, McGraw Hill.
3. Robotic: Control, Sensing, Vision and Intelligence, by Fu, McGraw Hill.
4. Introduction to Industrial Robotics, by Nagrajan, Pearson India.
5. Robotics, by J.J. Craig, Addison-Wesley.
6. Industrial Robots, by Groover, McGraw Hill.
7. Robotic Engineering - An Integrated Approach : Richard D. Klafter Thomas A.

8. Robots & Manufacturing Automation, by Asfahl, Wiley.

[BTOE-093]COMPUTERIZED PROCESS CONTROL

Course Objective : Students undergoing this course are expected to

1. Understand the role and benefits of computers in process control.
2. Learn about the different elements and architectures of computer-aided process control systems.
3. Gain knowledge of industrial communication systems and data transfer techniques.
4. Develop skills in process modeling and control model formulation.
5. Learn advanced strategies for computerized process control and their real-world examples.

Subject Code	COMPUTERIZED PROCESS CONTROL	L:T:P	Credits
BTOE-083		3:1:0	03

Course Outcome (CO): The Students will be able to	
CO1	Ability to design and implement computer-aided process control systems.
CO2	Understanding of the economic benefits and real-world applications of computerized process control.
CO3	Proficiency in using industrial communication systems and computer control process software.
CO4	develop and validate process models for effective process control.
CO5	Knowledge of advanced control strategies and their application in various industries.

SYLLABUS

UNIT–I

Basics of Computer-Aided Process Control: Role of computers in process control, Elements of a computer aided Process control System, Classification of a Computer–Aided Process Control System Computer Aided Process–control Architecture: Centralized Control Systems, Distributed control Systems, Hierarchical Computer control Systems. Economics of Computer-Aided Process control. Benefits of using Computers in a Process control. Process related Interfaces: Analog Interfaces, Digital Interfaces, Pulse Interfaces, Standard Interfaces.

UNIT–II

Industrial communication System: Communication Networking, Industrial communication Systems, Data Transfer Techniques, Computer Aided Process control software, Types of Computer control Process Software, Real Time Operating System.

UNIT–III

Process Modelling for computerized Process control: Process model, Physical model, Control Model, Process modelling. Modelling Procedure: Goals Definition, Information Preparation, Model Formulation, Solution Finding, Results Analysis, Model Validation.

UNIT–IV

Advanced Strategies For Computerised Process control: Cascade Control, Predictive control, Adaptive Control, Inferential control, Intelligent Control, Statistical control.

UNIT–V

Examples of Computerized Process Control: Electric Oven Temperature Control, Reheat Furnace Temperature control, Thickness and Flatness control System for metal Rolling, Computer-Aided control of Electric Power Generation Plant.

BOOKS AND REFERENCES

1. S. K. Singh, “Computer Aided Process control”, PHI.
2. C. L. Smith, “Digital computer Process Control”, Ident Educational Publishers.
3. C. D. Johnson, “Process Control Instrumentation Technology”, PHI.
4. Krishan Kant, “Computer Based Industrial Control”

5. Pradeep B. Deshpande & Raymond H. Ash, “Element of Computer Process
6. Control with Advance Control Applications”, Instrument Society of America, 1981.
7. 6. C. M. Houpis & G. B. Lamond, “Digital Control System Theory”,McGraw Hill.

[BTOE-094]DATA WAREHOUSING & DATA MINING

Course Objective : Students undergoing this course are expected to

1. Understand the concept and components of Data Warehousing.
2. Familiarize with Data Warehouse process, technology and schema design.
3. Learn the principles and techniques of Data Mining.
4. Understand classification and clustering algorithms.
5. Learn how to visualize data and its overall perspective.

Subject Code	DATA WAREHOUSING & DATA MINING	L:T:P	Credits
BTOE-094		3:1:0	03

Course Outcome (CO): The Students will be able to	
CO1	Design and build a Data Warehouse.

CO2	Implement Data Warehouse process and technology.
CO3	Preprocess data and perform Data Mining.
CO4	Apply classification and clustering algorithms.
CO5	Visualize data and provide insights to stakeholders.

SYLLABUS

UNIT–I

Data Warehousing:

Overview, Definition, Data Warehousing Components, Building a Data Warehouse, Warehouse Database, Mapping the Data Warehouse to a Multiprocessor Architecture, Difference between Database System and Data Warehouse, Multi Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept.

UNIT–II

Data Warehouse Process and Technology:

Warehousing Strategy, Warehouse /management and Support Processes, Warehouse Planning and Implementation, Hardware and Operating Systems for Data Warehousing, Client/Server Computing Model & Data Warehousing. Parallel Processors & Cluster Systems, Distributed DBMS implementations, Warehousing Software, Warehouse Schema Design

UNIT–III

Data Mining:

Overview, Motivation, Definition & Functionalities, Data Processing, Form of Data Pre-processing, Data Cleaning: Missing Values, Noisy Data, (Binning, Clustering, Regression, Computer and Human inspection), Inconsistent Data, Data Integration and Transformation. Data Reduction:-Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Reduction, Discretization and Concept hierarchy generation, Decision Tree

UNIT–IV

Classification:

Definition, Data Generalization, Analytical Characterization, Analysis of attribute relevance, Mining Class comparisons, Statistical measures in large Databases, Statistical- Based Algorithms, Distance-Based Algorithms, Decision Tree-Based Algorithms.

Clustering:

Introduction, Similarity and Distance Measures, Hierarchical and Partitional Algorithms. Hierarchical Clustering- CURE and Chameleon. Density Based Methods DBSCAN, OPTICS. Grid Based Methods- STING, CLIQUE. Model Based Method – Statistical Approach, Association rules: Introduction, Large Item sets, Basic Algorithms, Parallel and Distributed Algorithms, Neural Network approach.

UNIT–V

Data Visualization and Overall Perspective:

Aggregation, Historical information, Query Facility, OLAP function and Tools. OLAP Servers, ROLAP, MOLAP, HOLAP, Data Mining interface, Security, Backup and Recovery, Tuning Data Warehouse, TestingData Warehouse. Warehousing applications and Recent Trends: Types of Warehousing Applications, Web Mining, Spatial Mining and Temporal Mining.

BOOKS AND REFERENCES

1. Alex Berson, Stephen J. Smith "Data Warehousing, Data-Mining & OLAP", Mc GrawHil.
2. Mark Humphries, Michael W. Hawkins, Michelle C. Dy, "Data Warehousing: Architecture and Implementation", Pearson Education..
3. I. Singh, "Data Mining and Warehousing", Khanna Publishing House.
4. Margaret H. Dunham, S. Sridhar ,"Data Mining: Introductory and Advanced Topics" Pearson Education.

[BTOE-095]DIGITAL AND SOCIAL MEDIA MARKETING

Course Objective : Students undergoing this course are expected to

1. Understand the shift from traditional marketing practices to digital marketing practices.
2. Learn marketing strategies and practices for the digital world.
3. Gain knowledge about social media marketing channels and their advertising campaigns.
4. Learn to acquire and engage users through digital channels using various tools and techniques.
5. Explore digital transformation, innovation, and trends in the global and Indian context.

Subject Code	DIGITAL AND SOCIAL MEDIA MARKETING	L:T:P	Credits
BTOE-095		3:1:0	03

Course Outcome (CO): The Students will be able to	
CO1	develop digital marketing strategies and practices.
CO2	create and manage social media campaigns.
CO3	acquire and engage users through various digital channels.
CO4	evaluate the effectiveness of digital marketing strategies.
CO5	understand digital transformation, innovation, and trends in the global and Indian context.

SYLLABUS
UNIT–I Introduction to Digital Marketing: The new digital world - trends that are driving shifts from traditional marketing practices to digital marketing practices, the modern digital consumer and new consumer's digital journey. Marketing strategies for the digital world-latest practices.
UNIT–II Social Media Marketing -Introduction to Blogging, Create a blog post for your project. Include headline, imagery, links and post, Content Planning and writing. Introduction to Face book, Twitter, Google +, LinkedIn, YouTube, Instagram and Pinterest; their channel advertising and campaigns.
UNIT–III Acquiring & Engaging Users through Digital Channels: Understanding the relationship between content and branding and its impact on sales, search engine marketing, mobile marketing, video marketing, and social-media marketing. Marketing gamification, Online campaign management; using marketing analytic tools to segment, target and position; overview of search engine optimization (SEO).
UNIT–IV Designing Organization for Digital Success: Digital transformation, digital leadership principles, online

P.R. and reputation management. ROI of digital strategies, how digital marketing is adding value to business, and evaluating cost effectiveness of digital strategies.

UNIT–V

Digital Innovation and Trends: The contemporary digital revolution, digital transformation framework; security and privatization issues with digital marketing Understanding trends in digital marketing – Indian and global context, online communities and co-creation.

BOOKS AND REFERENCES

1.Moutsy Maiti: Internet Mareting, Oxford University Press India

2.Vandana, Ahuja; Digital Marketing, Oxford University Press India (November, 2015).

3.Eric Greenberg, and Kates, Alexander; Strategic Digital Marketing: Top Digital Experts

4.Share the Formula for Tangible Returns on Your Marketing Investment; McGraw-Hill Professional.

5.Ryan, Damian; Understanding Digital Marketing: marketing strategies for engaging the digital generation; Kogan Page.

6.Tracy L. Tuten & Michael R. Solomon: Social Media Marketing (Sage Publication)

[BTOE-096]MODELING OF FIELD-EFFECT NANO DEVICES

Course Objective : Students undergoing this course are expected to

1. Understand the fundamentals of MOSFET scaling and short channel effects.
2. Analyze the impact of channel engineering and source/drain engineering on device performance.
3. Explore the design of multigate transistors and their advantages over single gate MOSFETs.
4. Evaluate the characteristics of silicon nanowire and carbon nanotube MOSFETs, as well as molecular transistors.
5. Investigate the effects of radiation on SOI MOSFETs and the design of digital, analog, and RF circuits using nano-devices.

Subject Code	MODELING OF FIELD-EFFECT NANO DEVICES	L:T:P	Credits
BTOE-096		3:1:0	03

Course Outcome (CO): The Students will be able to	
CO1	Develop models for MOS electrostatics and analyze MOSFET current-voltage characteristics.
CO2	Design double gate MOS systems and analyze their performance using various parameters.
CO3	Understand the characteristics and design of carbon nanotube and molecular transistors.
CO4	Analyze the effects of radiation on SOI MOSFETs and the performance tradeoffs in digital and analog circuit design.
CO5	Apply the knowledge gained in the course to develop new and innovative field-effect nano devices.

Syllabus

UNIT–I

MOSFET scaling, short channel effects - channel engineering - source/drain engineering - high k dielectric - copper interconnects -strain engineering, SOI MOSFET, multigate transistors – single gate – double gate – triple gate – surround gate, quantum effects – volume inversion – mobility – threshold voltage – inter subband scattering, multigate technology – mobility – gate stack.

UNIT–II

MOS Electrostatics – 1D – 2D MOS Electrostatics, MOSFET Current- Voltage Characteristics – CMOS Technology – Ultimate limits, double gate MOS system – gate voltage effect - semiconductor thickness effect – asymmetry effect – oxide thickness effect – electron tunnel current – two dimensional confinement, scattering – mobility.

UNIT–III

Silicon nanowire MOSFETs – Evaluvation of I-V characteristics – The I-V characteristics for nondegenerate carrier statistics – The I-V characteristics for degenerate carrier statistics – Carbon nanotube –Band structure of carbon nanotube – Band structure of graphene – Physical structure of nanotube – Band structure of nanotube – Carbon nanotube FETs – Carbon nanotube MOSFETs – Schottky barrier carbon nanotube FETs – Electronic conduction in molecules – General model for ballistic nano transistors – MOSFETs with 0D, 1D, and 2D channels – Molecular transistors – Single electron charging – Single electron transistors.

UNIT–IV

Radiation effects in SOI MOSFETs, total ionizing dose effects – single-gate SOI – multi-gate devices, single event effect, scaling effects.

UNIT–V

Digital circuits – impact of device performance on digital circuits –leakage performance trade off – multi VT devices and circuits –SRAM design, analog circuit design – trans conductance - intrinsic gain – flicker noise – self heating –band gap voltage reference – operational amplifier –comparator designs, mixed signal – successive approximation DAC, RF circuits.

BOOKS AND REFERENCES

1. J P Colinge, "FINFETs and other multi-gate transistors", Springer – Series on integrated circuits and

systems, 2008
2. Mark Lundstrom, Jing Guo, "Nanoscale Transistors: Device Physics, Modeling and Simulation", Springer, 2006
3 .M S Lundstorm, "Fundamentals of Carrier Transport", 2nd Ed., Cambridge University Press, Cambridge UK, 2000

[BTOE-097]MODELLING AND SIMULATION OF DYNAMIC SYSTEMS

Course Objective : Students undergoing this course are expected to

1. Introduce the concepts of modeling and simulation of dynamic systems
2. Understand bond graph modeling and its application in mechanical, thermal, hydraulic, and electrical systems
3. Explore system models of combined systems and their linearity/non-linearity
4. Study dynamic response and system transfer functions, and analyze their performance measures
5. Learn simulation techniques and applications using SIMULINK and optimization techniques.

Subject Code	MODELLING AND SIMULATION OF DYNAMIC SYSTEMS	L:T:P	Credits
BTOE-097		3:1:0	03

Course Outcome (CO): The Students will be able to	
CO1	Ability to model and simulate dynamic systems using MATLAB and Bond Graph modeling
CO2	Proficiency in modeling mechanical, thermal, hydraulic, and electrical systems using Bond Graph modeling
CO3	Understanding of combined system models and linearity/non-linearity of the systems
CO4	analyze and evaluate dynamic response and system transfer functions and their performance measures
CO5	Proficiency in using SIMULINK for simulation, validation and verification of simulation models, and optimization techniques for system identifications.

SYLLABUS

UNIT–I

I**ntroduction to modeling and simulation:** Introduction to modeling, Examples of models, modeling of dynamic system, Introduction to simulation, MATLAB as a simulation tool, Bond graph modeling, causality, generation of system equations.

UNIT–II

Bond graph modeling of dynamic system: Methods of drawing bond graph model- Mechanical systems & Electrical systems, some basic

system models- Mechanical systems, Thermal systems, hydraulic systems, pneumatic systems and

electrical systems.

UNIT–III

System models of combined systems: Linearity and non-linearity in systems combined rotary and translatory system, electro mechanical system, hydro- mechanical system.

UNIT–IV

Dynamic Response and System Transfer Function: Dynamic response of 1st order system and 2nd order system, performance measures for 2nd order system, system transfer function, transfer function of 1st and 2nd order system Block diagram algebra, signal flow diagram, state variable formulation, frequency response and bode plots.

BOOKS AND REFERENCES

1. Zeigler B.P. Praehofer. H. and Kim I.G. "Theory of modeling and simulation", 2nd Edition. Academic press 2000.
2. Robert L. Woods, Kent L. Lawrence, “Modeling and simulation of dynamic systems”, Person, 1997.
3. Brown, Forbes T. “Engineering System Dynamics”, New York, NY: CRC, 2001. ISBN: 9780824706166.
4. Pratab.R " Getting started with MATLAB" Oxford university Press 2009.

CO-PO Matrix

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	2	1	-	-	-	3	2	3
CO2	3	3	3	3	3	1	-	-	-	3	2	3
CO3	3	3	3	2	2	2	-	-	-	3	1	3
CO4	3	2	2	2	2	2	-	-	-	2	1	3
CO5	3	3	3	3	2	2	-	-	-	2	1	3
Avg	**3**	**2.8**	**2.8**	**2.6**	**2.2**	**1.6**	**-**	**-**	**-**	**2.6**	**1.4**	**3**