DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY

CIRCULAR NO.SU/Engg./T.Y.B.Tech./63/2018

It is hereby informed to all concerned that, the syllabi prepared by the Board of Studies & recommended by the Dean, Faulty of Science & Technology, the **Academic Council at its meeting held on 30 June & 02 July 2018 has accepted the following syllabi in accordance with Choice Based Credits & Grading System for all Branches T.Y.B.Tech** under the Faulty of Science & Technology as enclosed herewith.

Sr.No.	Syllabi as per CBC & GS
[1]	Third Year B.Tech.[Civil Engineering],
[2]	Third Year B.Tech. [Mechanical Engineering],
[3]	Third Year B.Tech. [Agricultural Engineering],
[4]	Third Year B.Tech.[Electrical Engineering],
[5]	Third Year B.Tech. [Plastic & Polymer Engineering],
[6]	Third Year B.Tech [Electronics & Telecommunication Engg.],
[7]	Third Year B.Tech. [Computer Science Engineering].

This is effective from the Academic Year 2018-2019 and onwards.

All concerned are requested to note the contents of this circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,
Aurangabad-431 004.
REF.NO. SU/T.Y.B.TECH./2018/
Date:- 03-07-2018. /10486-96

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6/7/18
Deputy Registrar,
Syllabus Section.

Copy forwarded with compliments to :-

1] The Principals, affiliated concerned Colleges, Dr. Babasaheb Ambedkar Marathwada University.

2] The Director, University Network & Information Centre, UNIC, with **a request to upload this Circular on University Website.**

Copy to :-

1] The Director, Board of Examinations & Evaluation,
2] The Section Officer,[Engineering Unit] Examination Branch,
3] The Section officer, [Eligibility Unit],
4] The Programmer [Computer Unit-1] Examinations,
5] The Programmer [Computer Unit-2] Examinations,
6] The In-charge, [E-Suvidha Kendra],
7] The Public Relation Officer,
8] The Record Keeper,

SCHEME AND DETAILED SYLLABUS

of

T. Y. B. Tech. (Electrical Engineering)

of

FOUR YEAR DEGREE COURSE IN SCIENCE & TECHNOLOGY

DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD

FACULTY OF SCIENCE AND TECHNOLOGY
Revised Syllabus w.e.f. 2018-19
T .Y. B. Tech (Electrical Engineering)

Sub Code	SEMESTER-V	Contact Hrs / Week				Examination Scheme						
	Subject	L	T	P	Total	CT	TH	TW	P	Total	Credits	Duration of Theory Exam
EED301	Power Electronics	4	-	-	4	20	80	-	-	100	4	3 Hrs
EED302	Microprocessor and Microcontroller	4	-	-	4	20	80	-	-	100	4	3 Hrs
EED303	Digital Signal Processing	4	-	-	4	20	80	-	-	100	4	3 Hrs
EED304	Design of Electrical Machines	4	-	-	4	20	80	-	-	100	4	3 Hrs
EED305	Transmission and Distribution	4	-	-	4	20	80	-	-	100	4	3 Hrs
EED341-EED343	Elective II	2	-	-	2	10	40	-	-	50	2	2 Hrs
EED321	Lab I : Power Electronics	-	-	2	2	-	-	25	25	50	1	
EED322	Lab II : Microprocessor and Microcontroller	-	-	2	2	-	-	25	25	50	1	
EED323	Lab III: Digital Signal Processing	-	-	2	2	-	-	25	25	50	1	
EED324	Lab IV: Design of Electrical Machines	-	-	2	2	-	-	50	-	50	1	
EED325	Lab V: Mini Project	-	-	2	2	-	-	50	-	50	1	
	Total of semester-V	**22**	**-**	**10**	**32**	**110**	**440**	**175**	**75**	**800**	**27**	

Sub Code	SEMESTER-VI	Contact Hrs / Week				Examination Scheme						
	Subject	L	T	P	Total	CT	TH	TW	P	Total	Credits	Duration of Theory Exam
EED351	Power System Analysis	4	-	-	4	20	80	-	-	100	4	3 Hrs
EED352	Control System Engineering	4	-	-	4	20	80	-	-	100	4	3 Hrs
EED353	Electrical Drives	4	-	-	4	20	80	-	-	100	4	3 Hrs
BSH354	Industrial Management	4	-	-	4	20	80	-	-	100	4	3 Hrs
*	Open Elective-I	4	-	-	4	20	80	-	-	100	4	3 Hrs
EED355	Electromagnetic Field	2	-	-	2	10	40	-	-	50	2	2 Hrs
EED371	Lab VI: Power System Analysis	-	-	2	2	-	-	25	25	50	1	
EED372	Lab VII : Control System Engineering	-	-	2	2	-	-	25	25	50	1	
EED373	Lab VIII : Electrical Drives	-	-	2	2	-	-	25	25	50	1	
EED374	Lab IX : Simulation Lab	-	-	2	2	-	-	50	-	50	1	
EED375	Lab X: Project Part I	-	-	2	2	-	-	-	50	50	1	
**	Audit course-I	2	-	-	2	-	-	-	-	-	-	
	Total of semester-VI	**24**	**-**	**10**	**34**	**110**	**440**	**125**	**125**	**800**	**27**	
	Grand Total of V & VI									**1600**	**54**	

L: Lecture hours per week **T**: Tutorial hours per week **P**: Practical hours per week **CT**: Class Test
TH: University Theory Examination **TW**: Term Work **P**: Practical/Oral Examination

Elective-II Courses

Sub Code	Elective II
EED341	Special Purpose Electrical Machines
EED342	Renewable Energy Sources
EED343	Electronic Instrumentation

#Note: Interested students can opt for any one of the audit course offered by various departments.
*For Audit course, audit pass (NP) and audit fail (NF) grades will be awarded.

*__OpenElective-I Courses__

Sr.No.	Name of Course	Department	Course code
1	Remote Sensing and GIS	AED	AED381
2	Professional Ethics and Cyber Security	CSED	CSE381
3	Design for Environment	CED	CED381
4	Robotics and Automation	EED	EED381
5	Internet of Things	ETC	ETC381
6	Costing and Financial Management	MED	MED381
7	Introduction to Nano Technology	PPED	PPE381

**__Audit –I Courses__

Sr.No.	Name of Course	Department	Course code
1	Japanese Language module	BSH	BSH801
2	Cyber Crime and Law	CSED	CSE801
3	Road Safety Management	CED	CED801
4	Value Education	BSH	BSH802
5	Smart Cities	ETC	ETC801
6	Rural Community Engagement	MED	MED801
7	German Language Module	BSH	BSH803

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Science & Technology)
Syllabus of T. Y. B. Tech. (Electrical) Semester-V

Course Code : EED301 | **Course: Power Electronics**
Teaching Scheme: 4 Hrs/week | **Class Test (Marks): 20**
Theory: 4 Hrs/week | **Theory Examination (Duration): 3 Hrs**
Credits: 4 | **Theory Examination(Marks): 80**

Course Objectives :

- To get an overview of different types of power semi-conductor devices and their switching characteristics.
- To understand the operation, characteristics and performance parameters of controlled rectifiers.
- To learn the different modulation techniques of pulse width modulated inverters and to understand the harmonic reduction methods.
- To study the operation o and characteristics of chopper circuits.
- To study the operation of AC voltage controller and Matrix converters.

Unit-I : **Power Semi-conductor Devices:**
Study of switching devices, - Frame, Driver and snubber circuit of SCR, TRIAC, BJT, IGBT, MOSFET - Turn-on and turn-off characteristics, switching losses, Commutation circuits for SCR. **(8 Hrs)**

Unit-II : **Single Phase AC to DC Converter:**
Half wave converter, Mid-point converter, Fully controlled converter(rectification and inversion mode), Half controlled converter (Semi-converter), Operation of all converters with R, RL and RLE load, derivation of Average and RMS output voltage, power factor, THD, TUF. Effect of source inductance, Single phase dual converter. **(8 Hrs)**

Unit-III : **Three Phase AC to DC Converter:**
Half wave converter, Fully controlled converter, rectification and inversion mode, Half controlled converter (Semi-converter), Operation of all converters with R, RL and RLE load, derivation of Average and RMS output voltage, power factor, THD, TUF. Numerical based on output voltage and current calculations. **(8 Hrs)**

Unit-IV : **DC to DC Converter**:
Principle of operation of chopper, classification on the basis of Operating quadrants. Control techniques: CLC, TRC, PWM and FM Techniques. Analysis of Step up Chopper and step down chopper, Areas of application. **(8 Hrs)**

Unit-V : **Inverter:**
Single phase and three phase (both 120° mode and 180° mode) inverters, PWM techniques: Sinusoidal PWM modified sinusoidal PWM, multiple PWM, Introduction to space vector modulations, Voltage and harmonic control, Series resonant inverter, Current source inverter. **(8 Hrs)**

Unit-VI : **AC to AC Converters**:
Single phase AC voltage controllers, Multistage sequence control, single and three phase Cyclo-converters, Introduction to Integral cycle control, Power

factor control and Matrix converters. **(8 Hrs)**

Text Books :

1. Power Electronics: Circuits, Devices and Applications - M.H. Rashid, Pearson Education, PHI Third edition, New Delhi 2004.
2. Elements of Power Electronics - Philip T.Krein, Oxford University Press, 2004 Edition.

Reference Books :

1. Power Electronics for Technology - Ashfaq Ahmed Pearson Education, Indian reprint, 2003.
2. Power Electronics - P.S.Bimbra, Khanna Publishers, third Edition 2003.
3. Power Electronics: Converters, Applications and Design - Ned Mohan, Tore.M.Undeland, William.P.Robbins, John Wiley and sons, third edition, 2003.

Section A: Includes Unit I, II and III;
Section B: Includes Unit IV, V and VI.
All units carry equal weightage.

Pattern of Question Paper:

The Six units in the syllabus shall be divided in two equal parts i.e. 3 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

- Minimum ten questions.
- Five questions in each section.
- Question No-1 from section A and Question No-6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for 10 marks each. The Question no.1 and 6 should be of objective nature.

Two questions of 15 marks each from remaining questions from each section A and B be asked to solve.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Science & Technology)
Syllabus of T. Y. B. Tech. (Electrical) Semester-V

Course Code : EED302 **Course: Microprocessor and Microcontroller**
Teaching Scheme: 4 Hrs/week **Class Test (Marks): 20**
Theory: 4 Hrs/week **Theory Examination (Duration): 3 Hrs**
Credits: 4 **Theory Examination(Marks): 80**

Course Objectives :

- Study of architecture, instruction set, Programming and applications of the 8 bit microprocessor 8085.
- Overview of 8051 Microcontroller and PIC Microcontroller.

Unit-I : **Overview to Microprocessor:**
Digital Computer, Evaluation of Microprocessor, Architecture of 8085, Pin description, addressing modes**,** Instruction set, different programs, Timing diagram. **(7 Hrs)**

Unit-II : **Microprocessor 8085 & Interfacing:**
Different data transfer schemes, Memory mapping, memory mapped I/O and I/O mapped I/ O, Stack & subroutines, Delay subroutines, Interrupt structure, Need of I/O ports, Introduction to 8253, 8255, Interfacing of LED's, 7 Segment display, Switches, Relays, D.C motors, Stepper motor with 8255, ADC, DAC. **(9 Hrs)**

Unit-III : **Microprocessor 8086:**
Architecture of 8086, Pin diagram, Programming model of 8086, Physical addressing, Addressing modes, and overview of instruction set, Interrupt structure, Min-Max mode. **(7 Hrs)**

Unit-IV : **Introduction to 8051 Microcontroller:**
Comparison of microprocessor and microcontroller, Evolution, Features of MCS 51 families, 8051 Architecture, pin detail, Instruction set, programming model, addressing modes and i/o ports, Memory organization. **(9 Hrs)**

Unit-V : **8051 Microcontroller Interfacing:**
I/O port programming, interrupts, Timer/ Counter Programming, Serial Communication, Interfacing of LED, LCD ADC, DAC, SPI bus devices, RS232. **(7 Hrs)**

Unit-VI : **PIC Microcontroller**
Concept of RISC & CISC, PIC 10, PIC12, PIC16, PIC18 series architectures, comparison, features and selection as per application. PIC18f architecture, registers, memory Organization and types, stack, oscillator options, BOD, power down modes and configuration bit settings. Brief summary of Peripheral support Overview of instruction set, MPLAB IDE & C18 Compiler **(9 Hrs)**

Text Books :

1. Ramesh Gaonkar, "Microprocessor, Architecture, Programming and Application", Willey Eastern Ltd, Fourth Edition.
2. Sridhar Ghosh , "0000 to 8085" Prentice Hall India.
3. B. Ram, "Fundamentals of Microprocessor and Microcomputer", Dhanpat Rai and Sons New Delhi.
4. A.K.Ray, K.M.Bhurchandi ,"Advanced Microprocessors and

Peripherals", Tata McGraw Hill Publications,2000.
5. Muhammad Ali Mazidi and Janice Gillispie Mazidi, "The 8051 Microcontroller and Embedded Systems", Pearson Education Asia.
6. Ajay V Deshmukh, "Microcontrollers - Theory and Applications", Tata McGraw – Hill Education, New Delhi.
7. John B. Peatman, "Design with PIC Microcontrollers", Pearson Education.

Reference : Books

1. Berry Bray and C.R.Sharma, "The Intel Microprocessors Architecture, Programming & Interfacing" Pearson Education.
2. Mohammad Raffiquazaman, "Microprocessor and Microcomputer Based System Design" Universal Book Stall, New Delhi.
3. Uffenbeck, "The 8086/8088 Family –Design, Programming and Interfacing", Prentice Hall India.
4. Kenneth J. Ayala, "The 8051 Microcontroller – Architecture, Programming and Applications", Penram International Publishing (India), Second Ed.
5. Intel Data Book on MCS 51 family.
6. http://datasheet.octopart.com/PIC16C73B-04/SP-Microchipdatasheet-3121.pdf
7. http://ww1.microchip.com/downloads/en/devicedoc/39597b.pdf

Section A: Includes Unit I, II and III;
Section B: Includes Unit IV, V and VI.
All units carry equal weightage.

Pattern of Question Paper:

The Six units in the syllabus shall be divided in two equal parts i.e. 3 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

- Minimum ten questions.
- Five questions in each section.
- Question No-1 from section A and Question No-6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for 10 marks each. The Question no.1 and 6 should be of objective nature.

Two questions of 15 marks each from remaining questions from each section A and B be asked to solve.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
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Syllabus of T. Y. B. Tech. (Electrical) Semester-V

Course Code : EED303 | **Course: Digital Signal Processing**
Teaching Scheme: 4 Hrs/week | **Class Test (Marks): 20**
Theory: 4 Hrs/week | **Theory Examination (Duration): 3 Hrs**
Credits: 4 | **Theory Examination(Marks): 80**

Course Objectives :

- To classify signals and systems & their mathematical representation.
- To analyze DT signals with Z transform, inverse Z transform and DTFT.
- To analyze the discrete time systems.
- To study about filters and their design for digital implementation.
- To study about a programmable digital signal processor & quantization effects.

Unit-I : **Introduction:**
Classification of systems: Continuous, discrete, linear, causal, stable, dynamic, recursive, time variance; classification of signals: continuous and discrete, energy and power; mathematical representation of signals; spectral density; sampling techniques, quantization, quantization error, Nyquist rate, aliasing effect. Digital signal representation. **(8 Hrs)**

Unit-II : **Discrete Time System Analysis:**
Z-transform and its properties, inverse z-transforms; difference equation, Solution by z-transform, application to discrete systems, Stability analysis, frequency response, Convolution, Fourier transform of discrete sequence **(8 Hrs)**

Unit-III : **Discrete Fourier Transform & Computation:**
DFT properties, magnitude and phase representation, Computation of DFT using FFT algorithm, DIT & DIF, FFT using radix 2, Butterfly structure. **(10 Hrs)**

Unit-IV : **Design of Digital Filters:**
FIR & IIR filter realization, Parallel & cascade forms. FIR design: Windowing Techniques. IIR design: Analog filter design, Butterworth and Chebyshev approximations . **(8 Hrs)**

Unit-V : **Digital Signal Processors:**
Introduction, Von Neumann Model, Harvard Architecture, TMS320C54X, Architecture, Features, Addressing Formats, Functional modes, Comparison of Microprocessor and DSP processor.
(8 Hrs)

Unit-VI : **Applications of DSP:**
Introduction, Spectral Analysis using DFT, Musical sound processing, Application in Radar, Subband coding of speech signal, Oversampling A/D converter-Oversampling D/A converter. **(6 Hrs)**

Text Books :

1. J.G. Proakis and D.G. Manolakis, 'Digital Signal Processing Principles, Algorithms and Applications', Pearson Education, New Delhi, 2003 / PHI.
2. S.K. Mitra, 'Digital Signal Processing – A Computer Based Approach', Tata

McGrawHill, New Delhi, 2001.

Reference : Books

1. Multirate Digital Signal Processing: Multirate Systems - Filter Banks – Wavelets by N. J. Fliege, John Wiley and Sons Ltd.
2. Multirate and Wavelet Signal Processing by Bruce W. Suter, Academic Press.
3. N.G Palan, 'Digital Signal Processing Principles', Tech-Max Publications, Pune, 3rd Revised Edition.

Section A: Includes Unit I, II and III;
Section B: Includes Unit IV, V and VI.
All units carry equal weightage.

Pattern of Question Paper:

The Six units in the syllabus shall be divided in two equal parts i.e. 3 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

- Minimum ten questions.
- Five questions in each section.
- Question No-1 from section A and Question No-6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for 10 marks each. The Question no.1 and 6 should be of objective nature.

Two questions of 15 marks each from remaining questions from each section A and B be asked to solve.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Science & Technology)
Syllabus of T. Y. B. Tech. (Electrical) Semester-V

Course Code : EED304 | **Course: Design of Electrical Machines**
Teaching Scheme: 4 Hrs/week | **Class Test (Marks): 20**
Theory: 4 Hrs/week | **Theory Examination (Duration): 3 Hrs**
Credits: 4 | **Theory Examination(Marks): 80**

Course Objectives :

- To understand and develop the concept of designing of various electrical machines.
- To be able to differentiate between electrical and magnetic circuits and their loading concepts.
- To be able to develop conceptual designs and identify different materials for the important parts of machines.
- To be able to verify the designs and confirm dimensions.
- An ability to design and draw a system, or a component, to meet desired needs within realistic constraints.

Unit-I : **Principles and design of Electrical machines:**
Design of Electrical machines along with their parts and special features, rating, Specifications, Standards, Performance and other criteria to be considered, Brief study of magnetic, electric, dielectric and other materials. **(6 Hrs)**

Unit-II : **Design of Electrical Apparatus:**
Detailed design of heating coils, starters and regulators. Design of Electrical Devices Field coils, Chokes and lifting magnets. **(6 Hrs)**

Unit-III : **AC and DC Winding:**
Types of dc windings, Pitches, Choice and design of simple/ duplex lap and wave winding, Concept of multiplex windings and reasons for choosing them, Single and double layer single phase AC winding with integral and fractional slots, Single and double layer integral and fractional slot windings of three phase. Numerical examples. **(10 Hrs)**

Unit-IV : **Heating, Cooling and Ventilation:**
Study of different modes of heat generation, Temperature rise and heat dissipation, Heating and Cooling cycles, heating and cooling time constants, their estimation, dependence and applications, Methods of cooling / ventilation of electrical apparatus, Thermal resistance, radiated heat quantity of cooling medium (Coolant) Numerical. **(10 Hrs)**

Unit-V : **Design of Transformer:**
Design of distribution and power transformers, Types, Classification and specifications, Design and main dimensions of core, yoke, winding, tank (with or without cooling tubes) and cooling tubes, Estimation of leakage reactance, resistance of winding, Testing of transformers as per I.S.S., Numerical examples. **(10 Hrs)**

Unit-VI : **Computer aided Design of Electrical machine:**
Introduction, advantages various approaches of Computer Aided Designing, Computer Aided Designing of transformer, Winding of rotating Electrical

Machines. Optimization of Design. **(6 Hrs)**

Text Books :

1. Siskind – Electrical Machine Design (Mcgraw Hill).
2. Sawhaney. A. K– A Course in Electrical Machine Design (Dhanpat Rai).
3. Deshpande. M. V- A Course in Electrical Machine Design (Prentice Hall Of India).(Design And Testing Of Electrical Machines).
4. Sen .S. K– Computer aided design of Electrical Machines.
5.

Reference Books :

1. Performance And Design Of AC Machines, M. G. Say, CBS Publishers and Distributors Pvt. Ltd.
2. Design Data Handbook, A. Shanmugasundarm, G. Gangadharan, R. Palani,Wiley Eastern Ltd.
3. Design Of Electrical Machines, V. N. Mittle, 4th edition

Section A: Includes Unit I, II and III;
Section B: Includes Unit IV, V and VI.
All units carry equal weightage.

Pattern of Question Paper:

The Six units in the syllabus shall be divided in two equal parts i.e. 3 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

- Minimum ten questions.
- Five questions in each section.
- Question No-1 from section A and Question No-6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for 10 marks each. The Question no.1 and 6 should be of objective nature.

Two questions of 15 marks each from remaining questions from each section A and B be asked to solve.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
(Faculty of Science & Technology)
Syllabus of T. Y. B. Tech. (Electrical) Semester-V

Course Code: EED305 **Course: Transmission and Distribution**
Teaching Scheme: 4 Hrs/week **Class Test (Marks): 20**
Theory: 4 Hrs/week **Theory Examination (Duration): 3 Hrs**
Credits: 4 **Theory Examination(Marks): 80**

Course Objectives :

- To explain the mechanical design of transmission line.
- To describe the basic structure of power system and its components.
- To explain Distribution system with classification.
- To discuss the overhead transmission line and Underground cables.

Unit-I : **Mechanical design of Transmission Line:** Line supports, spacing between the conductors, length of span, calculation of sag, equal and unequal supports, and effect of ice and wind loadings, Types of insulators, pin type, suspension type and strain type insulators, voltage distribution along string of suspension insulators, string efficiency.
Corona: Phenomenon of corona, factors affecting the corona, power loss disadvantages **(8 Hrs)**

Unit-II : **Inductance and Resistance of Transmission Line:** Definitions of Inductance, Flux Linkages of an isolated current carrying conductor, Inductance of 1-Phase two-wire line, Conductors types, Flux linkages of one conductor in group, Inductance of composite conductor lines, Inductance of 3-phase lines, Double circuit 3-phase lines, Bundle Conductor, Resistance, Skin effect and proximity effect, Magnetic field induction. **(8 Hrs)**

Unit-III : **Capacitance of Transmission Line:** Introduction**,** Electrical field of Long state conductor, Potential difference between two conductors of a group of parallel conductor, Capacitance of two wire line, Capacitance of 3-phase line with equilateral spacing, Capacitance of 3-phase line with unsymmetrical spacing, Effect of Earth on transmission line capacitance, Method of GMD (modified), Bundled Conductors, Electrostatic Induction. **(8 Hrs)**

Unit-IV : **Characteristics and Performance of Transmission Line**: Short, medium and long lines, Voltages and currents at sending and receiving end of line, surge impedance loading of transmission line, Power flow through transmission line, Sending end and receiving power circle diagrams, Power transmission capability, Tuned power lines, Ferranti Effect, Nominal 'Pi' and 'Tee' Representation. **(8 Hrs)**

Unit-V : **Classification of Distribution Systems:** AC Distribution- Primary and Secondary Distribution systems, Overhead and Underground systems, Connection scheme of distribution system, Radial system, Ring main system, Interconnected systems, feeders and distributors, AC distribution calculations, carrier current equipments (P.L.C.C.) **(08 Hrs)**

Unit-VI : **Underground Cable:** Classification, Construction of cable, XLPE cables, insulation resistance, capacitance, cable faults and location of faults. **(08 Hrs)**

Text Books :

1. A text book on Power System Engineering by A Chakraborty, M.L.Soni, P.V.Gupta, U.S. Bhatnagar,Dhanpat rai & Co., Delhi.
2. Power System Analysis & Design by B.R.Gupta, 4th Reprint, S.Chand Publishing Co.
3. Power System Analysis by W.D. Stevenson, Tata McGraw Hill Publications.
4. Transmission and Distribution by J.B. Gupta, S.K.Kataria& Sons, New Delhi.
5. Electric Power Generation, Transmission and Distribution by S.N.Singh, Prentice Hall of India.

Reference Books :

1. Elements of Power Station Design by M.V. Deshpande, Wheeler Publishing.
2. Modern Power System Analysis by I.J. Nagrath and D.P.Kothari, Tata Mc Graw Hill Publications.
3. Generation and Economic Considerations by J.B.Gupta, S.K.Kataria& Sons, New Delhi.
4. Power System Engineering by Nagrath& Kothari, Tata McGraw Hill Publications.
5. Websites of MERC and MSEDCL Power System Analysis by Arthur R. Bergen. Pearson Education, New Delhi.

Section A: Includes Unit I, II and III;
Section B: Includes Unit IV, V and VI.
All units carry equal weightage.

Pattern of Question Paper:

The Six units in the syllabus shall be divided in two equal parts i.e. 3 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

- Minimum ten questions.
- Five questions in each section.
- Question No-1 from section A and Question No-6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for 10 marks each. The Question no.1 and 6 should be of objective nature.

Two questions of 15 marks each from remaining questions from each section A and B be asked to solve.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
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Syllabus of T. Y. B. Tech. (Electrical) Semester-V

Course Code : EED321 **Course: Lab I – Power Electronics**
Teaching Scheme: Practical **Teachers Assessment: TW-25 Marks**
Practical / Term Work: 2Hrs /Week **Practical/Viva Exam: 25 Marks**
Credits: 1

Course Objectives : To develop ability among students for problem formulation, system design and solving skills.

List of Practical's (Not less than 10) :

List of Practical :

Group A: Perform any SIX experiments (Hardware).

1. Static VI characteristic of SCR and TRIAC (Both)
2. dv / dt and di / dt protection of SCR
3. Forced Commutation circuits (Class A,B,C,D & E)
4. VI Characteristic of MOSFET and IGBT (Both)
5. Single phase fully controlled converter with R and RL load
6. DC Step-down and Step-up chopper.
7. Single phase series and parallel inverter.
8. Single phase A.C. voltage regulator.

Group B: Perform any FOUR experiments (Hardware/Software).

1. Design of snubber circuit and verification using simulation.
2. Single phase half controlled converter with R and RL load
3. Three phase AC-DC fully controlled bridge converter
4. Three phase voltage source inverter using 120^0 and 180^0 mode
5. Study of cascaded type multilevel inverter
6. Harmonic analysis of three phase VSI inverter with different PWM techniques.

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above

The assessment of practical examination shall be on the following criteria:
The practical examination shall consist of performing an experiment based on the practical work done during the course, the record of the experiments submitted by the candidate and viva-voce based on the syllabus.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

(Faculty of Science & Technology)

Syllabus of T. Y. B. Tech. (Electrical) Semester-V

Course Code : EED322 **Course: Lab II - Microprocessor and Microcontroller**

Teaching Scheme: Practical **Teachers Assessment: TW-25 Marks**

Practical / Term Work: 2Hrs /Week **Practical/Viva Exam: 25 Marks**

Credits: 1

Course Objectives :

- Introduce microprocessor & microcontroller concepts and features.
- Write ALP for various operations in 8085, 8086 and 8051
- Differentiate Serial and Parallel Interface.
- Interface different I/Os with Microprocessors & microcontroller.

List of Practical's (Not less than 10) :

List of Practical :

1. Study of 8085 Microprocessor Kit used in laboratory.
2. Program to transfer a block of 10 bytes.
3. Program to find largest/smallest numbers from the array.
4. Program for data sorting in ascending and descending order.
5. Interfacing of 8255 study card with microprocessor 8085.
6. Interfacing of LED with 8085 through 8255 in mode 1/mode2 8085.
7. Interfacing of A/D converter with microprocessor 8085.
8. Study of 8086 Microprocessor Kit used in laboratory.
9. Program to add and Subtract two 16- bit number using 8086.
10. Program to multiplication and division using MUL and DIV instructions.
11. Program to find the sum of two numbers in decimal.

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above

The assessment of practical examination shall be on the following criteria:

The practical examination shall consist of performing an experiment based on the practical work done during the course, the record of the experiments submitted by the candidate and viva-voce based on the syllabus.

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Syllabus of T. Y. B. Tech. (Electrical) Semester-V

Course Code : EED323 **Course: Lab III - Digital Signal Processing**
Teaching Scheme: Practical **Teachers Assessment: TW-25 Marks**
Practical / Term Work: 2 Hrs /Week **Practical/Viva Exam: 25 Marks**
Credits: 1

Course Objectives :

- To analyze DT signals with Z transform, inverse Z transform and DTFT.
- To design Digital filters and analyze their response.
- To demonstrate DSP Applications in electrical engineering.

List of Practical's (Not less than 10) **:**

List of Practical :

1. Plotting of discrete time waveforms (a) Sine, (b) Unit Step, (c) Exponential.
2. Verification of Z-transform properties (any two).
3. Find Linear convolution and correlation of signals.
4. Plot frequency response of given system function (Magnitude & Phase).
5. Find DFT & IDFT of sequence.
6. Find Circular convolution Using DFT IDFT method and linear convolution using Circular convolution.
7. DIT- FFT or DIF-FFT algorithm
8. Design of IIR filters (Butterworth method).
9. Design of FIR filters (window (any one) method).
10. Verification of Sampling Theorem.

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above

The assessment of practical examination shall be on the following criteria:
The practical examination shall consist of performing an experiment based on the practical work done during the course, the record of the experiments submitted by the candidate and viva-voce based on the syllabus.

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Syllabus of T. Y. B. Tech. (Electrical) Semester-V

Course Code : EED324 **Course: Lab IV – Design of Electrical Machines**

Teaching Scheme: Practical **Teachers Assessment: TW-50 Marks**

Practical / Term Work: 2 Hrs /Week **Practical/Viva Exam: NA**

Credits: 1

Course Objectives :

- To design a system, a component to meet desired needs, differentiates and will be able to compare different options based on results, and able to analyze and interpret results for different industrial application to meet desired needs within realistic constraints and confirms manufacturability.
- To develop computer programs for the utility and machine design techniques.

List of Practical's (Not less than 5) :

List of Practical :

1. Layout of Lap and Wave winding.
2. Details and layout of AC winding with design (only sheet).
3. Design of an Iron-cored choke.
4. Details and assembly of 3- phase transformer with design report.
5. Report based on Industrial visit to a manufacturing unit. (Transformer).

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above

The assessment of practical examination shall be on the following criteria:

The practical examination shall consist of performing an experiment based on the practical work done during the course, the record of the experiments submitted by the candidate and viva-voce based on the syllabus.

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Syllabus of T. Y. B. Tech. (All)

Course Code: EED 325 **Course: Minor Project**

Practical: 02 Hrs/week **Term Work: 25 Marks**

Credits: 02

The course objectives and detailed guidelines for Minor Project are as follows.

Course Objectives:

- To plan for various activities of the project and distribute the work amongst team members.
- To develop the ability to define and design the problem and lead to its accomplishment with proper planning.
- To understand the importance of document design by compiling Technical Report on the Minor Project work carried out.
- To develop student‘s abilities to transmit technical information clearly and test the same by delivery of Seminar based on the Minor Project.

Guidelines:

1. Students should select a problem which addresses some basic home, office or other real life applications.
2. Projects which will address the social issues will be given due weightage.
3. It is desirable that the systems developed by the students have some novel features.
4. The batch size shall not exceed TWO students per batch.
5. The students have to select a suitable problem, design, prepare the drawings, produce the components, assemble and commission the project.
6. Institute may arrange demonstration with poster presentation of all mini projects developed by the students at the end of semester.
7. At the end of the semester, the students have to prepare and present 20-25 pages project report.
8. Final evaluation shall be based on continuous internal assessment followed by Viva-Voce.

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Syllabus of T. Y. B. Tech. (Electrical) Semester-V

Course Code : EED342 **Course: Special Purpose Electrical Machines**

Teaching Scheme: 2 Hrs/week **Class Test (Marks): 10**

Theory: 2 Hrs/week **Theory Examination (Duration): 2Hrs**

Credits: 2 **Theory Examination(Marks): 40**

Course Objectives :

- To differentiate between generalized machines and control machines.
- To understand principle and working of different control machines.
- To be able to identify and implement control machines.

Unit-I : Hysteresis Motors:

Magnetic field production & nature of torque, Applications. Reluctance Motors: F. H. P. Reluctance motors, switched reluctance motors, Principle of working & operation, Applications. **(4 Hrs)**

Unit-II : Control Motors:

D C servomotors, transfer function of Armature and field controlled motors their applications, Construction of F. H. P. Induction two-phase servomotors, production of torque, Torque-speed curves-characteristics & features-dynamic equations, Methods of control, Applications. Numerical on DC and AC servos. **(4 Hrs)**

Unit-III : Eddy Current Devices:

Construction & operation of eddy current couplings & dynamometers, merits & limitations. **(2 Hrs)**

Unit-IV : Tacho-Generators:

Basic requirements of tacho-generators, Ideal characteristics, classification.

i) D.C. Tacho Generators: Output characteristics, Deviation from no-load Characteristics, Dead-zone, Tooth ripples, Temperature effect, Accuracy class.

ii) Induction Tacho-generators: Operating principle, Output characteristics, Equivalent circuit, Reasons for deviation from desired characteristics, Corrective means, Advantages.

iii) A. C. Tacho-generators: Construction & operation, Output characteristics, Non-linearities & tooth ripples, Advantages over other tacho-generators. Dynamic characteristics of tacho-generators, Applications of tacho-generators. **(6 Hrs)**

Unit-V : Synchro & Synchro Transformers:

Different types of single phase & three-phase synchros, Differential synchros, Synchro-indicators, Their constructional features, Characteristics & applications, Synchrotransformers principle, Characteristics error, applications of synchrotransformers. **(4 Hrs)**

Unit-VI : Linear Motors:

Construction, Theory of operation of a linear induction motor, System with two-dimensional & three dimensional field patterns, Performance of linear induction motors, Effect of variation in the air gap, Effect of width &

thickness of the reaction plate, Thrust of linear induction motors, Applications. **(4 Hrs)**

Text Books :

1. Bhimbhra P. S., 'Electrical Machine and Power Electronics' Tata-McGraw Hill Publication.
2. Ogata K., 'Modem control Engineering', Prentice Hall.

Reference Books :

1. Principles of Electrical Machines by V.K.Mehta, Chand Publication.
2. Electrical Machines by Ashfaque Hussain.
3. Electrical Machines by Nagnath Kothari, TATA McGraw Hill.
4. Electrical Technologies by Edward Hughes Elbs , Pearson Education.

Section A: Includes Unit I, II and III;
Section B: Includes Unit IV, V and VI.
All units carry equal weightage.

Pattern of Question Paper:

The Six units in the syllabus shall be divided in two equal parts i.e. 3 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 40 marks Paper:

- Minimum six questions.
- Three questions in each section.
- Question No-1 from section A and Question No-6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for 08 marks each. The Question no.1 and 6 should be of objective nature.
- Two questions of 06marks each from remaining questions from each section A and B be asked to solve.

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Syllabus of T. Y. B. Tech. (Electrical) Semester-V

Course Code : EED343 | **Course: Renewable Energy Sources**

Teaching Scheme: 2 Hrs/week | **Class Test (Marks): 10**

Theory: 2 Hrs/week | **Theory Examination (Duration): 2Hrs**

Credits: 2 | **Theory Examination(Marks): 40**

Course Objectives :

- Knowledge of role, scope and potential of various renewable sources.
- Understanding the principle of harnessing different renewable energy sources.

Unit-I : **Solar Energy:**

Role and potential of renewable energy source, World and Indian scenario. Principles of solar radiation, the solar constant, Instruments for measuring solar radiation, Solar energy collection: Flat plate and concentrating collectors, Solar energy storage and applications, Solar ponds. **(6 Hrs)**

Unit-II : **Solar Applications:**

Solar heating, Cooling techniques, Solar distillation and drying, Photovoltaic energy conversion. **(3 Hrs)**

Unit-III : **Wind Energy**:

Sources and potentials, Horizontal and vertical axis windmills, Performance characteristics -Betz criteria. **(3 Hrs)**

Unit-IV : **Bio-Mass**:

Resources, Biomass conversion processes, Biogas and models of biogas digesters, Constituents and factors controlling yield of biogas, Gasifier, Types and application of gasifiers, Bio-mass economic aspects. **(5 Hrs)**

Unit-V : **Ocean Energy**:

OTEC: Scope and potentials across world and in India Principles for utilization Energy Conversion, Open and closed cycle system, Advantages and limitations.

Tidal energy: Principle of harnessing tidal energy, Basin scheme of TECS, Advantages and limitations, Scope and potentials.

Wave energy: Wave energy as a renewable energy, Devices for harnessing wave energy, Scope and potentials. **(5 Hrs)**

Unit-VI : **Geothermal Energy:**

Resources, Methods of harnessing, Economics of a geothermal power plant, World scenario and potential in India. **(2 Hrs)**

Text Books :

1. Fundamentals of Renewable Energy Resources, G.N. Tiwari and M. K. Ghosal, Narosa Publishing House, 2007.
2. Solar Energy, Sukhatme, 3rd Edition, Tata McGraw-Hill Education, 2008.

Reference : Books

1. Renewable Energy Resources, John Twidell & Anthony D. Weir, 2nd Edition, Taylor & Francis, 2006.
2. Thermal Energy, Mahesh Rathore, Tata McGraw-Hill Education, 2010.
3. Principles of Solar Energy, D. Yogi Goswami, Frank Krieth & John F Kreider, 2nd Edition, Taylor & Francis, 2000.
4. Non-Conventional Energy, Ashok V Desai, Wiley Eastern Ltd. New Delhi, 2003.
5. Non-Conventional Energy Systems, K. Mittal, Wheeler Publishing, 1997.

Section A: Includes Unit I, II and III;
Section B: Includes Unit IV, V and VI.
All units carry equal weightage.

Pattern of Question Paper:

The Six units in the syllabus shall be divided in two equal parts i.e. 3 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 40 marks Paper:

- Minimum six questions.
- Three questions in each section.
- Question No-1 from section A and Question No-6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for 08 marks each. The Question no.1 and 6 should be of objective nature.
- Two questions of 06marks each from remaining questions from each section A and B be asked to solve.

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Syllabus of T. Y. B. Tech. (Electrical) Semester-V

Course Code : EED344 **Course: Electronic Instrumentation**
Teaching Scheme: 2 Hrs/week **Class Test (Marks): 10**
Theory: 2 Hrs/week **Theory Examination (Duration): 2Hrs**
Credits: 2 **Theory Examination(Marks): 40**

Course Objectives :

- To understand different types of standards, methods of calibration used in measurements also to get idea about statistical and regression analysis.
- To understand the principle of operation & working of different electronic instruments.
- To understand the principle of operation & working of different transducers, applications in the field of instrumentation and control.

Unit-I : **Oscilloscopes:**
CRT, Construction, Basic CRO circuits, Block diagram of a modern oscilloscope, Y-amplifiers, X-amplifiers, Time base-single and mixed time base. Triggering, Oscilloscopic measurement. **(4 Hrs)**

Unit-II : **Special purpose CRO's:**
Dual trace, Duel beam, Sampling oscilloscope, Analog and digital storage CROs. **(4 Hrs)**

Unit-III : **Electronic instruments:**
Electronic voltmeter, Digital voltmeter, vector voltmeter, Vector Impedance meter and Q-meter. **(4 Hrs)**

Unit-IV : **Transducers:**
Classification, Inductive, Resistive and Capacitive transducers, Analog and Digital Transducers with applications. Hall effect, Piezo Electric, Photovoltaic transducer, Measurement of temperature and pressure. **(4 Hrs)**

Unit-V : **Display Devices & Recorders:**
Digital display, LED, LCD, Strip chart recorder, X-Y recorder, Magnetic tape recorder. **(4 Hrs)**

Unit-VI : **Signal Generation:**
Sine wave generator, Triangular wave and square wave generator.
Signal Analysis: Wave analyzer, Frequency selective and hetrodyne wave analyzer, Distortion measurement, Harmonic analyzer. **(4 Hrs)**

Text Books :

1. Sawhney A.K. - Electrical & Electronic Measurement and Instrumentation.
2. Helfrick and Copper - Modern Electronics Instrumentation and Measurement, Pearson Education, New Delhi.

Reference Books :

1. Patranabis D – Sensors and Transducers, Wheeler, 1996.
2. Kalsi - Electronics Instrumentation, TMH Publication, New Delhi.

Section A: Includes Unit I, II and III;
Section B: Includes Unit IV, V and VI.
All units carry equal weightage.

Pattern of Question Paper:

The Six units in the syllabus shall be divided in two equal parts i.e. 3 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 40 marks Paper:

- Minimum six questions.
- Three questions in each section.
- Question No-1 from section A and Question No-6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for 08 marks each. The Question no.1 and 6 should be of objective nature.
- Two questions of 06marks each from remaining questions from each section A and B be asked to solve.

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Syllabus of T. Y. B. Tech. (Electrical) Semester-VI

Course Code : EED351 **Course: Power System Analysis**
Teaching Scheme: 4 Hrs/week **Class Test (Marks): 20**
Theory: 4 Hrs/week **Theory Examination (Duration): 3 Hrs**
Credits: 4 **Theory Examination(Marks): 80**

Course Objectives :

- The present day power systems are characterized by large high interconnected network.
- Apply this knowledge to model and predict system behaviour.
- Extensive system studies are required at almost all stages of its planning, operation and control.
- Simulation and analysis of such a large system is possible only with the help of digital computers.

Unit-I : **Representation of Power system Components**:
Introduction (Characteristics of Modern Power Systems) Physical Structure, OLD & Impedance & Reactance Diagram, Per Unit System- P.U. Representation of Transformer, P.U. Impedance Diagram of Power system, Steady State Model of Synchronous Machine, Numerical treatment expected. **(8 Hrs)**

Unit-II : **Symmetrical Fault Analysis:**
Transients on transmission line, Short Circuit on Unloaded Synchronous machine, Short Circuit on loaded Synchronous machine **,** Selection Checklist for circuit breaker, Short circuit MVA, Algorithm for Short circuit studies **,** Z- Bus Formulation, Numerical treatment expected. **(8 Hrs)**

Unit-III : **Symmetrical Components:**
Sequence Impedances Synchronous machine, Sequence Impedances Transformer, Construction of Sequence network of Power Systems, Numerical treatment expected. **(8 Hrs)**

Unit-IV : **Unsymmetrical Fault Analysis:**
Symmetrical component analysis of Unsymmetrical Faults, Analysis of Single Line to Ground (LG) fault, Line-To-Line (LL) fault, Double-Line-To-Ground (LLG) fault, One conductor open fault, Bus Impedance Matrix for analysis of Unsymmetrical shunt faults, Numerical treatment expected. **(8 Hrs)**

Unit-V : **Load Flow Analysis:**
Load flow problem, Gauss-Seidel Method, Newton-Raphson Method, Decoupled Load Flow studies, Fast Decoupled Load Flow studies. Comparison of Load Flow methods, Numerical treatment expected. **(8 Hrs)**

Unit-VI : **Load dispatch center:**
Load dispatch center function, contingency analysis, preventive, emergency and restorative control. **(8 Hrs)**

Text Books :

1. Modern Power System Analysis - I.J. Nagrath& D.P. Kothari, Tata McGraw Hill, New Delhi.
2. Power System Analysis and Design - B R Gupta , S.Chand
3. Power System Analysis - Abhijit Chakraborty and SunitaHaldar,

J.B.Gupta."A course in power systems"

4. Power System Analysis - P.S.R. Murthy, B.S. Publications.
5. Power System Analysis - Hemalatha and Jayachrista, Scitech Publication. Electrical Power Systems, Ashfaq Hussain, CBS publishers, New Delhi V edition

Reference Books :

1. Power System Analysis - H. Hadi Sadat, Tata McGraw-Hill New Delhi.
2. Computer Methods in Power System Analysis - Stagg &Abid, Tata McGraw Hill, New Delhi.
3. Electric Power Systems: Design and Analysis - M.E.El-Hawary, IEEE Press, New York Elements of Power System Analysis - Stevenson W.D. (4thEd.) Tata McGraw Hill, New Delhi.

Section A: Includes Unit I, II and III;
Section B: Includes Unit IV, V and VI.
All units carry equal weightage.

Pattern of Question Paper:

The Six units in the syllabus shall be divided in two equal parts i.e. 3 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

- Minimum ten questions.
- Five questions in each section.
- Question No-1 from section A and Question No-6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for 10 marks each. The Question no.1 and 6 should be of objective nature.

Two questions of 15 marks each from remaining questions from each section A and B be asked to solve.

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Syllabus of T. Y. B. Tech. (Electrical) Semester-VI

Course Code : EED352 | **Course: Control System Engineering**

Teaching Scheme: 4 Hrs/week | **Class Test (Marks): 20**

Theory: 4 Hrs/week | **Theory Examination (Duration): 3 Hrs**

Credits: 4 | **Theory Examination(Marks): 80**

Course Objectives :

- To understand basic concepts of the classical control theory.
- To model physical systems mathematically.
- To analyze behavior of system in time and frequency domain.
- To design controller to meet desired specifications.

Unit-I : Control System Modeling:

Basic concepts of control system, open loop, close loop, classification of control systems. Types of control system: Feedback, tracking, regulator system, feed forward system. Transfer function, Pole and zero concept. Modeling and representation of control system-Basic concept. Mechanical, Electrical and equivalent system. Block diagram reduction, signal flow graph, Mason's gain formula. **(8 Hrs)**

Unit-II : Control System Components:

Modeling and transfer function of control system components such as simple electrical, mechanical, electromechanical systems, Lag network, lead network, Potentiometer, Synchros, AC and DC servo motors, Gear trains, AC-DC Tacho-Generators, Optical encoder, Two tank systems. **(8 Hrs)**

Unit-III : Time Domain Analysis:

Standard test signal – step, ramp, parabolic and impulse signal, type and order of control system, time response of first and second order systems to unit step input, steady state errors – static and dynamic errors coefficients. Generalized errors series method. Time domain specifications of second order systems. Dominant closed loop poles of higher order systems, Design specifications in time domain. **(8 Hrs)**

Unit-IV : Stability Analysis And Root Locus:

Concept of stability-Absolute, relative and marginal. Nature of system response for various locations of roots in S-plane of characteristics equation. Routh's criterion and Hurwithz criterion. Root Locus: Basic properties of root locus. Construction of root locus. Angle and magnitude condition for stable system. Root contour design concept. **(8 Hrs)**

Unit-V : Frequency Domain Analysis:

Steady state response of a system due to sinusoidal input. Relation between time and frequency response for second order system. Frequency domain specifications, analysis with Bode plot, Polar plot, Nyquist plot, stability analysis using Nyquist plot and Bode plot. **(8 Hrs)**

Unit-VI : PID Controllers:

Basic concept of PID controller, Design specifications in time domain and frequency domain. Time design of P, PI, PID controllers. Frequency domain

design of P, PI, PID controllers, Tuning of PID controllers. Zigler-Nichol Method. **(8 Hrs)**

Text Books :

1. Control System Engineering - I.J. Nagrath, M. Gopal, New Age International Publishers, 4th Edition, 2006.
2. Modern control system engineering - Katsuhiko Ogata, Prentice Hall, 2010.
3. Control Systems Engineering - Natarajan Ananda, Babu P. Ramesh, Second Edition, Scitech Publication, 2010.
4. Automatic Control Engineering - Benjamin C. Kuo, Prentice Hall of India Pvt. Ltd.

Reference Books :

1. Modern control system - Richard C Dorf and Robert H Bishop, Pearson Education, 12th edition, 2011.
2. Control Systems Engineering - Nise N. S., John Wiley & Sons, Incorporated, 2011.
3. Control Engineering: An Introductory Course - Jacqueline Wilkie, Michael Johnson, Reza Katebi, Palgrave Publication, 2002.
4. Modern Control Engineering - D. Roy Choudhary, PHI Learning Pvt. Ltd., 2005.
5. Control Systems: Theory and Applications - Smarajiti Ghosh, Dorling Kindersley (RS), 2012.
6. Control Systems – N.K. Sinha, New Age International (P) Ltd Publishers, 3rd Edition, 1998.

Section A: Includes Unit I, II and III;
Section B: Includes Unit IV, V and VI.
All units carry equal weightage.

Pattern of Question Paper:

The Six units in the syllabus shall be divided in two equal parts i.e. 3 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

- Minimum ten questions.
- Five questions in each section.
- Question No-1 from section A and Question No-6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for 10 marks each. The Question no.1 and 6 should be of objective nature.

Two questions of 15 marks each from remaining questions from each section A and B be asked to solve.

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Syllabus of T. Y. B. Tech. (Electrical) Semester-VI

Course Code : EED353 **Course: Electrical Drives**
Teaching Scheme: 4 Hrs/week **Class Test (Marks): 20**
Theory: 4 Hrs/week **Theory Examination (Duration): 3 Hrs**
Credits: 4 **Theory Examination(Marks): 80**

Course Objectives :

- To understand the motor drives and control.
- To provide a foundation in the theory and applications of electrical machinery and their different types with respect to their control.
- In-depth study on recent drives and its applications.

Unit-I : **Introduction:**
Definition, Advantages of electrical drives, Components of Electric drivesystem, Selection Factors, Types of Electrical Drives (DC & AC). Motor-Load Dynamics, Speed Torque conventions and multi quadrant operation, Equivalent values of drive parameters.
Load Torque Components, Nature and classification of Load Torques, Constant Torque and Constant Power operation of a Drive. Steady state stability, Load equalization by using flywheel. **(6 Hrs)**

Unit-II : **Solid state controlled D.C. Motors:**
Single phase and three phases fully controlled converterdrives and performance of converter fed separately excited DC Motor for starting and speed control operations. Chopper controlled drives for separately excited and series DC Motor operations. Closed loop speed control of DC motor below and above base speed. **(8 Hrs)**

Unit-III : **Solid State Controlled Induction Motors:**
Thyristorised stator voltage control (using acregulators, for fixed frequency variable voltage control), Transistorised stator frequency control: v/f control, voltage source inverter (VSI) control, Steady State Analysis, current source inverter (CSI) control, Regenerative braking and multi quadrant operation of Induction motor drives, relative merits and demerits of VSI and CSI for induction motor drives. **(8 Hrs)**

Unit-IV : **Synchronous Motor Drives:**
Review of starting, pull in and braking of Synchronous motor, Static variable frequency control for Synchronous motors, Load commutated inverter fed Synchronous motor drive, Introduction to closed loop control of Load commutated inverter fed Synchronous motor drive. **(6 Hrs)**

Unit-V : **Energy Saving Techniques:**
Calculation of time and energy loss in transient operations: Starting, Speed variation and Braking. Energy Saving in starting of Induction Motor Drive: Static rotor resistance control, Slip Power recovery schemes: Static Scherbious Drive, Static Kramer Drive Energy Saving in running of Induction Motor Driving Pump and Blower: Consideration of load torque characteristics and energy saving calculations. Power Rating: Selection criteria of motors, motor duties, inverter duty motors. Load diagram, Heating and cooling, Thermal Resistance, determination of HP rating of motor based on duty cycle, de-rating of motor, effect of harmonic current and

voltage harmonics, short time rating. **(10 Hrs)**

Unit-VI : Latest Trends In Drives And Industrial Applications:

Latest trends in Drives: Rotor flux oriented vector control for induction motor drives. Brush less DC Motor.

Industrial Applications: Drives for Rolling mills (Four Quadrant Operation), Machine tools (Constant Torque Application), Textile mills (Synchronized operation of Drive in Tandem), Sugar Mills: Centrifuged Drive, Traction drives.

(10 Hrs)

Text Books :

1. Fundamentals of Electric Drives - G. K. Dubey, 2nd Edition, Narosa Publishing House
2. Electric Drives - N. K. De, P. K. Sen, Prentice Hall of India Eastern Economy Edition
3. Analysis of Thyristor Power Conditioned Motors - S. K. Pillai, University Press.

Reference Books :

1. Modern Power Electronics and AC Drives - K. Bose, Pearson Education.
2. Practical Variable Speed Drives and Power Electronics - Malcolm Barnes, Newnes.
3. Electric Motor Drives – Modeling Analysis and Control - R. Krishnan, PHI India.
4. Electric Drives: Concepts & Application - V. Subrahmanyam, Tata Mc-Graw Hill (An imprint of Elsevier).

Section A: Includes Unit I, II and III;
Section B: Includes Unit IV, V and VI.
All units carry equal weightage.

Pattern of Question Paper:

The Six units in the syllabus shall be divided in two equal parts i.e. 3 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

- Minimum ten questions.
- Five questions in each section.
- Question No-1 from section A and Question No-6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for 10 marks each. The Question no.1 and 6 should be of objective nature.

Two questions of 15 marks each from remaining questions from each section A and B be asked to solve.

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Syllabus of T. Y. B. Tech. (Electrical) Semester-VI

Code No.: BSH 354 | **Title: Industrial Management**
Teaching Scheme: 04Hrs/week | **Class Test (Marks): 20**
Theory: 04Hrs/week | **Theory Examination (Duration): 03 Hrs**
Credits:04 | **Theory Examination (Marks): 80**

Objectives	**:**	1. Students should understand concept of management 2. Students should understand human resource management, production management, marketing management, financial management and quality management **3.** Students should understand modern management techniques
Unit-I	**:**	**Basics of Management:** Introduction, Definition of Management, Characteristics of management, functions of Management – planning, Organizing, Staffing, Directing, Coordinating, Controlling, Motivation, Communication, Decision Making, Principles of management – F. W. Taylor, Henry Fayol, Elton Mayo, Administration and Management, Nature of Management, Levels of Management, Managerial skills, managerial roles, Forms of organization, Line, Line-staff etc. Forms of ownership – Partnership, Proprietorship, joint stock, cooperative society, Government sector etc., concept of globalization. **[8 Hours]**
Unit-II	**:**	**Human Resource Management:** Objectives of HRM, Strategic importance of HRM, Challenges to HR Professionals, Roles and responsibilities of HR professionals, Human resources planning, talent acquisition, recruitment and selection, Career Planning & Management, Training & Development, discipline and disciplinary action, executive development, need and benefits of good HR policy. **[8 Hours]**
Unit-III	**:**	**Purchase & Stores Management:** Materials Function, Purchasing or Procurement, buying techniques, purchase procedure, vendor selection, vendor rating. Stores management: Introduction to Stores Management, Stores and material control, Receipt and issue of Materials, Concept of inventory control & its objectives, EOQ, ABC analysis, Material Requirement Planning. **[8 Hours]**
Unit-IV		**Production and Quality Management:** Types of production, Functions of Production Planning & Control, Plant location and layout, Method Study. Inspection, types of inspection, difference between inspection and quality control, sampling inspection statistical quality control, quality circles, reliability concept. **[8 Hours]**
Unit-V		**Marketing Management & Financial Management:** Marketing Management: Introduction, the sales concept, sales vs marketing, market research, sales forecasting, and channels of distribution, pricing. Financial Management: Introduction to financial management, types of capital, sources of finance, assets and Liabilities, factors affecting requirement of working capital, return on investment. **[8 Hours]**
Unit-VI	**:**	**Modern Management Techniques**: Kaizen, Flexible Manufacturing System, Just in Time, Lean Manufacturing, Total Productive Maintenance, Supply Chain Management, Agile Manufacturing, Six Sigma, Management Information System. **[8 Hours]**
Reference	**:**	**1.** O P Khanna, "Industrial Engineering and Management", 2nd Edition, Dhanpat Rai, 2004.

Books:		**2.** Korgaonkar M.G. 'Just In Time Manufacturing', Laxmi Publication. **3.** Besterfield Dale H., Besterfield Carol, Total Quality Management 3rd Edn. **4.** Chopra Sunil, Meindl Peter, Kalra D.V., Supply Chain Management : Strategy Planning & Operation 6th Edn., Pearson. **5.** S. S. Patil & N K Hukeri, Industrial Engineering and Production and Operations Management, Electrotech Publication **6.** S. Sadagopan, Management Information System, PHI Learning. **7.** Craig W Baird, The six Sigma Manual for small and Medium Business.

Section A: Includes Unit I, II and III; Section B: Includes Unit IV, V and VI.
Pattern of Question Paper:
The six units in the syllabus shall be divided in two equal parts i.e. 3 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.
For 80 marks Paper:

1. Minimum ten questions
2. Five questions in each section
3. Question no 1 from section A and Question no 6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for ten marks each. The Question no.1 and 6 should be of objective nature.

Two questions of 15 marks each from remaining questions from each section A and B be asked to solve.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

(Faculty of Science & Technology)

Syllabus of T. Y.B. Tech. Semester- VI

Code No.: AED381 | **Title: Open Elective-I (Remote Sensing & GIS)**

Teaching Scheme: 04Hrs/week | **Class Test: 20 Marks**

Theory: 04 Hrs/week | **Theory Examination (Duration): 03 Hrs**

Theory Examination (Marks): 80

Credits : 4

Objectives : To develop applications of environmental remote sensing and GIS which can directly enhance service delivery on land use management, ground water management/prospects, agriculture, forestry, food and water security, disaster management. Present subject is designed for fulfillment of following objectives

1. To understand the fundamental principles and applications of Remote Sensing and Geographical Information Systems.
2. To increase awareness about RS and GIS among students for various researches pertaining to watershed management
3. To describe how geographical information is used and managed.

Unit-I : Remote Sensing: Definition, Historical Development, remote sensing system, Multi concept of remote sensing. Advantages and disadvantages in remote sensing, general applications of remote sensing (Descriptive & Analytical) (08 Hrs)

Unit-II : Electromagnetic radiation: Electromagnetic energy, energy interaction with atmosphere and earth surface, resolutions in remote sensing (08Hrs)

Unit-III : Sensors and Platforms: Classification, Land observation satellites, Weather satellites, Satellite data reception, transmission and processing, Data products, Standard products, Digital data products, (Descriptive & Analytical) (08 Hrs)

Unit-IV : Image interpretation: Procedure, elements, techniques, equipments for image interpretation, basic principles of image interpretation, factors governing the quality of an image, factors governing interpretability, visibility of objects, digital image processing, digital image, steps, remote sensing in agriculture progress and prospects, microwave radiometry for monitoring agriculture crops and hydrologic forecasting, aerial photo interpretation for water resources development and soil Conservation survey. (Descriptive & Analytical) (08Hrs)

Unit-V : Geographical Information System: History of development of GIS definition, basic components, GIS input data and output product, general application. (Descriptive & Analytical) (08 Hrs)

Unit-VI : GIS data: type, representation, source, data sets, acquisition, data structure, data base management systems (DBMS), GIS application. (Descriptive & Analytical) (08Hrs)

Reference Books :

1. Remote sensing and Geographical Information System by A. M. Chandra & S. K. Ghosh, Narosa Publishing House, New Delhi
2. Remote Sensing- Principals and Applications by B. C. Panda, Viva book Publication, New Delhi
3. Basics of Remote Sensing & GIS by S. Kumar, an online book published by Laxmi Publications, New Delhi
4. Remote Sensing & GIS by Basudeb Bhatta, an online book published by OUP India

Section A: Includes Unit I, II and III; **Section B**: Includes Unit IV, V and VI.

Pattern of Question Paper:

The six/four units in the syllabus shall be divided in two equal parts i.e. 3 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Minimum ten questions
2. Five questions in each section
3. Question no 1 from section A and Question no 6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for ten marks each. The Question no.1 and 6 should be of objective nature.
4. Two questions of 15 marks each from remaining questions from each section A and B be asked to solve.

Dr.Babasaheb Ambedkar Marathwada University, Aurangabad

(Faculty of Science and Technology)

Syllabus of T.Y.B. Tech. (Computer Science and Engineering) Semester-VI

Code No.: CSE 381 **Title: Open Elective-I Professional Ethics and Cyber Security**

Teaching Scheme:04 Hours per week **Class Test: 20**

Theory: 04 Hours per week **Theory Examination (Duration): 03 Hrs**

Tutorial: **Theory Examination (Marks): 80**

Credits:04

Objectives 1. To make students familiar with the fundamental concepts of computer ethics.

2. To know the linkage between computer, professional ethics and ethical decision making
3.To know the ethical concepts and ethical theories
4. To Know the privacy and cyberspace
5. To know concept of cyber security.
6. To know the practice of administrating using Cyber Security.

Unit-I : **Introduction: Why Computer Ethics?** (08 **Hrs)**

The Standard Account: New Possibilities, a Vacuum of Policies, Conceptual Muddles• An Update to the Standard Account.
Ethical Decision making: Ethical dilemma, Guidelines for dilemma(Formal and Informal), Solving ethical dilemma **,**
Socio technical Computer Ethics, Micro- and Macro-Level Analysis ,
Intellectual Property: Copy right, Trade mark, Trade Secret, Patent

Unit-II : **Professional Ethics, Codes of Conduct, and Moral Responsibility**

Professional Ethics: Profession, Professional, Computer/ IT Professional **,** (08 **Hrs)**

Computer/IT Professionals Special Moral Responsibilities: Safety-Critical Software, **Professional Codes of Ethics and Codes of Conduct:** Purpose of Professional Codes, Criticisms of Professional Codes, Defending Professional Codes,

Conflicts of Professional Responsibility: Employee Loyalty and Whistle-Blowing , Whistle-Blowing Issues, Strategy for Understanding Professional Responsibility

Unit-III : **Ethical Concepts and Ethical Theories: Establishing and Justifying A Moral System**

(08 **Hrs)**

Ethics and Morality: Morality, Rules and Principles of a Moral System,
Ethical Theories: Consequence-Based **:**Utilitarianism , Duty-Based: Deontology, Contract-Based **,** Rights-Based Contract , Character-Based : Moral Person vs. Following Moral Rules, Acquiring the "Correct" Habits ,
Integrating Aspects of Classical Ethical Theories into a Single Comprehensive Theory: Moor's Just-Consequentiality Theory and Its Application to Cyber technology**.**

Unit-IV : **PRIVACY AND CYBERSPACE**

Cyber technology Unique or Special, Personal Privacy: Accessibility Privacy, Decisional Privacy, Informational Privacy, Comprehensive Account of Privacy, Privacy as "Contextual Integrity", **Privacy Important:** Intrinsic Value, Social Value. **Gathering Personal Data:** Dataveillance Techniques, Internet Cookies , RFID Technology, Cyber technology and (08 **Hrs)**

Government Surveillance, **Exchanging Personal Data:** Merging Computerized Records, Matching Computerized Records . **Protecting Personal Privacy in Public Space:** Search Engines and the Disclosure of Personal Information, Accessing Online Public Records.

Unit-V : **Security Basics**

Security Basics: Introduction, Elements of Information security, Security Policy, Techniques, steps, Categories, Operational Model of Network Security, Basic Terminologies in Network Security. **Intrusion and Firewall**: Introduction, Intrusion detection, IDS: Need, Methods, Types of IDS, Password Management, Limitations and Challenges, Firewall Introduction, Characteristics and types, Benefits and limitations. Trusted Systems, Access Control. (08 **Hrs**)

Unit-VI : **Security perspective of Hacking and its counter majors**

Remote connectivity and VoIP hacking, Wireless Hacking, Mobile Hacking, Hacking (08**Hrs**)

Hardware, Application and data Hacking, Mobile Hacking, Counter majors: General

Strategies, Example Scenario's: Desktop, Servers, Networks, Web, Database, Mobile.

Reference Books: :

1 . Computer Ethics by Deborah Johnson 4th edition

2. Ethics and Technology Controversies, Questions, and Strategies for Ethical Computing by HERMAN T. TAVANI, 4th Edition, Wiley publication

3. Dr. V.K. Pachghare, Cryptography and Information Security, PHI,ISBN 978-81-303-5082-3

4. Nina Godbole,Sunit Belapure, Cyber Security,Wiley India, ISBN:978-81-345-2179-1

Section A: Includes Unit I, II and III; **Section B**: Includes Unit IV, V and VI.

Pattern of Question Paper:

The six/four units in the syllabus shall be divided in two equal parts i.e. 3 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Minimum ten questions.
2. Five questions in each section.
3. Question no 1 from section A and Question no 6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for ten marks each. The Question no.1 and 6 should be of objective nature.

Two questions of 15 marks each from remaining questions from each section A and B be asked to solve

Code No.: CED381	**Title: Open Elective: Design for Environment**
Teaching Scheme: 04Hrs/week	**Class Test (Marks): 20**
Theory: 04Hrs/week	**Theory Examination (Duration): 03 Hrs**
Credits:04	**Theory Examination (Marks): 80**

Objectives :
- This course has been designed to teach about environmental engineering, energy and economy through the use of case studies, computer software tools, and seminars from the point of view of sustainable development and changing societal, industrial demands. Case studies provide the basis for group projects as well as individual

Unit-I : Review of physical, chemical, ecological, and economic principles used to examine interactions between humans and the natural environment. Modeling concepts, applications in all engineering domains **[7 Hours]**

Unit-II : Mass balance concepts are applied to ecology, chemical kinetics, hydrology, and transportation; energy balance concepts are applied to design, ecology, and climate change; and economic and life cycle concepts are applied to resource evaluation and engineering design. **[7 Hours]**

Unit-III : Design for Environment (DfE) concepts, applications, and Case studies [**10 Hours]**

Unit-IV : Assessment, Monitoring and control of Rural, Urban and Industrial Pollutions using CDTs**[8 Hours]**

Unit-V : Numerical models are used to integrate concepts and to assess environmental impacts of human activities. Problem sets involve development of MATLAB and GIS models for engineering applications in all domains. **[8 Hours]**

Unit-VI : Emphasis on the principles of infrastructure planning with a focus on appropriate and sustainable technologies incorporating technical, socio-cultural, public health, and economic factors into the planning and design of urban, industrial systems. **[8 Hours]**

Reference Books:

1. Ecological Water Quality (Water Treatment and Reuse) – Kostas Voudouris and Dimitra Voutsa.
2. Wastewater Engineering- Metcalf and Eddy, McGraw Hill Publication.
3. MATLAB for Engineering Application- Williams J. Palm, Tata McGraw Hill Publication.
4. Application of GIS and Remote Sensing in Environmental Management- S. A. Abbasi, DPH Publications.
5. Harte, John "Consider a Cylindrical Cow: More Adventures in Environmental Problem Solving." Mill Valley, CA: University Science Books, 2001.
6. Fay, James A., and Dan S. Golomb. Energy and the Environment. New York, NY: Oxford University Press, 2002
7. Etter, Dolores. Introduction to MATLAB for Engineers and Scientists. Upper Saddle River, NJ: Prentice Hall, 1996
8. Etter, Dolores, David Kuncicky, and Holly Moore, "Engineering Problem Solving with MATLAB" . Upper Saddle River, NJ: Prentice Hall, 2006.
9. Howard S. Peavy, Donald R. Rowe, George Tchobanoglous “Environmental Engineering” Mcgraw Higher Ed. ISBN: 9789351340263

Section A: Includes Unit I, II and III; **Section B**: Includes Unit IV, V and VI.

Pattern of Question Paper:

The six/four units in the syllabus shall be divided in two equal parts i.e. 3/2 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Minimum ten questions.
2. Five questions in each section.
3. Question no 1 from section A and Question no 6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for ten marks each. The Question no.1 and 6 should be of objective nature.
4. Two questions of 15 marks each from remaining questions from each section A and B be asked to solve.

Code No.: EED381	**Title: Open Elective-I: Robotics and Automation**
Teaching Scheme: 4 hrs/week	**Class Test (Marks): 20**
Theory: 4 hrs/week	**Theory Examination (Duration): 3 hrs**
Credits:4	**Theory Examination (Marks): 80**

Objectives :

1. Describe the history and early beginnings of automated manufacturing & Robotics. Ability to recognize industrial control problems.
2. Aims to Develop understanding Robotics Components.
3. Apply creative approaches to practical applications, identify technological opportunities in robotics.
4. An over view of technology of advanced topics such as CNC Machines, Human Robot Interaction.
5. The ability to provide Automation solution.

Unit-I : **Introduction to Automation:**

Types of Automation; Architecture of Industrial Automation Systems, Advantages and limitations of Automation, Effects of modern developments in automation on global competitiveness. Introduction of CNC Machines: Basics and need of CNC machines, NC, CNC and DNC (Direct NC) systems, Structure of NC systems, Applications of CNC machines in manufacturing, Advantages of CNC machines. **(8 Hrs)**

Unit-II : **Robotics**:

Robot anatomy-Definition, law of robotics, History and Terminology of Robotics-Accuracy and repeatability of Robotics-Simple problems Specifications of Robot-Speed of Robot-Robot joints and links-Robot classifications-Architecture of robotic systems-Robot Drive systems Hydraulic, Pneumatic and Electric system.**(8 Hrs)**

Unit-III : **Robot Transformation, Sensors & End effectors**:

Transformation types: 2D, 3D. Translation- Homogeneous coordinates multiple transformation-Simple problems. Sensors in robot – Touch sensors-Tactile sensor – Proximity and range sensors Robotic vision sensor-Force sensor-Light sensors, Pressure sensors End effectors : Mechanical grippers-Slider crank mechanism, Screw type, Rotary actuators, cam type-Magnetic grippers- Vacuum grippers-Air operated grippers-Gripper force analysis-Gripper design-Simple problems**(8 Hrs)**

Unit-IV : **Kinematics:**

Rigid body Kinematics, Inverse Kinematics, Rotation matrix, Homogenous transformation matrix, Denavit - Hartenberg convention, Euler angles, RPY representation, Direct and inverse Kinematics for industrial robots for position and orientation Redundancy, Manipulator, Jacobian Joint, End effector, velocity – direct and inverse velocity analysis. Control: Individual joint computed torque.**(8 Hrs)**

Unit-V : **Dynamics:**

Lagrangian Dynamics, link inertia tensor and manipulator inertia tensor, Newton-Euler Dynamics of Robot, Newton-Euler formulation for RR & RP manipulators, Dynamics of systems of Interacting Rigid Bodies, D-H Convention, Trajectory planning for Flexible Robot, Cubic polynomial linear segments with parabolic blending, static force and moment transformation, solvability, stiffness, Singularities.**(8 Hrs)**

Unit-VI : Robot Control & Applications 6L Control approaches: oscillatory based time varying control law, control law based on vector field orientation approach. Advanced strategies of control: conventional aerial vehicle, Bidirectional X4-flyer. Applications of Fuzzy Logic and Neural network in Robot Control, Neural controllers, Implementation of Fuzzy controllers: Trajectory tracking controller. Applications of Robotic system: complex control system, vision system in complex control system. Human Robot Interaction: Architecture.(**8 hrs)**

Text books :

Sr. No.	Title	Author	Publication	Edition
1	Robotics And Automation Handbook	Thomas R. Kurfess,	CRC Press	2004, ISBN 0- 8493-1804-1
2	Robot Motion and Control(Recent Developments)	M.Thoma & M. Morari		2018
3	Welding Robots - Technology, System Issues and Applications	J. Norberto Pires, Altino Loureiro and Gunnar Bölmsjo	Springer-Verlag	2006, ISBN-10:1852339535
4	Robotics : Designing the Mechanisms for Automated Machinery	Ben-Zion Sandler,	Academic Press,	2nd ed.1999

Reference Books

Section A: Includes Unit I, II and III; **Section B:** Includes Unit IV, V and VI.

Pattern of Question Paper:

The six units in the syllabus shall be divided in two equal parts i.e. 3 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Minimum ten questions.
2. Five questions in each section.
3. Question no 1 from section A and Question no 6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for ten marks each. The Question no.1 and 6 should be of objective nature.
4. Two questions of 15 marks each from remaining questions from each section A and B be asked to solve

Code No.: ETC 381	**Title: Open Elective-I: Internet of Things**
Teaching Scheme: 04Hrs/week	**Class Test (Marks): 20**
Theory: 04Hrs/week	**Theory Examination (Duration): 03 Hrs**
Credits:04	**Theory Examination (Marks): 80**

Prerequisites : Python Fundamentals, basics of electronics, Networking fundamentals, WWW terminology

Objectives :
- To understand IOT value chain structure (device, data cloud), application areas and technologies involved
- To understand IOT sensors and technological challenges faces by IoT devices.
- Explore and learn about Internet of things with the help of projects

Unit-I : **Introduction to IoT:**
Definition of IOT- Evolution of IOT and related terms, hardware, software, network stack for IoT, Business Scope, SAAS Model, Industry 4.0. . **[8Hours]**

Unit-II : **Elements of IoT:**
Introduction to elements of IOT, Basic Architecture of an IOT application sensors, and Actuators – Edge Networking (WSN) – Gateways – IOT Communication Model – WPAN and LPWA, 6LoPAN, Sigfox, Introduction to basis looping and conditional statements, basics of HTML. . **[8Hours]**

Unit-III : **IoT Sensors:**
Node MCU ESP 8266- hardware specification, GPIO programming, WIFI connectivity programming, Access Point Programming. . **[8Hours]**

Unit-IV : **Communication and Connectivity Technologies:**
Introduction to: TCP/IP, UDP, NTP, MQTT, Network and Sockets, WIFI. Cloud Computing in IOT - IOT Communication Model – Cloud Connectivity, Things speak, '100', HCR. . **[8Hours]**

Unit-V : **Data Analytics and IOT Platforms:**
Basics of statistics, Descriptive statistics and probability distributions. Big Data Analytics - Hadoop, Data Visualization – radar charts, – IOT Platforms- Microsoft Azure and Amazon Web Services, IBM Watson, Google Home and Amazon's Alexa . **[8Hours]**

Unit-VI : **Preparing IoT Projects**
(Creating the sensor project with Node MCU ESP 8266 - Sensor libraries - Interacting with the hardware, Internal representation of sensor values - Persisting data - External representation of sensor values - Exporting sensor data - Creating the actuator project Hardware - Interfacing the hardware - Creating a controller - Representing sensor values - Parsing sensor data - Calculating control states. . **[8Hours]**

Reference Books: :

Text Books:
- The Internet of Things: Applications and Protocols, Wiley publications. Author(s): Oliver Hersent, David Boswarthick, Omar Elloumi
- Architecting the Internet of Things, Springer publications. Author(s): Dieter Uckelmann, Mark Harrison, Florian Michahelles
- Internet of Things with Arduino Cookbook, Packt Publications. Author(s): Marco Schwatrz

Reference Books:
- Internet of Things and Data Analytics, Wiley Publications

Section A: Includes Unit I, II and III; **Section B**: Includes Unit IV, V and VI.

Pattern of Question Paper:

The six/four units in the syllabus shall be divided in two equal parts i.e. 3/2 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Minimum ten questions.
2. Five questions in each section.
3. Question no 1 from section A and Question no 6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for ten marks each. The Question no.1 and 6 should be of objective nature.
4. Two questions of 15 marks each from remaining questions from each section A and B be asked to solve.

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

(Faculty of Science & Technology)

Syllabus of T. Y. B. Tech. (All) Semester-VI

Course Code: MED 381	**Course: Open Elective:Costing and Financial Management**
Teaching Scheme: 04 Hrs/week	**Class Test: 20 marks**
Theory: 04 Hrs/week	**Theory Examination (Duration): 03 Hrs**
Credits: 04	**Theory Examination (Marks): 80**

Objectives :

1. To understand the basic concepts and processes used to determine product costs,
2. To be able to analyze and evaluate information for cost ascertainment, planning, control and decision making, and
3. To develop ability to analyze and interpret various tools of financial analysis and planning,
4. To gain knowledge of management and financing of working capital,
5. To understand concepts relating to financing and investment decisions

Unit-I : Costing

Methods of costing and elements of cost.

Material Cost

Different methods of pricing of issue of materials.

Labour Cost

Different methods, wages and incentive plans. Principles of good remunerating system, labour turnover.

Depreciation

Concept, importance and different methods of depreciation (**8 Hrs)**

Unit-II : Overheads

Classification, collection of overheads, Primary and Secondary apportionment of overheads, absorption of overheads- Machine hour and labour hour rate. Under and over absorption of overheads. **(8 Hrs)**

Unit-III : Standard costing:

Concept, development and use of standard costing, variance analysis.

Marginal Costing

Use of Marginal Costing in decision-making.

Capital Budgeting

Control of Capital Expenditure, techniques of capital budgeting –Pay Back Method, Accounting rate of return, Internal Rate of Return, DCF, Net Present Value and profitability index. **(8 Hrs)**

Unit-IV : Introduction To Financial Management

Concept of business finance, Goals & objectives of financial management, Sources of financing **-** LONG TERM: shares, debentures, term loans, lease & hire purchase, retained earnings, public deposits, bonds (Types, features & utility), SHORT TERM: bank finance, commercial paper, trade credit & bills discounting, INTERNAL: Retained earnings, Cost of Capital & Means of Finance. **(8 Hrs)**

Unit-V : Financial Statement Preparation, analysis & Interpretation

Preparation of financial statement and Profit & Loss Account, Balance Sheet.

Ratio Analysis

Classification, Ratio Analysis and its limitations, Index Statement & Common Size Statement. **(8 Hrs)**

Unit-VI : Working Capital Management

Concept and design of Working Capital, types of working capital, sources of working capital, Time value of money, definition of cost and capital, Cash management, creditors management, debtors management. **(8 Hrs)**

Text Books :

- Bhattacharya A. K., "Principles and Practice of Cost Accounting", Prentice Hall India.
- B K Bhar, "Cost Accounting – Methods and Problems", Academic Publishers
- Khan M. Y., Jain P. K., "Financial Management", Tata McGraw Hill
- Pariasamy P., "Financial , Cost & Management Accounting", HH Publication

Reference Books :

1. Colin Drury, "Management and Cost Accounting", English Language Book Society, Chapman and Hall London.
2. Tulsian P. C., "Financial Management", S. Chand.

Section A: Includes Unit I, II and III; **Section B**: Includes Unit IV, V and VI.

Pattern of Question Paper:

The six/four units in the syllabus shall be divided in two equal parts i.e. 3 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

- Minimum ten questions
- Five questions in each section

- Question no 1 from section A and Question no 6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for ten marks each. The Question no.1 and 6 should be of objective nature.
- Two questions of 15 marks each from remaining questions from each section A and B be asked to solve.

Code No.: PPE 381	**Title: Open Elective-I: Introduction to Nanotechnology**
Teaching Scheme: 4 hrs/week	**Class Test (Marks): 20**
Theory: 4 hrs/week	**Theory Examination (Duration): 3 hrs**
Credits:4	**Theory Examination (Marks): 80**

Objectives : 1. To study the introduction to nanomaterials and the factors affecting it.
2. To study the types and synthesis methods of nanomaterials.
3. To study the characterizations and properties of nanomaterials.
4. To study the different applications of nanomaterials.

Unit-I : **Introduction:**
Introduction to nanotechnology, conventional micro vs. nano-material properties, role of size in properties of nano-materials, length scale and surface to volume concept, and uniqueness of nanostructured materials; health hazards and handling of nanomaterials.

(4 h)

Unit-II : **A) Types of Nano-Materials:**
Montmorillonite, Layer double hydroxide (LDH), Carbon nanofibers (CNFs) – vapour grown carbon fibers (VGCFs), Polyhedral Oligomeric Sisoquioxane (POSS), Carbon nanotubes, Nanosilica, Nanoaluminium oxide, Nanotitanium oxide, Nano-hybrids .

(4 h)

B) Synthesis:
Bottom-up and Top-down approach for nano materials synthesis, Methods: Ball Milling, Chemical vapor deposition, Pressure vapor deposition, Ultrasound assisted, Minimulsion, Microemulsion, Nanoemulsion, Hydrothermal**,** Sol-gel, Miscellaneous techniques.

(8 h)

Unit-III : **Properties of Nanomaterials in terms of Structure Property Relationship:**
Thermal properties, Mechanical properties, Gas barrier properties, Flame retardant properties, Electrical and electrochemical properties, Electronic properties, Optical properties, Magnetic properties, Biodegradable properties, Antimicrobial properties, Catalytic properties.

(8 h)

Unit-IV : **Preparation of Polymer Nanocomposites:**
Solution intercalation, Melt intercalation, Roll Milling, Emulsion Polymerization, In-Situ Polymerization.

(6 h)

Unit-V : **Characterization of Nanomaterials and Nanocomposites:**
X ray diffraction (XRD), Dynamic light scattering (DLS), Scanning electron microscopy (SEM), Transmission electron microscopy (TEM), Energy dispersive x-ray spectroscopy (EDS), Atomic force microscopy (AFM), Small angle X ray scattering (SAXS), Differential scanning calorimetry (DSC), Thermo gravimetric analysis (TGA).

(10 h)

Unit-VI : **Application of Nanomaterials and Nanocomposites:**
Biomedical-Drug delivery, Bone replacement; Sensors – gas sensor, Metal adsorption and recovery, Bio-molecule detectors; Energy storage and conversion - Super capacitors, Solar cells, Energy generators; Electronics; Self cleaning & Self

healing paints, Nano-engineering of cement-based materials, Agricultural Nanotechnologies.

(8 hrs)

Reference books :

Sr. No.	Title	Author	Publication	Edition
1	Polymer Nanocomposites Processing, Characterization, and Applications	Joseph H. Koo	McGraw-Hill Nanoscience and Technology Series	1st 2006
2	Encyclopedia of Nanoscience and Nanotechnology	Hari singh Nalwa	American Scientific publishers	-
3	Nanoparticle Technology Handbook	M Hosokawa, K Nogi, M Naito, T Yokoyama	Elsevier	-
4	The Science of Nanotechnology: An introductory text	Luanne Tilstra et al	Nova Science Publishers, Inc.	-
5	Polymer-Layered Silicate and Silica Nanocomposites	Y.C. Ke, P. Stroeve	Elsevier	2005
6	Nanotechnology in concrete – A review	Florence Sanchez, Konstantin Sobolev	Construction and Building Materials, Elsevier	24 (2010) 2060–2071
7	Agricultural Nanotechnologies: What are the current possibilities?	Claudia Parisi et al	Nano Today, Elsevier	2014

Section A: Includes Unit I, II and III; **Section B:** Includes Unit IV, V and VI.

Pattern of Question Paper:

The six units in the syllabus shall be divided in two equal parts i.e. 3 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Minimum ten questions
2. Five questions in each section
3. Question no 1 from section A and Question no 6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for 10 marks each. The Question no.1 and 6 should be of objective nature.
4. Two questions of 15 marks each from remaining questions from each section A and B be asked to solve.

Course Code : EED355 **Course: Electromagnetic Field**
Teaching Scheme: 2 Hrs/week **Class Test (Marks): 10**
Theory: 2 Hrs/week **Theory Examination (Duration): 2 Hrs**
Credits: 2 **Theory Examination(Marks): 40**

Course Objectives :

- To impart knowledge on the basics of Static Electric and Static Magnetic Field and the associated laws.
- To understand the boundary conditions.
- To analyze time varying electric and magnetic fields.
- To understand Maxwell's equation in different form and media.
- To give insight to propagation of EM waves.

Unit-I : **Scalars and Vectors:**
Scalar, Vector algebra, Unit Vector, Vector arithmetic Distance Vector, Vector multiplication- Dot & Cross Product Coordinate systems – rectangular, Cylindrical, Spherical coordinates. **(03 Hrs)**

Unit-II : **Static Electric Field:**
Gradient, Divergence, Curl, Divergence theorem, Coulombs law, Electric field intensity over Point charge, Line charge, Surface charge and Volume charge distributions, Electric flux density, Gauss law and its applications **(04Hrs)**

Unit-III : **Conductors, Dielectrics and Capacitance:**
Current and current density, Continuity of current, Capacitance - Capacitance of a two wire line, Poisson's equation, Laplace's equation, Application of Laplace's and Poisson's equations. **(04 Hrs)**

Unit-IV : **Static Magnetic Fields:**
Biot-Savart Law, Ampere's Circuital Law, Stokes theorem, Magnetic flux and magnetic flux density, The Scalar and Vector Magnetic potentials **(04 Hrs)**

Unit-V : **Time Varying Fields and Maxwell's Equations:**
Faraday's law for Electromagnetic induction, Displacement current, Point form of Maxwell's equation, Integral form of Maxwell's equations for good conductor **(05Hrs)**

Unit-VI : **Electromagnetic Waves:**
Uniform Plane Waves, Plane waves in free space, Plane waves in lossy dielectrics – Propagation in good conductors – Skin effect. Poynting's theorem. **(04 Hrs)**

Text Books :

1. Engineering Electromagnetics - W H.Hayt & J A Buck, TATA McGraw-Hill, 7th Edition 2007.
2. Outline Theory and Problem of Electromagnetics – Edimister, TATA McGraw-Hill.
3. Electromagnetic Field Theory - S. P. Ghosh, Lipika Datta, McGraw-Hill Education India Private Limited.
4. Principles of Electromagnetics - Matthew N.O. Sadiku, Oxford

University Press Inc, New Delhi, 2009.
5. Electromagnetic waves and Radiating Systems - Edward C. Jordan and Keith G. Balmain, PHI, 2nd Edition.

Reference Books :

1. Electromagnetism - Ashutosh Pramanik, PHI Learning Private Limited, 2014
2. Electromagnetics with applications - Kraus Fleisch, McGraw Hill, 5th Edition.
3. Electromagnetic Field Theory Fundamentals - Bhag Singh Guru, Huseyin R. Hiziroglu, Cambridge University Press, 2nd Edition.

Section A: Includes Unit I, II and III;
Section B: Includes Unit IV, V and VI.
All units carry equal weightage.

Pattern of Question Paper:

The Six units in the syllabus shall be divided in two equal parts i.e. 3 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

- Minimum ten questions.
- Five questions in each section.
- Question No-1 from section A and Question No-6 from section B be made compulsory and should cover complete syllabus of the respective section and should be set for 10 marks each. The Question no.1 and 6 should be of objective nature.

Two questions of 15 marks each from remaining questions from each section A and B be asked to solve.

Course Code : EED371 **Course: Lab VI -Power System Analysis**
Teaching Scheme: Practical **Teachers Assessment: TW-25 Marks**
Practical / Term Work: 2 Hrs /Week **Practical/Viva Exam: 25 Marks**
Credits: 1

Course Objectives :

- To measure parameters of transmission lines.
- To analyze various types of faults in power systems.
- To perform load flow analysis.

List of Practical's (Not less than 10) :

List of Practical :

1. Measurement of ABCD parameters of a medium transmission line.
2. Measurement of ABCD parameters of a long transmission line.
3. Plotting of receiving end circle diagram to evaluate performance of medium transmission line.
4. Study of the effect of VAR compensation on the profile of receiving end voltage using capacitor bank.
5. Static measurement of sub-transient reactance of a salient-pole alternator.
6. Measurement of sequence reactance of a synchronous machine.
7. Formulation and calculation of Y- bus matrix of a system using software.
8. Unsymmetrical fault analysis of a 3-bus system software.
9. Calculation of inductance and capacitance for symmetrical and unsymmetrical configuration of transmission line using software.
10. Solution of a load flow problem using Gauss-Seidal method using software.
11. Solution of a load flow problem using Newton-Raphson method using software.

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above

The assessment of practical examination shall be on the following criteria:
The practical examination shall consist of performing an experiment based on the practical work done during the course, the record of the experiments submitted by the candidate and viva-voce based on the syllabus.

Course Code : EED372 **Course: Lab VII : Control System Engineering**
Teaching Scheme: Practical **Teachers Assessment: TW-25 Marks**
Practical / Term Work: 2 Hrs /Week **Practical/Viva Exam: 25 Marks**
Credits: 1

Course Objectives : To develop ability among students for problem formulation, system design and solving skills.

List of Practical's (Not less than 10) :

List of Practical :

A) Minimum SEVEN experiments should be conducted.

1. Experimental analysis of D.C. Position Control System.
2. Experimental determination of DC servo motor parameters for mathematical modeling, transfer function and characteristics.
3. Experimental determination of AC servo motor parameters for mathematical modeling, transfer function and characteristics.
4. Syncro Transmitter & receiver: Modeling, characteristics and transfer function.
5. Experimental study of time response characteristics of R-L-C second order system: Validation using simulation.
6. Experimental frequency response determination of Lag and Lead compensator.
7. Experimental determination of transfer functions of two tank system.
8. PID control of level/Pressure/Temperature control system.

B) Minimum THREE experiments should be conducted.

1. Stability analysis using a) Bode plot b) Root locus c) Nyquist plot using software.
2. Time response of second order system effect of P, PI, PID on it.
3. Analysis of closed loop DC position control system using PID controller.
4. Effect of addition of pole-zero on root locus of second order system.

Course Code : EED373 **Course: Lab VIII - Electrical Drives**
Teaching Scheme: Practical **Teachers Assessment: TW-25 Marks**
Practical / Term Work: 2 Hrs /Week **Practical/Viva Exam: 25 Marks**
Credits: 1

Course Objectives :

- To understand the motor drivers and control.
- In-depth study on recent drives and its applications.

List of Practical's (Not less than 10) :

List of Practical :

1. To verify the Electrical braking of D.C. Shunt motor (Rheostatic, Plugging).
2. To Verify the Electrical braking of 3-phase Induction Motor (DC Dynamic Braking).
3. Study of Single phase converter fed separately excited D.C. motor speed control characteristics (Fully controlled /Semi controlled).
4. Study of Three phase (Fully controlled/Semi controlled) converter fed D.C. Shunt motor (Open Loop Control).
5. Study of Chopper fed D.C. Shunt motor speed control characteristics.
6. Study of VSI fed 3-phase Induction motor (using V/f control PWM inverter) speed control characteristics.
7. Study of Solid state stator voltage control of 3-phase Induction motor (Using AC voltage Regulator).
8. Study of Closed loop speed control of D.C. Shunt motor
9. Energy saving with Variable frequency drives
10. Study of parameterization of drives (AC/DC) using manufacturer's drive manual.
11. Simulation of starting characteristics of D.C. / 3-phase Induction motor.
12. Simulation of an electric drive system for steady state and transient analysis.

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above

The assessment of practical examination shall be on the following criteria:
The practical examination shall consist of performing an experiment based on the practical work done during the course, the record of the experiments submitted by the candidate and viva-voce based on the syllabus.

Course Code : EED374 **Course: Lab IX –Simulation Lab**
Teaching Scheme: Practical **Teachers Assessment: TW-50 Marks**
Practical / Term Work: 2 Hrs /Week **Practical/Viva Exam: NA**
Credits: 1

Course Objectives : To formulate and develop electrical engineering problem using simulation software like MATLAB, PSIM, PSCAD, PROTEUS etc.

List of Practical's :

List of Practical :
Minimum TEN experiments to be conducted.

1. Verification of Superposition and Maximum power transfer Theorem.
2. Transient responses of series RLC, RL, RC circuits with Sine and Step inputs.
3. Speed control of dc motor.
4. Generation of various types of PWM.
5. A simple battery monitoring and charging system.
6. A single phase H-bridge rectifier using R and R-L load.
7. A single phase H-bridge inverter using R and R-L load.
8. Design of lag, lead and lag-lead compensators.
9. Design of low pass, high pass,band pass and band reject filters.
10. Simulation of symmetrical and unsymmetrical faults in a transmission system.
11. Fault analysis of synchronous machine.
12. To analyze the performance of transmission line with reactive power compensation.
13. Harmonic analysis of signals.
14. Designing and frequency calculation of RC phase shift oscillator.
15. Frequency response of RC coupled amplifiers with feedback and without feedback.
16. LCD interfacing with Microcontroller.
17. Speed control of stepper motor using Microcontroller.

Text Books :

1. Simulation of Dynamic Systems with MATLAB and Simulink by Harold Klee and Randal Allen,CRC Press.
2. MATLAB and SIMULINK for Engineers by Agam Kumar Tyagi,Oxford Publication.

Reference Books :

1. Modeling and Simulation of Systems Using MATLAB and Simulink by Devendra K. Chaturvedi,CRC Press.
2. System Simulation Techniques with MATLAB and Simulink by Dingyu Xue and YangQuan, Wiley Publication.

The assessment of term work shall be done on the basis of the following.

- Continuous assessment
- Performing the experiments in the laboratory
- Oral examination conducted on the syllabus and term work mentioned above

The assessment of practical examination shall be on the following criteria:
The practical examination shall consist of performing an experiment based on the practical work done during the course, the record of the experiments submitted by the candidate and viva-voce based on the syllabus.

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(Faculty of Science & Technology)

Syllabus of T. Y. B. Tech. (All Branches) Semester - VI

Code No.: EED375	**Title: Project I**
Teaching Scheme: 02 Hrs/week	**Practical Examination(Marks): 50**
Practical: 02 Hrs/week	**Credits:01**

Objectives : The Projects in the undergraduate study of engineering aims at developing in the student, knowledge and skills to match the current and projected needs of industry, society or user systems and to create social awareness and professional attitudes. Apart from monitoring the engineering processes and maintenance of engineering work, machines and equipments, an engineer has to do investigate survey, collect data, refer handbooks/datasheets, prepare estimates and design the systems.

Outcomes Upon studying this course student will be able to,

1. Conduct surveys and investigate the field situation, collect, analyze and synthesize the data.
2. Apply knowledge to solve real time/field problems
3. Develop inquisitive, innovative skills and confidence to work independently.
4. Work effectively in team.
5. Plan and organize the work properly.

Contents :

- The completion of project is to be carried out in two semesters i.e. in T.Y. Sem. VI and final year B. Tech Sem. VII.
- The students shall form project group of maximum 3 students for within department projects and maximum of 6 students in case of interdepartmental projects of their choice.
- The students groups shall collect the information on the topic/area of interest and submit brief synopsis to Project Coordinator.
- The Project Coordinator shall allot the Project Guide depending upon the area or specialization of eligible faculty members from the department.
- The individual student from the project group shall maintain the

project diary and update weekly by taking remark of respective guide.

- The industry sponsored projects and inter departmental projects shall be encouraged and in case of inter departmental projects, students of maximum 3 different departments/disciplines shall work together by forming the group. The guide allotment and internal/external assessment of such groups shall be done by the respective departments.
- The projects addressing issues related to environmental, rural development and societal issues shall be preferred.
- The selected project shall help to promote participation in government approved schemes like Unnat Maharashtra Abhiyaan (UMA) and Unnat Bharat Abhiyaan (UBA).
- The students shall aim to promote their project work in project exhibitions/competitions, paper presentation/publication in reputed journals and conferences.
- The relevance of project and implementation including details of attainment of POs and PSOs addressed through the projects with justification must be clearly stated.

Phases of Project Part- I:

Phase I: Problem Identification, Literature survey, data collection, deciding scope of topic and objectives of the project.

Phase II: Confirmation of block diagram or layout of the proposed project.

Phase III: Submission of small report of project work.

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Syllabus of T.Y.B. Tech. (All) Semester-VI

Code No.: BSH801 **Title: Audit I: Japanese Language module**

Teaching Scheme:02 Hours per week **Examination Scheme**

Theory: 02 Hours per week **Total Marks: 50 (Continuous Assessment)**

Objectives		• Students will be able to apply communicative Japanese Grammar in communication. • Students will be able to enhance the level of Japanese vocabulary. • Students will be able to pronounce and articulate words as well as sentences accurately. • Students will be able to understand and apply Japanese language eventually. • Students will be able to develop Japanese language skills. • Students will be able to manage situational communication in Japanese.
Unit-I	**:**	**Kana scripts** Hiragana & Katakana **[2 Hours]**
Unit-II	**:**	**Chinese characters** Kanji- Pictograms with stroke order **[2 Hours]**
Unit-III	**:**	**Grammar** Parts of speech, articles , word order or syntax, demonstratives & interrogatives, counters, verbs and verb conjugation, adjectives, adverbs, comparisons, giving and receiving, requests and commands, potential and conditionals, possessive, direct indirect speech, various other form, etc **[8 Hours]**.
Unit-IV		**Vocabulary** Nouns, verbs tenses-past and present, adjectives, adverbs, expressions of time , expression and phrases etc. **[5 Hours]**
Unit-V		**Situational conversations and practice drills** Self-introduction, numbers, day and date, time, location and presence, possession of objects, time expressions and their usage, visiting people, accepting and receiving objects, hospital, asking direction, asking price of objects etc. **[5 Hours]**
Unit-VI		**Introduction to the history of Japan and its cultural Aspects** Ikebana, origami, calligraphy, kabuki etc **[2 Hours]**

List of Reference Books	**Sr. No.**	**Title**	**Author**	**Publication**
	1	Japanese Kanji for Beginners	Timothy G. Stout and Kaori Hakone	Tuttle Publishing
	2	Essential Japanese	Masahiro	Tuttle Publishing

		Grammar: A Comprehensive Guide to Contemporary Usage	Tanimori and Eriko Sato Ph.D.	
	3	15-Minute Japanese: Learn in Just 12 Weeks	D.K. Goel and Rajesh Goel	Amazon.in
	4	Oxford Japanese Grammar and Verbs (Dictionary)	Bunt Jonathan	Oxford Publication
	5	Read and write Japanese scripts: Teach yourself	Helen Gilhooly	Teach Yourself
	6	Complete Japanese Beginner to Intermediate Book and Audio Course: Learn to read, write, speak and understand a new language with Teach Yourself	Helen Gilhooly	Teach Yourself

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Syllabus of T.Y.B. Tech. (Computer Science and Engineering) Semester-VI

Code No.: CSE 801 **Title: Cyber crime and law**

Teaching Scheme:02 Hours per week

Theory: 02 Hours per week

Objectives

1. To introduce the cyber world and cyber law in general
2. To enhance the understanding of problems arising out of online transactions and provoke them to find solutions
3. To examine the effects of cyber crime through the experiences of victims and law enforcement
4. To Know the technologies that stand behind certain cyber crimes,
5. Students identify and analyze statutory, regulatory, constitutional, and organizational laws that affect the information technology professional.
6. Students distinguish enforceable contracts from non - enforceable contracts.

Unit-I : **Introduction** (04 **Hrs)**

Overview of Computer and Web Technology, Need for Cyber Law, Cyber Jurisprudence at International and Indian Level

Unit-II : **Jurisdictional Aspects in Cyber Law**

Issues of jurisdiction in cyberspace, Types of jurisdiction, The Test evolved, Minimum Contacts Theory, Sliding Scale Theory, Jurisdiction under IT Act, 2000. (04 **Hrs)**

Unit-III : **Cyber Crimes & Legal Framework**

Cyber Crimes against Individuals, Institution and State, Hacking, Digital Forgery, Cyber Stalking/Harassment, Identity Theft & Fraud, Cyber Terrorism, Right to Privacy and Data Protection on Internet, Different offences under IT Act, 2000 (04 **Hrs)**

Unit-IV : **Digital signature and Electronic Signature and Data Protection**

Concept of public key and private key, Certification authorities and their role, Creation and authentication of digital signature, Concept of electronic signature certificates, Electronic Governance (04 **Hrs)**

Unit-V : **E Contracting & E Commerce**

Salient features of E-contract, Formation of E-contract and types, E-mail Contracting, Indian Approach on E-contracts, E-commerce-Salient Features and advantages, Models of E-commerce like B2B, B2C, Indian Laws on E-commerce (04 **Hrs**)

Unit-VI : **Intellectual Property Issues in Cyber Space**

Copyright Law, Patent Law, Trademarks &Domain Names Related issues, Dispute (04 **Hrs**)

Resolution in Cyberspace

Reference Books: :

1. Karnika Seth,Compters, Internet and New TechnologyLaws, Lexis NexisButterworthsWadhwa Nagpur.
2. Chris Reed & John Angel, Computer Law, OUP, New York, (2007).
3. Cyber Crime An Introduction by Prasad R.S.
4. Cyber Laws by Ed. Kumar Krishna

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Syllabus of Third Year B. Tech. (Civil Engineering) Semester –VI

Code No.: CED 801 **Course Title: Road Safety Management Audit**

Teaching Scheme:

Theory: 02 Hrs./ week

Course Objectives : To acquire knowledge and understanding of the road environment.
To inculcate decision making and behavioural skills necessary to survive in the road environment.
To impart knowledge and understanding of the causes and consequences of accidents.
To understand roles and responsibilities in ensuring road safety.

Unit-I : **Introduction to Road Safety & Planning.**
Road traffic accidents scenario in India and in world. Road Safety and its importance. Traffic Rules and Driving Behaviour. Characteristics of accidents, accidents vs. crash. Need of Road Safety. Awareness about rules and regulations of traffic. Assisting Traffic control authorities. Multidisciplinary approach to planning for traffic safety and injury control. Vulnerable road users: crashes related to pedestrian and bicyclists, their safety, provision for disabled. **(05Hrs)**

Unit-II : **Traffic Signs, signals & traffic furniture & Role of traffic signals.**
Warning, cautioning & Informing sign. Location of Road sign, Traffic signals. Road Marking: Colour of road marking, kerb marking, night driving aid, traffic light signals. Types of Signals. Road safety tips for different categories of Road users. Causes of accidents, prevention & 1st aid to accident victim. Rules on road. Necessity of traffic lights. Major violations leading to accidents. **(05Hrs)**

Unit-III : **Responsibility of Road accidents and Safety measures.**
People responsible for accident prevention: Police, Politicians, Community members, Policy makers, Teachers, Parents, Infrastructure authorities, Drivers and Official road safety body. Reasons of students/ children have accidents. 4 E's of Accidents Prevention: 1. Engineering - by altering the environment 2. Enforcement - by imposing laws 3. Encouragement - by the use of publicity campaigns 4. Education - by gaining and using knowledge. **(05 Hrs)**

Unit-IV : **Road Safety Education & Events.**
Introduction to Road Safety Education. 5 P's of Road safety education: 1. Pre-school road safety education 2. Practical rather than theory education 3. Principles of own development about road safety education 4. Presentations on road safety education 5. Place for road safety education in syllabus. Discussions on efforts done by Government on Road Safety. Workshop on Road Safety week/ Organization of seminar on Road Safety. **(06 Hrs)**

Unit-V : **Traffic Flow Analysis.**
Macroscopic, Microscopic & Mesoscopic approach Types of Flow, Traffic stream characteristics ,Space, Time diagram, Relationship between speed, flow & density, Level of service & capacity analysis, Shockwave theory.
(07 Hours)

Unit-VI : **Road Safety Audit.**
Global & Local perspective, Road safety issues, Road safety programmes, types of RSA, planning, design, construction & operation stage audits ,Methodology , Road safety audit measures **(07 Hours)**

Text Books :
1. Traffic Flow Theory & Control- D. R. Drew- McGraw Hill, New York, 1968.
2. Traffic Engineering and Transport Planning- L.R. Kadiyali- Khanna Publishers, New Delhi, 2002.
3. Transportation Engineering-An Introduction- C. J. Khisty- Prentice-Hall, NJ, 2005
4. Traffic Flow Fundamentals- A. D. May- Prentice – Hall, Inc., New Jersey, 1990.
5 Highways- Traffic Planning & Engineering- C. A. O'Flaherty- Edward Arnold, UK
6. Traffic Engineering – Theory & Practice- L. J. Pignataro- John Wiley, 1985.
7. Highway Traffic Analysis and Design, R. J. Salter, N. D. Hounsel- Macmillan, London, 1996.
8. Traffic Engineering & Transport Planning- L. R. Kadiyali- Khanna Publishers, 2003.

Section A: Includes Unit I, II and III;
Section B: Includes Unit IV, V and VI.

Pattern of Question Paper:-

The six/four units in syllabus shall be divide in two equal parts i.e.3 units respectively. Question paper shall be set having two sections A & B. Section-A question shall be on first part & section question on second part. Question paper should cover entire syllabus.

For 40 marks paper:-

1. Minimum eight questions.
2. Four question in each section.
3. Question no.1 from section A & Question no. 5 from section-B made compulsory & should cover complete syllabus of the respective section& should be set for six marks each. The question no.1 & 5 should be of objective nature.
4. Two question of 07 marks each from remaining question, from each section A & B asked to solve.

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Syllabus of Third Year B. Tech. (All) Semester –VI

Code No.: BSH 802 **Course Title: Value Education**

Teaching Scheme:
Theory: 02 Hrs./ week

Course Objectives : **The students will be able to:**

- Understand the need of values and its classification in contemporary society.
- Appreciate the values needed for peaceful society like democratic, secular, and socialist etc.
- Become aware of role of education in building value as dynamic social reality.
- Know the importance of value education towards personal, national and global development.

Unit-I : **Introduction to Value Education:**
Value Education, Purpose of Value Education as specifying the present deterioration in the value system in the fast changing world trends.
[4 Hours]

Unit-II : **Importance of Values in Life:**
What is a Value system? What kinds of values need to be inculcated? Eg.. Ethical, moral and spiritual instead of materialistic values, value inculcation, trend of values such as a permissive culture. [4 Hours]

Unit-III : **Character Building:**
Advantages of good character, importance of trust, honesty, integrity, morality, and reliability as qualities of a good character.
Building Relationship-Group Behaviour, limitations of a relationship.
How to be a better person, better manager and better Engineer? [4 Hours]

Unit-IV : **The Purpose of Life & Education**: Meaning, purpose of one's life, Destination success - why are you here? How to make everyday worth living? [4 Hours]

Unit-V : **Values For Personal Life & Professional Life**: Self sovereignty-Discernment-Decision making-Self-actualization, Caring-Patience-Honesty-Forgiveness, Competence-Co-operation-Perseverance, Flexibility-Reliability-Tolerance-Unity- Knowledge Thirst, Sincerity in Profession, Regularity, Punctuality, Faith [4 Hours]

Unit-VI : **Value Education towards National and Global Development**:
Constitutional Values: Sovereign, Democracy, Socialism, Secularism, Equality, Justice, Liberty, Freedom, Fraternity
Social Values: Pity and Probity, Self-Control, Universal Brotherhood.
Religious and Moral Values: Tolerance, Wisdom, character.
Aesthetic Values: Love and Appreciation of literature, fine arts and respect for the

same.

- Environmental Ethical Values
- National Integration and international understanding.
- Need of Humanistic value for espouse peace in the society
- Conflict of cross-cultural influences, cross-border education

[4 Hours]

Reference: :

1. Sharma, S.P. Moral and Value Education; Principles and Practices, Kanishka publishers, 2013.

2. Kiruba Charles & V. Arul Selvi. Value Education: Neelkamal Publications, New Delhi, 2012.

3. Passi, B.K. and Singh, P. Value Education. National Psychological Corporation, Agra. 2004.

4. Chitakra, M.G.: Education and Human Values, A.P.H. Publishing Corporation, New Delhi. 2003.

5. Monica J. Taylor. Values in Education and Education in Value. Routledge. 1996.

6. Neil Postman. The End of Education: Redefining the Value of School. Vintage publisher. 1996.

7. http://cbseportal.com/exam/e-books/download-free-ncert-e-book-education-for-values-in-school-a-framework\

8. http://cbseacademic.in/web_material/ValueEdu/Value%20Education%20Kits.pdf

Code No.: ETC 801 **Title:Audit Course-I Smart Cities**
Teaching Scheme:
Theory: 02Hrs/week
Credits:Nil

Objectives :

- To identify urban problems.
- To study Effective and feasible ways to coordinate urban technologies.
- To study models and methods for effective implementation of Smart Cities.
- To study new technologies for Communication and Dissemination.
- To study new forms of Urban Governance and Organization.

Unit-I **Understanding Inclusive Planning**

Definition and components; urban consultations; basic principles of urban consultation, process of urban consultations; urban strategic planning, good urban governance, subsidiarity, equity, efficiency, transparency and accountability, civic engagement and citizenship, security; valuing difference and working with diversity; livable cities[**4Hrs]**

Unit-II **Participatory Planning Process and Policies, Programmes and Legislation**

Methods, role of stakeholders (including civil society organizations), etc.; Related Acts, Five year plans, policies and programmes at various levels

[4 Hrs]

Unit-III **Smart Cities**

Innovation economy (Innovation in industries, clusters, districts of a city; Knowledge workforce: Education and employment; Creation of knowledge-intensive companies)

[4 Hrs]

Unit-IV **Smart Cities**

Urban Infrastructure (Transport, Energy/ Utilities, protection of the environment and safety); Governance(Administration services to citizens, participatory and direct democracy, services to the citizen, quality of life)
[4Hrs]

Unit-V **Planning interventions –I**

Inclusive zoning, development and building regulations, Slum Improvement; drafting strategic urban development plans – objectives and key actors; planning framework for actions, process of drafting the plan, key considerations. [**4 Hrs]**

Unit-VI **Planning interventions –II**

Urban design and decision-making; city transport for all; water supply and sanitation, urban disaster management, management through decentralization
[4Hrs]

Reference Books:

Jo Beall (1997); “A city for all: valuing differences and working with diversity”; Zed books limited,
London (ISBN: 1-85649-477-2)

2. UN-Habitat; “Inclusive and sustainable urban planning: a guide for municipalities”; Volume 3:
Urban Development Planning (2007); United Nations Human Settlements Programme (ISBN: 978-
92-1-132024-4)

3. Arup Mitra; “Insights into inclusive growth, employment and wellbeing in India”; Springer (2013),
New Delhi (ISBN: 978-81-322-0655-2)

4. William J. V. Neill (2004); “Urban Planning and cultural identity”; Routledge, London (ISBN: 0-
415-19747-3)

5. John S. Pipkin, Mark E. La Gory, Judith R. Balu (Editors); “Remaking the city: Social science
perspective on urban design”; State University of New York Press, Albany (ISBN: 0-87395-678-8)

6. Giffinger, Rudolf; Christian Fertner; Hans Kramar; Robert Kalasek; Nataša Pichler-Milanovic;
Evert Meijers (2007). "Smart cities – Ranking of European medium-sized cities". Smart Cities.
Vienna: Centre of Regional Science

7. "Draft Concept Note on Smart City Scheme". Government of India - Ministry of Urban
Development (http://indiansmartcities.in/downloads/CONCEPT_NOTE_-3.12.2014__REVISED_AND_LATEST_.pdf)

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(Faculty of Science & Technology)
Syllabus of T. Y. B. Tech. (Mechanical) Semester-VI

Code No.: MED801
Title: Rural Community Engagement
Teaching Scheme:
Theory: 2
Credits: NIL

Objectives :

1. To provide practical opportunities for students for participation in rural community mobilization, service engagement and empowerment activities.
2. To promote preparation of strategies for building resilience and community responding system in nutrition, water, food safety and healthcare.

Unit-I : **Rural Society and Dynamics of Rural Society:** Social, Economic, political and cultural **Community Goal Setting:** Inner Engineering and Analysis **(4 Hrs)**

Unit-II : **Participatory Learning, Social Mapping:** Approaches and Methods, Community Project Proposal and Project Management, Concept and Steps, Thematic Maps **Village Development and Disaster Management Plan:** Village Development Plan including aspects and process of preparation of Village Disaster Management Plan **(8Hrs)**

Unit-III : **Resource Mapping Natural and Human Resource Mapping and Management** Rural Institutions Engagement with School/Street/Health Centre/ Panchayat/ SHGs **Community: Awareness :** Health & Hygiene/ Rights / Policies & Programmes/Corruption (**6Hrs)**

Unit-IV : **Disaster Management:** Disaster Preparedness- Risk Reduction Role and Responsibilities Rehabilitation: Physical and Psychological aspects **Professional Intervention**: Partnership with public , Private and non-governmental Organizations **(6 Hrs)**

Reference Books: :

Katar Singh "Rural development- Principles, Policies and Management" SAGE Publication 1999.

Agoramoorthy Govindaswamy "Sadguru Model of Rural Development: Elevates Food Security and Ease Poverty" Daya Publishing House, a division of Astral International Pvt. Limited, 2016

V.Gopalkrishnan Asari "Technological Change for Rural Development in India". B.R.Publisher

B.S.Gautam "Cooperatives And Rural Development In India" Radha Publications

Outcomes

After completion of the course, the students will be able to:

1. Understand the social, economic, political and cultural framework of the rural society
2. Address the challenges with suitable responses for the identified rural issues
3. Engage in the management of the rural community

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad

(Faculty of Science and Technology)

Syllabus of T.Y.B. Tech. (All) Semester-VI

Code No.: BSH803 **Title: Audit I: German Language Module**

Teaching Scheme:02 Hours per week **Examination Scheme**

Theory: 02 Hours per week **Total Marks: 50 (Continuous Assessment)**

Objectives		• Students will be able to apply communicative German Grammar in communication. • Students will be able to enhance the level of German vocabulary. • Students will be able to pronounce and articulate words as well as sentences accurately. • Students will be able to understand and apply German language eventually. • Students will be able to develop German language skills. • Students will be able to manage situational communication in German. .
Unit-I	:	**Significance and purpose** The Significance of Language study, Speaking and Thinking , Self – discovery, Communication, Language Competence, Language and Culture, Language Changes, Connection with other areas of study, The Mother—language, Other languages and Purpose of Language study **[2 Hours]**
Unit-II	:	**Purpose of the Study of the German Language** Listening, Speaking, Reading and writing. **[2 Hours]**
Unit-III	:	**Grammar** Parts of speech, articles , word order or syntax, demonstratives & interrogatives, counters, verbs and verb conjugation, adjectives, adverbs, comparisons, giving and receiving, requests and commands, potential and conditionals, possessive, direct indirect speech, various other form, etc. **[8 Hours]**
Unit-IV		**Vocabulary** Nouns, verbs tenses-past and present, adjectives, adverbs, expressions of time , expression and phrases etc. **[5Hours]**
Unit-V		**Situational conversations and practice drills** Self-introduction, numbers, day and date, time, location and presence, possession of objects, time expressions and their usage, visiting people, accepting and receiving objects, hospital, asking direction, asking price of objects etc. **[5 Hours]**
Unit-VI		**Introduction to the history of German and its cultural Aspects** Norms and values, Lifestyles and aims in life, Cultural traditions **[2 Hours]**

List of Reference	**Sr. No.**	**Title**	**Author**	**Publication**
	1	German Made Simple: Learn to speak and understand German	Arnold Leitner PhD	Namrata's Amazon.in

Books		quickly and easily		
	2	The Everything Learning German Book: Speak, write, and understand basic German in no time	Edward Swick	Adams Media
	3	Langenscheidt German in 30 Days	Von Angelika G. Beck	Langenscheidt
	4	Complete German Beginner to Intermediate Book and Audio Course: Learn to read, write, speak and understand a new language with Teach Yourself	Heiner Schenke	The McGraw Hill
	5	German: How to Speak and Write It (Beginners' Guides)	Joseph Rosenberg	Repro Books
	6	Collins Easy Learning – Collins Easy Learning German Grammar and Practice	Collins	Collins