J. S. UNIVERSITY SHIKOHABAD

EVALUATION SCHEME & SYLLABUS

FOR

B. TECH. FOURTH YEAR

ELECTRONICS ENGINEERING

[Effective from the Session: 2021-22]

B.Tech. VII Semester
Electronics and Communication Engineering

S. No.	Course Code	Course Title	Periods			Evaluation Scheme				End Semester		Total	Credits
			L	T	P	CT	TA	Total	PS	TE	PE		
1.	BTHU701	Rural development : administration and 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
4.		Open Elective-II	3	0	0	30	20	50		100		150	3
5.	BTEC751	Lab for Department Elective -	0	0	2				25		25	50	1
6.	BTEC752	Mini Project or Internship Assessment**	0	0	2				50			50	1
7.	BTEC753	Project I	0	0	8				150			150	4
		Total										**850**	**18**

Course Code	**Course Title**
	Department Elective-IV
BTEC703	Digital Image Processing
BTEC704	VLSI Design
	Department Elective-V
BTEC705	Optical Network
BTEC706	Microwave & Radar Engineering

Open Elective-II

BTOE-071	FILTER DESIGN
BTOE-072	BIOECONOMICS
BTOE-073	MACHINE LEARNING
BTOE-074	RENEWABLE ENERGY RESOURCES
BTOE-075	OPERATIONS RESEARCH
BTOE-076	VISION FOR HUMANE SOCIETY
BTOE-077	DESIGN THINKING
BTOE-078	SOIL AND WATER CONSERVATION ENGINEERING
BTOE-079	INTRODUCTION TO WOMEN'S AND GENDER STUDIES

Course Code	***Elective Lab**
BTEC751	Digital Image Processing Lab
BTEC752	VLSI Design Lab
BTEC753	Optical System and Networking Lab
BTEC754	Microwave & Radar Engineering Lab

***Students will opt one subject from the list of Department Elective-IV with its corresponding lab. i.e. if someone has opted Digital Image Processing from Department Elective-IV then it will be mandatory to opt the DIP Lab

B.Tech. VIII Semester
Electronics and Communication Engineering

S. No.	Course Code	Course Title	Periods			Evaluation Scheme				End Semeste		Total	Credits
			L	T	P	CT	TA	Total	PS	TE	PE		
1.	BTHU802	Project management & Enterpreneurship	3	0	0	30	20	50		100		150	3
2.	BTOE081-090	Open Elective –III	3	0	0	30	20	50		100		150	3
3.	BTOE091-097	Open Elective –IV	3	0	0	30	20	50		100		150	3
4.	BTEC851	Project II	0	0	18				100		300	400	9
		Total										**850**	**18**

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

** It is mandatory that for these subjects only Trained Faculty (who had done the FDP for these courses) will teach the courses.

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

B.Tech 4rd Year
VII Semester
Syllabus

BTHU701	**RURAL DEVELOPMENT: ADMINISTRATION AND PLANNING**	**3L:0T:0P**	**3 Credits**

Unit	**Topics**	**Lectures**
I	**Rural Planning & Development:** Concepts of Rural Development, Basic elements of rural Development, and Importance of Rural Development for creation of Sustainable Livelihoods, An overview of Policies and Programmes for Rural Development- Programmes in the agricultural sector, Programmes in the Social Security, Programmes in area of Social Sector.	8
II	**Rural Development Programmes:** Sriniketan experiment, Gurgaon experiment, marthandam experiment, Baroda experiment, Firkha development scheme, Etawa pilot project, Nilokheri experiment,approaches to rural community development: Tagore, Gandhi etc	8
III	**Panchayati Raj & Rural Administration:** Administrative Structure: bureaucracy, structure of administration; Panchayati Raj Institutions Emergence and Growth of Panchayati Raj Institutions in India; People and Panchayati Raj; Financial Organizations in Panchayati Raj Institutions, Structure of rural finance, Government & Non-Government Organizations / Community Based Organizations, Concept of Self help group.	8
IV	**Human Resource Development in Rural Sector:** Need for Human Resource Development, Elements of Human Resource Development in Rural Sector Dimensions of HRD for rural development-Health, Education, Energy, Skill Development, Training, Nutritional Status access to basic amenities - Population composition.	8
V	**Rural Industrialization and Entrepreneurship:** Concept of Rural Industrialization, Gandhian approach to Rural Industrialization, Appropriate Technology for Rural Industries, Entrepreneurship and Rural Industrialization-Problems and diagnosis of Rural Entrepreneurship in India, with special reference to Women Entrepreneurship; Development of Small Entrepreneurs in India, need for and scope of entrepreneurship in Rural area.	8

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.

COURSE OUTCOME: After completion of the course student will be able to:

1. Students can understand the definitions, concepts and components of Rural Development
2. Students will know the importance, structure, significance, resources of Indian rural economy.
3. Students will have a clear idea about the area development programmes and its impact.
4. Students will be able to acquire knowledge about rural entrepreneurship.
5. Students will be able to understand about the using of different methods for human resource planning

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**

BTEC701	Digital Image Processing	3L:0T:0P	3 Credits

Unit	Topics	Lectures
I	**Introduction:** Overview of Image Processing, Application area of image processing, Digital Image Representation, Types of images, Digital Image Processing Operations, Fundamental steps in DIP, Overview of Digital Image Systems, Physical Aspect of Image Acquisition, biological Aspect of Image Acquisition, sampling & quantization, Digital Halftone Process, Image storage and File formats.	8
II	**Image Enhancement:** Need for image enhancement, Image enhancement operations, Image enhancement in spatial domain, histogram based techniques, Spatial Filtering concepts, Image smoothing and sharpening spatial and frequency domain filters, homomorphic filtering. **Image Restoration:** Introduction to degradation, types of Image degradations, image degradation models, noise modeling, estimation of degradation functions, Image restoration in presence of noise only, periodic noise and band pass and band reject filtering, difference between enhancement & restoration, Image restoration techniques.	8
III	**Image Transforms:** Need for image transforms, Properties of Fourier transform, Discrete cosine transform, Discrete sine transform, Hadamard transform, Haar transform, Slant transform, SVD and KL transforms.	8
IV	**Image Compression:** Image compression model, type of redundancy, compression algorithms and its types, lossless compression algorithms, lossy compression algorithms, image and video compression standards.	8
V	**Image Segmentation:** Introduction, Detection of Discontinuities, Edge Detection, Hough Transforms and Shape Detection, corner detection, Principle of thresholding, Principle of region - growing.	8

Text Book:

1. Rafael C. Gonzalez Richard E woods Steven L. Eddins, ‘‘Digital Image Processing’’, Mc Graw Hill, 3rd Edition, 2008.
2. Anil K Jain, “Fundamentals of Digital Image Processing”, Prentice-Hall of India Pvt. Ltd, 1989.

Reference Books:

1. Jayaraman, “Digital Image Processing”, Tata Mc Graw hill Education, India, 2009.
2. S. Sridhar, “Digital Image Processing”, OXFORD University Press, Second Edition, 2011.

Course Outcomes: At the end of this course students will demonstrate the ability to:

1. Describe the concept and need for image processing.
2. Implement the various techniques for image enhancement and restoration both in spatial and frequency domains.
3. Interpret the various types of image transforms and their properties.
4. Distinguish between lossless and lossy image compression algorithms and examine their performances in spatial and frequency domains.
5. Examine the various image segmentation techniques.

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**

BTEC702	VLSI Design	3L:0T:0P	3 Credits

Unit	Topics	Lectures
I	**Introduction:** VLSI Design flow, general design methodologies; critical path and worst case timing analysis, overview of design hierarchy, layers of abstraction, integration density and Moore's law, VLSI design styles, packaging, CMOS Logic, Propagation Delay definitions, sheet resistance.	8
II	**Interconnect Parameters:** Resistance, Inductance, and Capacitance, skin effect and its influence , lumped RC Model, the distributed RC Model, transient Response, RC delay model, Linear Delay Model, Logical Effort of Paths, Scaling.	8
III	**Dynamic CMOS design:** steady-state behavior of dynamic gate circuits, noise considerations in dynamic design, charge sharing, cascading dynamic gates, domino logic, np-CMOS logic, problems in single-phase clocking, two-phase non-overlapping clocking scheme, Sequential CMOS Logic Circuits, Layout design.	8
IV	**Semiconductor Memories:** Dynamic Random Access Memories (DRAM), Static RAM, non-volatile memories, flash memories, Pipeline Architecture. Low – Power CMOS Logic Circuits: Introduction, Overview of Power Consumption, Low – Power Design through voltage scaling,	8
V	**Introduction to Testing:** Faults in digital circuits. Modeling of faults, Functional Modeling at the Logic Level, Functional Modeling at the Register, Structural Model and Level of Modeling. Design for Testability, Ad Hoc Design for Testability Techniques, Controllability and Observability, Introduction to Built-in-self-test (BIST) Concept.	8

Text Book:

1. Sung-Mo Kang & Yosuf Leblebici, “CMOS Digital Integrated Circuits: Analysis & Design”,Mcgraw Hill, 4th Edition.
2. Neil H.E.Weste, David Money Harris, “CMOS VLSI Design – A circuits and Systems Perspective” Pearson, 4th Edition.
3. D. A. Pucknell and K. Eshraghian, “Basic VLSI Design: Systems and Circuits”, PHI, 3rd Ed.,1994.

Reference Books:

1. R. J. Baker, H. W. Li, and D. E. Boyce , " CMOS circuit design, layout, and simulation", Wiley-IEEE Press,2007.
2. M. Abramovici, M.A. Breuer and A.D. Friedman, "Digital Systems and Testable Design" , Jaico Publishing House.

Course Outcomes: At the end of this course students will demonstrate the ability to:

1. Express the concept of VLSI design and CMOS circuits and delay study.
2. Analyze mathematical methods and circuit analysis models in analysis of CMOS digital electronics circuits.
3. Design and analyze various combinational & sequential circuits based on CMOS technology.
4. Examine power logic circuits and different semiconductor memories used in present day technology.
5. Interpret faults in digital circuits, Fault Models and various Testing Methodologies.

CO-PO Matrix												
Course Outcome	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	2	3	3	-	-	-	-	-	2	3
CO2	3	3	2	3	3	-	-	-	-	-	2	3
CO3	3	3	2	3	3	-	-	-	-	-	2	2
CO4	3	3	2	3	3	-	-	-	-	-	1	2
Avg	**3.00**	**3.00**	**2.00**	**3.00**	**3.00**	**-**	**-**	**-**	**-**	**-**	**1.75**	**2.50**

BTEC703	Optical Networks	3L:0T:0P	3 Credits

Unit	Topics	Lectures
I	Introduction to Optical Network:- Optical Networks: multiplexing techniques, second generation optical networks. The optical layer, optical packet switching. Transmission Basics: wavelength, frequencies and channel spacing, wavelength standards. Non linear Effects: Effective length and area, stimulated brillouin scattering, stimulated raman scattering, Propagation in a non linear medium, self phase modulation, cross phase modulation Four wave mixing	8
II	Components:-Couplers: Principles of operation, Conservation of energy, Isolators and circulators: Principles of operation Multiplexers and filters: Gratings, diffraction pattern, Bragg grating, Fiber gratings, Fabry-perot filters, multilayers dielectric thin – film filters, Mach-Zehnder interferometers, Arrayed waveguide grating, Acousto-optic tunable filter, High channel count multiplexer Architecture. Switching : large optical switches, Optical switch Technologies, large electronic switches wavelength converters: Optoelectronic Approch , optical grating, interferometric techniques wave mixing. Crosstalk: Intra-channel crosstalk, interchannel crosstalk, crosstalk in Networks, Bidirectional system crosstalk reduction.	8
III	Networks- SONET/SDH: Multiplexing, SONET/SDH layers, SONET Frame structure, SONET/SDH physical layer, Elements of a SONET/SDH infrastructure. ATM: Function of ATM, Adaptation layers, Quality of service. IP: Routing and forwarding, QOS, WDM Network elements: Optical line terminals, Optical line amplifiers, Optical add/Drop multiplexers: Architecture, reconfigurable OADMS, Optical cross connects: All optical OXC configuration	8
IV	WDM Network Design Cost Trade-offs, Light path Topology Design, and Routing and wavelength assignment problems, Dimensioning Wavelength Routing Networks, Network Survivability, Basic Concepts, Protection in SONET/SDH, Protection in client layer, Optical Layer Protection, Different Schemes, Interworking between Layers, Access Networks, Network Architecture Overview, Enhanced HFC, FTTC, PON evolution	8
V	Optical Switching, OTDM, Synchronization, Header Processing, Buffering, Burst Switching, Deployment Considerations- SONET/SDH core Network	8

Text Books:

1. R. Ramaswami, & K. N. Sivarajan, “Optical Networks a Practical perspective”,Morgan Kaufmann Publishers, 3rd Ed.
2. U. Black, “Optical Networks: Third Generation Transport Systems”/ PearsonEducations

Reference Books:

1. Biswanath Mukherjee “Optical WDM Networks” Springer Pub 2006

Course Outcomes: At the end of this course students will demonstrate the ability to:

1. Express the multiplexing techniques, second generation optical networks, optical layer, and optical packet switching.
2. Explain the concept of Principles of operation, Conservation of energy, Isolators and Circulators: Principles of operation.
3. Classify the basics of Multiplexing, SONET/SDH layers, SONET Frame structure, SONET/SDH physical layer, Elements of a SONET/SDH infrastructure.
4. Interpret the knowledge of Routing and wavelength assignment problems, Dimensioning Wavelength Routing Networks, Network Survivability.
5. Analyse the working of OTDM, Synchronization, Header Processing, Buffering, Burst Switching, Deployment Considerations- SONET/SDH core Network.

CO-PO Matrix												
Course Outcome	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	1	1	-	-	-	-	-	-	1	2
CO2	3	3	3	2	2	1	1	-	-	-	1	3
CO3	3	3	3	3	2	1	1	1	2	2	1	3
CO4	3	3	3	1	1	1	1	-	-	-	-	3
CO5	3	3	3	3	2	1	1	1	1	1	1	3
Avg	**3.00**	**3.00**	**2.60**	**2.00**	**1.75**	**1.00**	**1.00**	**1.00**	**1.50**	**1.50**	**1.00**	**2.80**

BTEC704	Microwave & Radar Engineering	3L:0T:0P	3 Credits

Unit	Topics	Lectures
I	**Transmission Line:** Transmission line equations & solutions, reflection and transmission coefficient, standing wave, standing wave ratio, line impedance and admittance, Introduction to strip lines, Microstrip Transmission line (TL). **Wave Guide:** Rectangular Wave guide -Field Components and Parameters, TE, TM Modes, Dominant Mode, Circular Waveguides: TE, TM modes. Wave Velocities, Wave guide Cavities.	10
II	**Passive microwave devices:** Microwave Junctions and Couplers, Scattering Matrix, Passive microwave devices: Microwave Hybrid Circuits, Terminations, Attenuators, Phase Shifters, Microwave Propagation in ferrites, Faraday Rotation, Isolators, Circ ulators. S parameter analysis of all components.	8
III	**Microwave tubes :** Microwave Tubes: Limitation of Conventional Active Devices at Microwave frequency, Two Cavity Klystron, Reflex Klystron, Magnetron, Traveling Wave Tube, Backward Wave Oscillators: Their Schematic, Principle of Operation, Performance Characteristic and their applications.	7
IV	**Microwave Measurements:** Measurement of Insertion Loss, Frequency, Cavity Q, Dielectric Constant, Scattering Parameters, Noise Factors, Return Loss, Impendence; VSWR Metering and Measurement, High Power Measurement; Power Meters, Microwave Amplifiers.	7
V	**Introduction to RADAR systems:** RADAR Block diagram, RADAR Range equation, Probability of detection of false alarm, Integration of RADAR pulses, RADAR cross section of targets, MTI RADAR, CW RADAR.	8

Text Books:

1. Liao, S.Y., " Microwave Devices & Circuits", 3rd Edition, Prentice Hall of India Publication, 1995.
2. Sushrut Das, "Microwave Engineering", 1st Edition, Oxford University Publication, 2015.
3. M.I. Skolnik, "Introduction to Radar Engineering ", 3rd Edition, Tata McGraw Hill Publication, 2001.

Reference Books:

1. A Das and S.K. Das, "Microwave Engineering", 1st Edition, Tata McGraw Hill Publication, 2000.

Course Outcomes: At the end of this course students will demonstrate the ability to:

1. Analyze various parameters and characteristics of the transmission line and waveguide and also use of wave guide component as per applications.
2. Describe, analyze and design simple microwave circuits and devices e g couplers, Attenuators, Phase Shifter and Isolators. Student will also understand the microwave propagation in ferrites.
3. Analyze the difference between the conventional tubes and the microwave tubes for the transmission of the EM waves.
4. Acquire knowledge about the handling and measurement of microwave equipment.
5. Differentiate different Radars, find applications and use of its supporting systems.

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**

OPEN ELECTIVES-II

[071]FILTER DESIGN

Course Objective : Students undergoing this course are expected to

1. Understand about the characteristics of different filters.
2. Understand the concept of Approximation Theory.
3. Learn about the switched capacitor filter.
4. Learn the principles of analog and digital filter design.
5. Develop skills in implementing and testing filter designs.

Subject Code	FILTER DESIGN	L:T:P	Credits
BTOE-071		3:0:0	03

Course Outcome (CO): The Students will be able to	
CO1	Choose an appropriate transform for the given signal.
CO2	Choose appropriate decimation and interpolation factors for high performance filters.
CO3	Model and design an AR system.
CO4	Implement filter algorithms on a given D S P processor platform.

SYLLABUS

UNIT–I

Introduction: Fundamentals, Types of filters and descriptive terminology, why we use Analog Filters, Circuit elements and scaling, Circuit simulation and modelling.

Operational amplifiers: Op-amp models, Op-amp slew rate, Operational amplifiers with resistive feedback: Non inverting and Inverting, Analysing Op-amp circuits, Block diagrams and feedback, The Voltage follower, Addition and subtraction, Application of Op-amp resistor circuits.

UNIT-II

First order filter: Bilinear transfer functions and frequency response– Bilinear transfer function and its parts, realization of passive elements, Bode plots, Active realization, The effect of A(s), cascade design.

UNIT-III

Second order low pass and band pass filters: Design parameters, Second order circuit, frequency response of low pass and band pass circuits, Integrators and others biquads.

UNIT-IV

Second order filters with arbitrary transmission zeros: By using summing, By voltage feed forward, cascade design revisited.

Low pass filters with maximally flat magnitude: the ideal low pass filter, Butter worth response, Butterworth pole locations, low pass filter specifications, arbitrary transmission zeros.

UNIT-V

Low pass filter with equal ripple (Chebyshev) magnitude eresponse: The chebyshev polynomial ,The chebyshev magnitude response, Location of chebyshev poles, Comparison of maximally flat & equal–ripple responses, Chebyshev filter design

Inverseche by shev and cauer filters: Inverseche by shev response, From specifications to pole and zero locations, Cauer magnitude response, Chebyshev rational functions, Cauer filter design.

BOOKS AND REFERENCES

1. Rolf. Schaumann, Haiqiao Xiao, Mac.E.VanValkenburg,"AnalogFilterDesign",2ndIndianEdition, Oxford University Press.
2. J.MichaelJacob,"ApplicationsandDesignwithAnalogIntegratedCircuits",Secondedition,Pearson.
3. T. Deliyannis, Yichuang Sun, J.K.Fidler,"Continuous-Time Active Filter Design", CRC Press.

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**

[BTOE-072] BIO ECONOMICS

Course Objective : Students undergoing this course are expected to	
1.	Develop an understanding of bio economics and its interdisciplinary nature.
2.	Learn the principles of sustainable resource management and conservation.
3.	Analyze the economic impact of biotechnology and biodiversity.
4.	Explore the relationship between agriculture, environment, and the economy.
5.	Develop skills in analyzing and solving bio economic problems.

Subject Code	**BIO ECONOMICS**	**L:T:P**	**Credits**
BTME-704		**3:0:0**	**03**

Course Outcome (CO): The Students will be able to	
CO1	understand basic concept of Bio economics, challenges, opportunities & regulations
CO2	understand development and innovation in terms of bio economy towards sustainable development
CO3	understand Inter-and trans disciplinarily in bio economy & research approaches
CO4	Explain biobased resources, value chain, innovative use of biomass and biological knowledge to provide food, feed, industrial products

SYLLABUS

UNIT–I

Introduction: Fundamentals, Types of filters and descriptive terminology, why we use Analog Filters, Circuit elements and scaling, Circuit simulation and modelling.

Operational amplifiers: Op-amp models, Op-amp slew rate, Operational amplifiers with resistive feedback: Non inverting and Inverting, Analysing Op-amp circuits, Block diagrams and feedback, The Voltage follower, Addition and subtraction, Application of Op-amp resistor circuits.

UNIT-II

Economic Growth, Development, and Innovation in terms of bio-economy, Environmental Economics and the Role of Government, Modelling and Tools Supporting the Transition to a Bio economy, Role of bio based Economy in sustainable development.

UNIT-III

Inter-and transdisciplinarity in Bio-economy &research approaches, primary production, processing of bio based resources, Markets, Sustainability Management and Entrepreneurship in bio based products.

UNIT-IV

Bio based Resources and Value Chains, Processing of Bio based Resources, Markets, Sustainability Management and Entrepreneurship opportunity in bio based product. Food Security and Healthy Nutrition in the Context of the Bio economy, Use of Biomass for the Production of Fuel and Chemicals, The importance of Bio technology for the Bio economy.

UNIT-V

sustainable and innovative use of biomass and biological knowledge to provide food, feed, industrial products, bio energy and ecological services, importance of bio economy-related concepts in public, scientific, and political discourse, Dynamic Management of Fossil Fuel, Bio fuel.

BOOKS AND REFERENCES

1. Principles of Bio economics by I. Sundar, Vedamse Books(P)Ltd New Delhi, India
2. Bio economy: Shaping the Transition to a Sustainable, Bio based Economy by Iris Lewandowski, Springer.
3.Sociobiology and Bio economics by Koslowski, Peter
4. Modeling, Dynamics, Optimization and Bio economics I, by Pinto, Alberto Adrego, Zilberman, David, Springer.

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**

[BTOE-073]MACHINE LEARNING

Course Objective : Students undergoing this course are expected to

1. Understand the basics of machine learning and design a learning system.
2. Learn the concept learning task and the decision tree learning algorithm.
3. Gain knowledge about artificial neural networks, evaluating hypotheses, and Bayesian learning.
4. Explore computational learning theory, instance-based learning, and genetic algorithms.
5. Learn about learning first-order rules, reinforcement learning, and their applications.

Subject Code	MACHINE LEARNING	L:T:P	Credits
BTME-073		3:0:0	03

Course Outcome (CO): The Students will be able to	
CO1	Understand the basics of machine learning and design a learning system.
CO2	Learn the concept learning task and the decision tree learning algorithm.
CO3	Gain knowledge about artificial neural networks, evaluating hypotheses, and Bayesian learning.
CO4	Explore computational learning theory, instance-based learning, and genetic algorithms.
CO5	Learn about learning first-order rules, reinforcement learning, and their applications. Course Outcom

SYLLABUS

UNIT–I

INTRODUCTION– Well defined learning problems, Designing a Learning System, Issues in Machine Learning; THE CONCEPT LEARNINGTASK- General-to-specific ordering of hypotheses, Find-S, List then eliminate algorithm, Candidate elimination algorithm, Inductive bias.

UNIT-II

DECISION TREE LEARNING-Decision tree learning algorithm-Inductive bias-Issues in Decision tree learning; ARTIFICIAL NEURAL NETWORKS– Perceptrons ,Gradient descent and the Delta rule, Adaline, Multi- layer networks, Derivation of back propagation rule Back propagation Algorithm Convergence, Generalization.

UNIT-III

Evaluating Hypotheses: Estimating Hypotheses Accuracy, Basics of sampling Theory, Comparing Learning Algorithms; Bayesian Learning: Bayes theorem, Concept learning, Bayes Optimal Classifier, Naïve Bayes classifier, Bayesian belief networks, EM algorithm.

UNIT-IV

Computational Learning Theory: Sample Complexity for Finite Hypothesis spaces, Sample Complexity for Infinite Hypothesis spaces, The Mistake Bound Model of Learning; INSTANCE-BASEDLEARNING–k-Nearest Neighbour Learning, Locally Weighted Regression, Radial basis function networks, Case-based learning.

UNIT-V

Genetic Algorithms: an illustrative example, Hypothesis spacesearch, Genetic Programming, Models of Evolution and Learning; Learning first order rules- sequential covering algorithms-General to specific beam search-FOIL;REINFORCEMENTLEARNING-The Learning Task, Q learning.

BOOKS AND REFERENCES

1. TomM. Mitchell,—Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.
2. Ethem Alpaydin,—Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press 2004.
3. Stephen Marsland, —Machine Learning: An Algorithmic Perspective, CRC Press, 2009.
4. Bishop, C. ,Pattern Recognition and Machine Learning. Berlin: Springer-Verlag.

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**

[BTOE-074] RENEWABLE ENERGY RESOURCES

Course Objective : Students undergoing this course are expected to

1. Understand non-conventional energy resources and their classification.
2. Learn the theory, materials, and limitations of solar cells and thermal energy.
3. Explore geothermal energy, MHD, fuel cells, wind energy, and bio-mass.
4. Study thermo-electrical and thermionic conversions, OTEC, and waste recycling.
5. Analyze the performance and limitations of renewable energy conversion systems.

Subject Code	RENEWABLE ENERGY RESOURCES	L:T:P	Credits
BTME-074		3:0:0	03

Course Outcome (CO): The Students will be able to	
CO1	classify and analyze non-conventional energy resources.
CO2	Knowledge of solar cells, thermal energy, and limitations.
CO3	Understanding of geothermal energy, MHD, fuel cells, and wind energy.
CO4	Familiarity with thermo-electrical and thermionic conversions, OTEC, and waste recycling.
CO5	Capacity to analyze the performance and limitations of renewable energy systems.

SYLLABUS

UNIT–I

Introduction: Various non-conventional energy resources- Introduction, availability, classification, relative merits and demerits. Solar Cells: Theory of solar cells .Solar cell materials, solar cell array, solar cell power plant, limitations.

UNIT-II

Solar Thermal Energy: Solar radiation, flat plate collectors and their materials, applications and performance, focusing of collectors and their materials, applications and performance; solar thermal power Plants, thermal energy storage for solar heating and cooling, limitations.

UNIT-III

Geothermal Energy: Resources of geothermal energy, thermodynamics of geo- thermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations. Magneto-hydrodynamics (MHD): Principle of working of MHD Power plant, performance and limitations. Cells: Principle of working of various types of fuel cells and their working, Performance and limitations.

UNIT-IV

Thermo-electrical and thermionic Conversions: Principle of working, performance and limitations. Wind Energy: Wind power and its sources, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics. Performance and limitations of energy conversion systems.

UNIT-V

Bio-mass: Availability of bio-mass and its conversion theory. Ocean Thermal Energy Conversion (OTEC): Availability, theory and working principle, performance and limitations. Wave and Tidal Wave: Principle of working, performance and limitations. Waste Recycling Plants.

BOOKS AND REFERENCES

1. Raja etal,"Introduction to Non-Conventional Energy Resources"Scitech Publications.
2. JohnTwideuandTonyWeir,"RenewalEnergyResources"BSPPublications,2006.
3. M.V.R. Koteswara Rao, "Energy Resources: Conventional &Non-Conventional" BSPPublications,2006.
4. D.S.Chauhan,"Non-conventionalEnergyResources"NewAgeInternational.
5. C.S.Solanki,"RenewalEnergyTechnologies:APracticalGuideforBeginners"PHILearning.
6. Peter Auer ,"Advances in Energy System and Technology". Vol.1&IIEditedbyAcademic Press.
7. Godfrey Boyle," Renewable Energy Power for a Sustainable Future", Oxford University Press.

CO-PO Matrix

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1			1						1
CO2	3	3	1		1							3
CO3	3	3	1	1	1							3
CO4	3	3	1	2	1	1						3
CO5	2	3	1		1	1						3
Avg	2.60	2.80	1.00	1.50	1.00	1.00						2.60

[BTOE-075]OPERATIONS RESEARCH

Course Objective : Students undergoing this course are expected to

1. Understand the definition, scope and phases of operations research.
2. Learn about linear programming, transportation and assignment problems, and network techniques.
3. Study project management and the theory of games.
4. Understand queuing models, quality systems, inventory control, and replacement models.
5. Develop skills to solve complex problems using OR models.

Subject Code	OPERATIONS RESEARCH	L:T:P	Credits
BTME-075		3:0:0	03

Course Outcome (CO): The Students will be able to	
CO1	apply operations research techniques to solve real-world problems.
CO2	Understanding of linear programming, transportation, and assignment problems, and their applications.
CO3	Knowledge of project management and network techniques.
CO4	Familiarity with queuing models, quality systems, inventory control, and replacement models.
CO5	Improved problem-solving skills and ability to model and analyze complex systems.

SYLLABUS

UNIT–I

Introduction: Definition and scope of operations research (OR),OR model, solving the OR model, art of modelling, phases of OR study. Linear Programming: Two variable Linear Programming model and Graphical method of solution, Simplex method, Dual Simplex method, special cases of Linear Programming, duality, sensitivity analysis.

UNIT-II

Transportation Problems: Types of transportation problems, mathematical models, transportation algorithms, Assignment: Allocation and assignment problems and models, processing of job through machines.

UNIT-III

Network Techniques: Shortest path model, minimum spanning Tree Problem, Max-Flow problem and Min-cost problem. Project Management: Phases of project management, guidelines for network construction, CPM and PERT

UNIT-IV

Theory of Games: Rectangular games, Minimax theorem, graphical solution of 2xnormx2 games, game with mixed strategies, reduction to linear programming model. Quality Systems: Elements of Queuing model, generalized Poisson queuing model, single server models.

UNIT-V

Inventory Control: Models of inventory, operation of inventory system, Quantity discount. Replacement: Replacement models: Equipments that Deteriorate with time, equipments that fail with time.

BOOKS AND REFERENCES
1. WayneL.Winston,"OperationsResearch"ThomsonLearning,2003. 2. HamdyH.Taha,"OperationsResearch-AnIntroduction"PearsonEducation,2003. 3. R.PanneerSeevam,"OperationsResearch"PHILearning,2008. 4. V.K.Khanna,"TotalQualityManagement"NewAgeInternational,2008

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**

[BTOE-076]VISION FOR HUMANE SOCIETY

Course Objective : Students undergoing this course are expected to

1. To help the students to understand the importance and types of relationship with expressions.
2. To develop the competence to think about the conceptual frame work of undivided society as well as universal human order.
3. To help the students to develop the exposure for transition from current state to the undivided society and universal human order.
4. Analyze the challenges faced by society and individuals.
5. Explore the role of vision and leadership in creating a humane society.

Subject Code	VISION FOR HUMANE SOCIETY	L:T:P	Credits
BTME-704		3:0:0	03

Course Outcome (CO): The Students will be able to	
CO1	systematic and rational study of the human being vis-à-vis the rest of existence.
CO2	do's and do n'ts related to values.
CO3	a process of self-investigation and self-exploration, and not of giving sermons. Whatever is found as truth or reality is stated as a proposal and the students are facilitated and encouraged to verify it in their own right, based on their Natural Acceptance and subsequent Experiential Validation.
CO4	process of self-exploration takes the form of a dialogue between the teacher and the students to begin with, and then to continue with in the student leading to continuous self-evolution.
CO5	self-exploration also enables them to critically evaluate their pre- conditionings and present beliefs.

SYLLABUS

UNIT–I

Introduction to the course: Basic aspiration of a Human Being and program for its fulfilment, Need for family and relationship for a Human Being, Human-relationship and role of work in its fulfillment ,Comprehensive Human Goal, Need for Undivided Society, Need for Universal Human Order, an appraisal of The Current State, Appraisal of Efforts in this Direction in Human History.

UNIT-II

Understanding Human- Human Relationship & its fulfilment: Recognition of Human-Human Relationship, Recognition of feelings in relationship, Established Values and Expressed Values in Relationship, interrelatedness of feelings and their fulfilment, Expression of feelings, Types of relationship and their purpose, mutual evaluation in relationship, Meaning of justice in relationship, Justice leading to culture, civilization and Human Conduct.

UNIT-III

Justice from family to world family order: Undivided Society as continuity and expanse of Justice in behavior – family to world family order, continuity of culture and civilization, Universal Order on the basis of Undivided Society, Conceptual Framework for Universal human order, Universal Human Order ascontinuityandexpanseoforderinliving:fromfamilyordertoworldfamily order, a conceptual frame work for universal human order.

UNIT-IV

Program for Ensuring Undivided Society and Universal Human Order: Education– Sanskar, Health Sanyam, Production-work, Exchange–storage, Justice-preservation.

UNIT-V

Human Tradition: Scope and Steps of Universal Human Order, Human Tradition (Ex. Family order to world family order), Steps for transition from the current state, Possibilities of participation of students in this direction, Present Efforts in this direction, Sum up.

BOOKS AND REFERENCES

1. A Foundation Course in Human Values and Profession Ethics(Text Book and Teachers' Manual),
2. R .R. Gaur, R. Asthana, G.P. Bagaria (2010), Excel Books, New Delhi.
3. Avartan sheel Arthshastra, A. Nagraj, Divya Path Sansthan, Amarkantak, India.
4. An Appeal by the DalaiL amato the World: Ethics Are More Important Than Religion, Dalai Lama XIV, 2015.
5. Economy of Permanence–(a quest for social order based on non-violence),J.C. Kumarappa (2010),Sarva- Seva-Sangh-Prakashan, Varansi, India.
6. Energy and Equity, Ivan Illich (1974), The Trinity Press, Worcester& Harper Collins, USA.

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**

[BTOE-077] DESIGN THINKING

Course Objective : Students undergoing this course are expected to

1. Develop an understanding of design thinking and its principles.
2. Learn the process of human-centered design and empathy building.
3. Analyze the different stages of the design thinking process.
4. Explore the applications of design thinking in solving complex problems.
5. Develop skills in applying design thinking to real-world design challenges.

Subject Code	DESIGN THINKING	L:T:P	Credits
BTME-704		3:0:0	03

Course Outcome (CO): The Students will be able to	
CO1	Develop a strong understanding of the design process and apply it in a variety of business settings
CO2	Analyze self, culture, teamwork to work in a multidisciplinary environment and exhibit empathetic behavior
CO3	Formulate specific problem statements of real time issues and generate innovative ideas using design tools
CO4	Apply critical thinking skills in order to arrive at the root cause from a set of likely causes
CO5	Demonstrate an enhanced ability to apply design thinking skills for evaluation of claims and arguments.

SYLLABUS

UNIT–I

Introduction to design thinking, traditional problem solving versus design thinking, history of design thinking, wicked problems. Innovation and creativity, the role of innovation and creativity in organizations, creativity in teams and their environments, design mindset. Introduction to elements and principles of design, 13Musical Notes for Design Mind set, Examples of Great Design, Design Approaches across the world.

UNIT-II

Understanding humans as a combination of I (self) and body, basic physical needs upto actualization, prosperity, the gap between desires and actualization. Understanding culture in family society, institution, startup, socialization process. Ethical behavior: effects on self, society, understanding core values and feelings, negative sentiments and how to overcome them, definite human conduct: universal human goal, developing human consciousness in values, policy, and character. Understand stakeholders, techniques to empathize, identify key user problems. Empathy tools-Interviews, empathy maps, emotional mapping, immersion and observations, customer journey maps, and brain storming, Classifying insight safter Observations, Classifying Stakeholders, Do's& Don'ts for Brain storming, Individual activity-'Moccas in walk'

UNIT-III

Defining the problem statement, creating personas, Point of View (POV) statements. Research-identifying drivers, information gathering, target groups, samples, and feedbacks. Idea Generation-basic design directions, Themes of Thinking, inspirations and references, brain storming, inclusion, sketching and presenting ideas, idea evaluation, double diamond approach, analyze – four W's, 5 why's, "How Might We", Defining the problem using Ice-Cream Sticks, Metaphor & Random Association Technique, Mind-Map, ideation activity games - six thinking hats, million-dollar idea, introduction to visual collaboration and brain storming tools-Mural, Jam Board

UNIT-IV

Fundamental concepts of critical thinking, the difference between critical and ordinary thinking, characteristics of critical thinkers, critical thinking skills-linking ideas, structuring arguments, recognizing incongruence, five pillars of critical thinking, argumentation versus rhetoric, cognitive bias, tribalism, and politics. Case study on applying critical thinking on different scenarios.

UNIT-V

The argument, claim, and statement, identifying premises and conclusion, truth and logic conditions, valid/invalid arguments, strong/weak arguments, deductive argument, argument diagrams, logical reasoning, scientific reasoning, logical fallacies, propositional logic, probability, and judgment, obstacles to critical thinking. Group activity/role plays on evaluating arguments.

BOOKS AND REFERENCES

1. Vijay Kumar, 101 Design Methods: A Structured Approach for DrivingI Innovation in Your Organization, 2013, John Wiley and Sons Inc, New Jersey
2. BP Banerjee, Foundations of Ethics andManagement,2005,ExcelBooks
3. Gavin Ambrose and Paul Harris,BasicsDesign08:DesignThinking,2010,AVAPublishingSA
4. Roger L. Martin, Design of Business: Why Design Thinking is the Next Competitive Advantage, 2009,Harvard Business Press, Boston M A

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**

[BTOE-078]SOIL AND WATER CONSERVATION ENGINEERING

Course Objective : Students undergoing this course are expected to

1. Understand the concept and scope of soil conservation engineering.
2. Learn about the various types and causes of soil erosion.
3. Study the methods of soil erosion control, including biological methods.
4. Gain knowledge about water conservation techniques and the economics of water resource utilization.
5. Understand the importance of floodplain management and methods of reducing the impact of flooding.

Subject Code	SOIL AND WATER CONSERVATION ENGINEERING	L:T:P	Credits
BTME-078		3:0:0	03

Course Outcome (CO): The Students will be able to	
CO1	Understand the importance and scope of soil conservation engineering.
CO2	Identify and analyze the various types and causes of soil erosion and their impact.
CO3	Gain knowledge about different methods of soil erosion control, including biological methods, and their effectiveness.
CO4	Apply the principles of water conservation and understand the economics of water resource utilization.
CO5	Understand the importance of floodplain management and be able to suggest methods for reducing the impact of flooding.

SYLLABUS

UNIT–I

Definition and scope of soil conservation, cause of soil erosion, Mechanism of erosion, universal soil loss equation, soil erosion due to wind and its control, vegetation management, i.e., strip cropping, stubble mulching and other practices.

UNIT-II

Types of soil erosion due to water- sheet erosion, rill erosion, gully erosion, sediment transport in channels, sediment deposition in reservoirs. Methods of soil erosion control: bounding and terracing on agriculture land for gully control, bench terraces, vegetated water ways, chute spillways, drop inlet spillways, check dams, river training works.

UNIT-III

Biological methods of soil erosion control, grass land management, forest management. Soil quality management, drainage works, reclamation of salt affected soils. Water conservation: water harvesting, rainfall- run off relation, water storage in ponds, lakes, reservoirs and aquifers, ground water recharge Through wells, check dams and storage works.

UNIT-IV

Water losses: filtration, seepage and evaporation losses, pollution/contamination of water quality due to agricultural practices i.e., fertilizers and pesticides, self-purification of surface water, sources of agricultural water pollution, pollutant dispersion in ground water.

UNIT-V

Need of planned utilization of water resources, economics of water resources utilization. Flood plain zones management, modifying the flood, reducing susceptibility to damage, reducing the impact of flooding.

BOOKS AND REFERENCES

1. Alam Singh – Modern Geotechnical Engineering
2. K. R. Arora – Soil Mechanics and foundation Engineering.
3. N. C. Brady – Principles of Soil Sciences
4. B. C. Punmia – Soil Mechanics and Foundation Engineering

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**

[BTOE-079]INTRODUCTION TO WOMEN'S AND GENDER STUDIES

Course Objective : Students undergoing this course are expected to

1. Understand the concepts of sex and gender.
2. Analyze the influence of gender in shaping institutions.
3. Evaluate theories of gender construction and patriarchy.
4. Examine feminist theories and movements.
5. Evaluate the psychology of gender roles and representations.

Subject Code	INTRODUCTION TO WOMEN'S AND GENDER STUDIES	L:T:P	Credits
BTME-079		3:0:0	03

Course Outcome (CO): The Students will be able to	
CO1	Identify and explain the differences between sex and gender.
CO2	Analyze the influence of gender in shaping institutions and societies.
CO3	Evaluate the impact of gender constructions and patriarchy on individuals and societies.
CO4	Examine feminist theories and movements and their historical and contemporary significance.
CO5	Evaluate the psychology of gender roles and representations and their impact on mental health, relationships, and social norms.

SYLLABUS

UNIT–I

Women and Society: Understanding Sex- Gender, Gender shaping Institutions, Theories of Gender construction Understanding Sexism and Androcentrism, Understanding Patriarchy and Theories of Patriarchy, Private and Public dichotomy, Sexual Division of Work, Patriarchy practices in different institutions and Text Books.

UNIT-II

Feminist Theory: Rise of Feminism, Introduction to various stands of Feminism-Liberal Feminism, Radical Feminism, Marxist Feminism, Socialist Feminism, Cultural Feminism, Eco-Feminism, Post Colonial Feminism, Post Modern Feminism. Waves of Feminism.

UNIT-III

Women's Movement: The socio-economic conditions of women during the age of Industrial revolution the Call for Women's Rights 1848, Women's rights movement 1848-1920,Historical Developments of Social Reform Movements in India ,Women's groups and organizations, Women's Movement Movements for Uniform Civil code and ShahBano case, Dalit women and the question of double marginality.

UNIT-IV

Gender Roles and Psychology of Sex: Difference Conceptualization of gender roles and gender role attitudes, Gender: Aggression, Achievement, Communication, Friendship and Romantic, Relationships Sex Differences in Mental Health Trauma relating to Rape , Taboo , Childhood Sexual Abuse , Domestic Violence , Sexual Harassment at Work Place, Educational Institutions, Eve Teasing etc.

UNIT-V

Gender and Representation: Gender and Mass Media- Print Media, Gender and Mass Media- Electronic Media, Gender and Films, Advertisements, Mega Serials, Stereotyping and breaking the norms of women's roles Women's Representation in Literary Texts.

BOOKS AND REFERENCES

1. Basabi Chakrabarti, Women's Studies: Various Aspects. UrbiPrakashani2014
2. Arvind Narrain. Queer: Despised Sexuality Law and Social Change. Book for Change. 2005
3. Chandra Talpade Mohanty, Feminism without Borders: Decolonizing Theory, Practicing Solidarity. Duke University Press.
4. Flavia Agnes. Law and Gender Inequality: The Politics of Women's Rights in India. Oxford University Press, 2001
5. Sonia Bathla, Women, Democracy and the Media: Cultural and Political Representations in the Indian Press, Sage, New Delhi, 1998.

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**

BTEC751	Digital Image Processing Lab	0L:0T:2P	1 Credit

SUGGESTIVE LIST OF EXPERIMENTS:

1. Introduction to MATLAB Image Processing Toolbox.
2. Write a MATLAB program to learn the basic image processing operations.
3. Write a MATLAB program for geometric transformation.
4. Write a MATLAB program for image enhancement using Histogram equalization.
5. Write a MATLAB program to perform smoothing or averaging filter in spatial domain.
6. Write a MATLAB program to perform smoothing or averaging filter in frequency domain.
7. Write a MATLAB program for image restoration.
8. Write a MATLAB program of sharpening of image using gradient mask.
9. Write a MATLAB program for performing morphological operations on the image.
10. Write a MATLAB program to fill the region of interest of the image.
11. Write a MATLAB program for edge detection of an image.
12. Write a MATLAB program for DCT based image compression.
13. Write a MATLAB program to remove high frequency components in the image using frequency domain approach.

Course Outcomes: At the end of this course students will demonstrate the ability to:

1. Explain image processing operations using MATLAB tool.
2. Evaluate the appropriate methods for image enhancement and image restoration.
3. Formulate spatial and frequency domain filters to obtain better quality image.
4. Select various attributes of image such as texture and edges from the image.
5. Design and develop the applications of transforms such as DCT and wavelet.

CO-PO Matrix												
Course Outcome	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	2	1	1	2	1	-	-	-	1	3
CO2	3	2	2	2	2	2	1	-	-	-	2	3
CO3	3	2	2	2	2	2	1	-	-	-	1	3
CO4	3	3	2	2	2	2	1	-	-	-	1	3
CO5	3	3	1	2	2	2	1	-	-	-	2	3
Avg	**3.00**	**2.40**	**1.80**	**1.80**	**1.80**	**2.00**	**1.00**	**-**	**-**	**-**	**1.4**	**3.00**

BTEC752	VLSI Design Lab	0L:0T:2P	1 Credit

SUGGESTIVE LIST OF EXPERIMENTS:

1. Design and analysis of basic of logic Gates: AND, OR, NOT, NAND, NOR, XOR, XNOR.
2. Design and implementation of Half adder and Full adder using CMOS logic.
3. To simulate the schematic of the common drain amplifier.
4. To simulate the schematic of the differential amplifier.
5. To simulate the schematic of the operational amplifier.
6. Design of 3-8 decoder using MOS technology.
7. Design a 4:1 Multiplexer.
8. Design and implementation of Flip flop circuit.
9. Layout design of PMOS, NMOS transistors.
10. Layout design of CMOS inverter and its analysis.

Course Outcomes: At the end of this course students will demonstrate the ability to:

1. Designing of logic gates.
2. Implementation of combinational and sequential circuits using CMOS logic.
3. Analyze amplifier circuits.
4. Design sequential circuits such as flip flop.
5. Do the layout designing for physical analysis of the MOS transistor and MOS based circuits.

CO-PO Matrix												
Course Outcome	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	2	1	1	2	1	-	-	-	1	3
CO2	3	2	2	2	2	2	1	-	-	-	2	3
CO3	3	2	2	2	2	2	1	-	-	-	1	3
CO4	3	3	2	2	2	2	1	-	-	-	1	3
CO5	3	3	1	2	2	2	1	-	-	-	2	3
Avg	**3.00**	**2.40**	**1.80**	**1.80**	**1.80**	**2.00**	**1.00**	**-**	**-**	**-**	**1.4**	**3.00**

BTEC753	Optical System & Networking Lab	0L:0T:2P	1 Credit

SUGGESTIVE LIST OF EXPERIMENTS:

Part - A

1. Familiarisation of different types of cables and different commands.
   a) Identify Cat5 cable , RJ 45 Connector , Crimping Tool , Wire Stripper
   b) Use Wire Stripper for Cutting wire shield and Understanding of Internal Structure of Cat5 Cable
   c) Finding Pin No-1 on RJ 45 Connector and Inserting Wires in connector
   d) Crimping of RJ45 connector using Crimping tool
   e) Preparation of Straight cable (used for Dissimilar devices such as PC to Switch , PC to router) and Cross cables (used for similar devices such as PC to PC , Router to Router, Switch to Switch)
   f) Understand different commands like ping, teacart, if config, dig etc..
2. Making a subnet and configuring router
   a) Understand the working of a router & method to access the router via console or using telnet, different types of cables used for connectivity.
   b) Different types of show commands & their purpose.
   c) Assignment of IP address and enabling layer 3 connectivity.
   d) Implement sub netting
3. Configuring web and DHCP servers
   a) Understand Internet Information Services tool and its installation.
   b) To configure web services using IIS tool.
   c) Configure DHCP
4. Configuring VLAN
   a) Understand the configuration of Vlan in a switch
   b) How to make the port of a switch as an access port & a trunk port, purpose of the Vlan ina network
   c) Different types of show commands & their purpose.
5. To implement a simple file transfer protocol (FTP) using connection oriented and connectionless sockets.
6. To develop a concurrent file server that spawns several threads, one for each client requesting specific file.
7. To develop a simple chatting application using (i) Connection oriented and (ii)Connectionless sockets

Part – B

1. To setting up fiber optic analog link.
2. Study and measurement of losses in optical fiber.
3. Study and measurement of numerical aperture of optical fiber.
4. Study and perform time division multiplexing (digital).
5. Study of framing in time division multiplexing.
6. Study of Manchester coding and decoding.
7. Study of voice coding and codec chip.
8. Study and measure characteristics of fiber optic LED's and photo detector.

Course Outcomes: At the end of this course students will demonstrate the ability to:

1. Define the concept of Optical Systems and Networking.
2. Indentify the various types of cables, connectors, routers and switches.
3. Design the various networking protocols.
4. Create various fiber optic link.
5. Interpret the basic knowledge of multiplexing and coding-decoding.

CO-PO Matrix												
Course Outcome	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	2	3	3	-	1	-	2	-	1	2
CO2	3	3	3	3	3	-	2	-	3	3	3	3
CO3	3	3	3	3	3	-	-	-	2	2	1	3
CO4	3	3	3	3	3	-	-	-	3	3	3	3
CO5	3	3	3	3	3	-	-	-	3	2	2	3
Avg	**3**	**3**	**2.8**	**3**	**3**	**-**	**1.5**	**-**	**2.6**	**2.5**	**2**	**2.8**

BTEC754	Microwave & Radar Engineering Lab	0L:0T:2P	1 Credit

SUGGESTIVE LIST OF EXPERIMENTS:

1. To study microwave test bench.
2. To study the characteristics of reflex klystron tube and to determine its electronic tuning range.
3. To determine the frequency and wavelength in a rectangular waveguide working on TE01 mode.
4. To study measurement of reflection coefficient and standing wave ratio using double minima method.
5. a) To study isolation and coupling coefficient of a magic Tee.
   b) To measure coupling coefficient, Insertion loss & Directivity of a Directional coupler.
6. To study V-I characteristic of Gunn diode.
7. To measure an unknown impedance with Smith chart.
8. a) To measure attenuation and insertion loss of a fixed and variable attenuator.
   b) To measure isolation and insertion loss of a three port Circulators/Isolator.
9. Study of Attenuator (Fixed and Variable type).
10. To Study working of Doppler radar, and measure the velocity of the object moving in the Radar range.

Course Outcomes: At the end of this course students will demonstrate the ability to:

1. Describe working on microwave testing bench.
2. Practically demonstrate the Characteristics of Reflex klystron using Microwave bench setup.
3. Demonstrate the performance of the Gunn diode using Microwave bench setup.
4. Perform measurement of Frequency, attenuation, VSWR, Impedance of microwave passive device using Klystron Bench Setup.
5. Interpret the basics of Smith chart for solution of transmission line problems and impedance matching.

CO-PO Matrix												
Course Outcome	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	2	3	3	-	1	-	2	-	1	2
CO2	3	3	3	3	3	-	2	-	3	3	3	3
CO3	3	3	3	3	3	-	-	-	2	2	1	3
CO4	3	3	3	3	3	-	-	-	3	3	3	3
CO5	3	3	3	3	3	-	-	-	3	2	2	3
Avg	**3**	**3**	**2.8**	**3**	**3**	**-**	**1.5**	**-**	**2.6**	**2.5**	**2**	**2.8**

B.Tech 4rd Year
VIII Semester
Syllabus

BTHU801	**PROJECT MANAGEMENT & ENTREPRENEURSHIP**	**3L:0T:0P**	**3 Credits**

Unit	**Topics**	**Lectures**
I	**Entrepreneurship:** Entrepreneurship: need, scope , Entrepreneurial competencies & traits, Factors affecting entrepreneurial development, Entrepreneurial motivation (Mc Clellend's Achievement motivation theory), conceptual model of entrepreneurship , entrepreneur vs. intrapreneur; Classification of entrepreneurs; Entrepreneurial Development Programmes	8
II	**Entrepreneurial Idea and Innovation:** Introduction to Innovation, Entrepreneurial Idea Generation and Identifying Business Opportunities, Management skills for Entrepreneurs and managing for Value Creation, Creating and Sustaining Enterprising Model & Organizational Effectiveness	8
III	**Project Management:** Project management: meaning, scope & importance, role of project manager; project life-cycle Project appraisal: Preparation of a real time project feasibility report containing Technical appraisal,; Environmental appraisal, Market appraisal (including market survey for forecasting future demand and sales) and Managerial appraisal.	8
IV	**Project Financing:** Project cost estimation & working capital requirements, sources of funds, capital budgeting, Risk & uncertainty in project evaluation , preparation of projected financial statements viz. Projected balance sheet, projected income statement, projected funds & cash flow statements, Preparation of detailed project report, Project finance.	8
V	**Social Entrepreneurship:** Social Sector Perspectives and Social Entrepreneurship, Social Entrepreneurship Opportunities and Successful Models, Social Innovations and Sustainability, Marketing Management for Social Ventures, Risk Management in Social Enterprises, Legal Framework for Social Ventures.	8

Text 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

COURSE OUTCOME: After completion of the course student will be able to:

1. Students can understand the definitions, concepts and components of Rural Development
2. Students will know the importance, structure, significance, resources of Indian rural economy.
3. Students will have a clear idea about the area development programmes and its impact.
4. Students will be able to acquire knowledge about rural entrepreneurship.
5. Students will be able to understand about the using of different methods for human resource planning

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**

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.

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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

Lawsconcerning 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.

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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

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[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**