।। सा विद्या या विमुक्तये ।।
स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड
"ज्ञानतीर्थ" परिसर, विष्णुपूरी, नांदेड - ४३१६०६ (महाराष्ट्र)
SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY NANDED
"Dnyanteerth", Vishnupuri, Nanded - 431606 Maharashtra State (INDIA)
Established on 17th September 1994 – Recognized by the UGC U/s 2(f) and 12(B), NAAC Re-accredited with 'A' Grade
25 1994 - 2019 SILVER JUBILEE YEAR

ACADEMIC (1-BOARD OF STUDIES) SECTION

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विज्ञान व तंत्रज्ञान विद्याशाखेतील पदवी स्तरावरील द्वितीय वर्षाचे अभ्यासक्रम शैक्षणिक वर्ष २०१९–२० पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, **दिनांक ०८ जून २०१९ रोजी संपन्न झालेल्या ४४व्या मा. विद्या परिषद बैठकीतील ऐनवेळचा विषय क्र.११/४४–२०१९** च्या ठरावानुसार **प्रस्तुत विद्यापीठाच्या विज्ञान व तंत्रज्ञान विद्याशाखेतील** खालील विषयांचे अभ्यासक्रम शैक्षणिक वर्ष २०१९–२० पासून लागू करण्यात येत आहे.

1. B.E. – II Year – Mechanical Engineering
2. B.E. – II Year – Electrical Engineering
3. B.E. – II Year – Civil Engineering
4. B.E. – II Year – Computer Engineering

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या **www.srtmun.ac.in** या संकेत–स्थळावर उपलब्ध आहेत. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून द्यावी.

'ज्ञानतीर्थ' परिसर,
विष्णुपुरी, नांदेड – ४३१ ६०६.
जा.क्र.: शैक्षणिक–०१/परिपत्रक/विज्ञान व तंत्रज्ञान अभ्यासक्रम/२०१९–२०/**२४१**
दिनांक : २८.०६.२०१९.

स्वाक्षरित/–
उपकुलसचिव
शैक्षणिक (१–अभ्यासमंडळ) विभाग

प्रत माहिती व पुढील कार्यवाहीस्तव :

१) मा. कुलसचिव यांचे कार्यालय, प्रस्तुत विद्यापीठ.
२) मा. संचालक, परीक्षा व मूल्यमापन मंडळ यांचे कार्यालय, प्रस्तुत विद्यापीठ.
३) मा. प्राचार्य, सर्व संबंधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
४) उपकुलसचिव, पदव्युत्तर विभाग, प्रस्तुत विद्यापीठ.
५) साहाय्यक कुलसचिव, पात्रता विभाग, प्रस्तुत विद्यापीठ.
६) सिस्टम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ.

Teaching Scheme - Second Year B.E. in Electrical Engineering

SEMESTER – III

SI. No.	Category	Code	Course Title	Hours per Week				Marking Scheme					Theory Total
				L	T	P	CR	PR	OR	TW	MSE	ESE	
1.	Professional core courses	PCC-EE 301	Electrical Circuit Analysis	3	0	2	4	25#	-	25	30	70	150
2.	Professional Core Courses	PCC- EE 302	Analog & Digital Circuit	3	0	2	4	25@	-	25	30	70	150
3.	Professional Core Courses	PCC- EE 303	Electrical Machine-I	3	0	2	4	50#	-	25	30	70	175
4.	Professional Core Courses	PCC-EE 304	Numerical Methods using MATLAB	3	1	0	4	-	-	-	30	70	100
5.	Engineering science courses	ESC-305	Engineering Mechanics	3	1	0	4	-	-	-	30	70	100
6.	Humanities & social sciences including management	HSMC 306	Humanities-I (Effective Technical Communication)	2	0	0	2	-	25@	25	-	-	50
7.	Humanities & social sciences including management	HSMC 307	Seminar-I	0	0	2	1	0	25@	0	0	0	25
8.	Mandatory Courses	MC 308	Environmental Sciences,	2	0	0	0	-	-	-	15	35	50
Total				**19**	**2**	**8**	**23**	**100**	**50**	**100**	**165**	**385**	**800**

Symbols to remember:@-internal Assessment,#-External assessment

T-Theory. P –Practical , T –Tutorial , CR-Credit , OR-Oral , TW- Term Work,MSE-Mid Semester Examination , ESE-End Semester Examination.

Teaching Scheme - Second Year B. E. in Electrical Engineering

SEMESTER – IV

SI. No.	Category	Code	Course Title	Hours per Week				Marking Scheme					Theory Total
				L	T	P	CR	PR	OR	TW	MSE	ESE	
1.	Professional core courses	PCC-EE 401	Electrical Measurement & Instruments	3	0	2	4	25#	-	50	30	70	175
2.	Professional Core Courses	PCC- EE 402	Electrical Machine-II	3	0	2	4	50#	-	25	30	70	175
3.	Professional Core Courses	PCC- EE 403	Power Electronics	3	0	2	4	25@	-	50	30	70	175
4.	Professional Core Courses	PCC-EE 404	Signal & System	3	1	0	4	-	-	-	30	70	100
5.	Basic science courses	BSC-405	Mathematics –III (Probability & Statistics)	3	1	0	4	-	-	-	30	70	100
6.	Basic Science Courses	BSC-406	Biology-I	2	0	0	2	-	25@	25	-	-	50
7.	Mandatory Courses	MC 407	Seminar-II	0	0	2	1	0	25@	0	0	0	25
Total				**17**	**2**	**08**	**23**	**100**	**25**	**125**	**165**	**385**	**800**

Symbols to remember:@-internal Assessment,#-External assessment

T-Theory. P –Practical , T –Tutorial , CR-Credit , OR-Oral , TW- Term Work,MSE-Mid Semester Examination , ESE-End Semester Examination.

Swami Ramanand Teerth Marathwada University, Nanded

B. E. Second Year in Electrical Engineering & Electrical, Electronics and Power

(Revised Syllabus, CGPA Revised)

Effective from 2019-20

PCC EE 301. ELECTRICAL CIRCUIT ANALYSIS

Category	Code	Course Title	L	T	P	CR	PR	OR	TW	MSE	ESE	Total Mark
Professional core courses	PCC-EE 301	**Electrical Circuit Analysis**	3	-	2	4	25#	-	25	30	70	150

Course Objectives:

a) To Study Basic Fundamentals, theorems used in circuit analysis

b) To Study steady state analysis of different AC circuits, attenuators, filters & coupled circuits.

Course Contents:

Module 1: Network Theorems (08 Hours)

Superposition theorem, Thevenin theorem, Norton theorem, Maximum power transfer theorem, Reciprocity theorem, Compensation theorem. Analysis with dependent current and voltage sources. Node and Mesh Analysis, Concept of duality and dual networks.

Module 2: Solution of First and Second order networks (08 Hours)

Solution of first and second order differential equations for Series and parallel R-L, R-C, R L-C circuits, initial and final conditions in network elements, forced and free response, time constants, steady state and transient state response.

Module 3: Sinusoidal steady state analysis (08 Hours)

Representation of sine function as rotating phasor, phasor diagrams, impedances and admittances, AC circuit analysis, effective or RMS values, average power and complex power. Three-phase circuits. Mutual coupled circuits, Dot Convention in coupled circuits, Ideal Transformer.

Module 4: Electrical Circuit Analysis Using Laplace Transforms (08 Hours)

Review of Laplace Transform, Analysis of electrical circuits using Laplace Transform for standard inputs, convolution integral, inverse Laplace transform, transformed network with initial conditions. Transfer function representation. Poles and Zeros. Frequency response (magnitude and phase plots), series and parallel resonances

Module 5: Two Port Network and Network Functions (08 Hours)

Two Port Networks, terminal pairs, relationship of two port variables, impedance parameters, admittance parameters, transmission parameters and hybrid parameters, interconnections of two port networks.

Course Outcomes:

At the end of this course, students will be able to

1. Network theorems for the analysis of electrical circuits.
2. Obtain the transient and steady-state response of electrical circuits.
3. Analyse circuits in the sinusoidal steady-state(single-phase and three phase).
4. Analyse two port circuit behaviors.

References Book :

1. M. E. Van Valkenburg, "Network Analysis", Prentice Hall, 2006.

2. D. Roy Choudhury, "Networks and Systems", New Age International Publications, 1998.

3. W. H. Hayt and J. E. Kemmerly, "Engineering Circuit Analysis", McGraw Hill Education, 2013.

4. C. K. Alexander and M. N. O. Sadiku, "Electric Circuits", McGraw Hill Education, 2004.

5. K. V. V. Murthy and M. S. Kamath, "Basic Circuit Analysis", Jaico Publishers, 1999.

List of Practical:-

Term work shall consists of Minimum 8 experiments from the list given below

1. To know your electric circuit's lab.

2. Apply the thieving theorem for finding current in a complex electrical circuit.

3. Verify the Norton's theorem.

4. Verify the super position theorems.

5. Verify the maximum power transfer theorem force circuits.

6. Find different electrical parameter in R-L, R-C, R-L-C. series circuits and draw the

a. Phasor diagram and determine current and PF. in each case

b. Determine and observe the resonance condition.

7. Find different electrical parameter in R-C & R-L-C parallel circuit and draw the

a. Phasor diagram& Find power and P.F. of the circuit

b. Observe parallel resonance condition.

8. Verification of reciprocity theorem using hardware.

9. Verification of Milliman's theorem using hard ware

10. Verification of series resonance using hard ware and digital simulation.

11. Verification of parallel resonance using hard ware and digital simulation

12. Verification of self-inductance and mutual inductance by using hard ware.

13. To find z & y parameters of a given two port network.

Swami Ramanand Teerth Marathwada University, Nanded

B. E. Second Year in Electrical Engineering & Electrical, Electronics and Power

(Revised Syllabus, CGPA Revised)

Effective from 2019-20

PCC EE 302. ANALOG & DIGITAL CIRCUIT

Category	Code	Course Title	L	T	P	CR	PR	OR	TW	MSE	ESE	Total Mark
Professional Core Courses	PCC-EE 302	Analog & Digital Circuit	3	-	2	4	25@	-	25	30	70	150

Course objectives:

a) Introduce students to the concepts and use of feedback and feedback (amplifier) design.

b) Extend student knowledge of the theory and applications of operational amplifier integrated circuits.

c) The primary goal is to provide in depth understanding of logic and system synthesis.

d) Enable student to implement simple logical operations using combinational logic circuits.

e) Impart the concepts of sequential circuits enabling student to analyse sequential systems in terms of state machines.

f) Enable student to implement synchronous state machines using flip-flops.

Course Content:

Unit 1: Transistor **(06 Hours)**

Formation of NPN and PNP transistor, CE transistor configuration, Transistor as amplifier ,Transistor as switch, DC load line concept, operating point, bias stability, design of fixed biasing, collector to base biasing, voltage divider biasing.

Unit 2: Small signal transistor analysis (08 Hours)

Transistor hybrid model parameter, analysis of transistor amplifier circuit using h -parameter. Comparison of performance parameter with CB,CE and CC amplifier, miller's theorem and its dual, Darlington pair.

Unit3: Op-amp and its application (06 Hours)

Op-amp: block diagram, ideal and practical parameters, open loop and closed loop configuration. Application of op-amp: integrator, differentiator,comparator,Schmitt trigger, instrumentation amplifier,IC555 timer as Monostable and astable multivibrator.

Unit4: Power amplifier (08 Hours)

Amplifier classes and efficiency, Class A, Class B, Class AB, principal of pushpull amplifier, push pull drivers, harmonic distortion and feedback, distortion in push-pull amplifier, introduction to complementary push pull amplifier using single power supply and quasi complementary pushpull configuration

Unit 5: Combinational logic design (08 Hours)

Boolean algebra and Minimization Techniques: Binary arithmetic: - addition and subtraction by 1's and 2's compliment. Revision of logic gates, Booleans algebra, Demorgon's theorem etc. K-map of two, three and four variable functions, minimizing SOP and POS expressions. Combinational Digital Circuits**:** Design of arithmetic circuits half adder and full adders, subtractors. Multiplexers, de-multiplexers, encoders, decoders, comparators,

Unit 6: Sequential logic design and Memories (06 Hours)

Flip flops and its Applications:– R-S, Clocked S-R, D latches, Edge triggered D flipflops, Edge triggered JK flip flops, JK Master - slave flip flop, Registers and Counters, Buffer registers, asynchronous counters, synchronous counter, twisted ring counters, N - module counters. Memories: RAM static & dynamic, ROM, PROMS and EPROMS, EEPROMS

Course outcomes:

After completing this course the student will be:

1. Able to identify, analyze op-amp circuit topologies and design the op amp circuits.
2. Able to demonstrate the operation of simple logic gates.
3. Able to combine simple gates into more complex circuit.

Text/Reference Books:

1. Robert L. Boylestad, Louis Nashelsky, "Electronic Devices and Circuit Theory", Eighth edition, PHI publishers, 2004.
2. J. Millman and C. C. Halkias, Integrated Electronics: Analog and Digital Circuits and

Systems, Tata McGraw-Hill Publishing Company, 1988.
3. R.A. Gayakwad, Op-Amps & Linear Integrated Circuits, PHI, Fourth Edition, 2012
4. R. P. Jain, "Modern Digital Electronics" Tata McGraw Hill, Third Edition, 2003.

List of Experiments:

It will consist of a record of at least eight experiments from the following list based on the Prescribed syllabus

1. Analysis of voltage divider biasing circuits
2. Measurement of op-amp parameters and comparison with op-amp data sheets.
3. Assembling of op-amp inverting, non-inverting and differential circuit to measure an input in the range of mill volts to few volts.
4. Transistor amplifiers: frequency response of BJT, multistage BJT amplifier and FET amplifier.
5. Op-amp as square, sine and triangular wave generator.
6. Instrumentation amplifier using 3 - op amp CMRR measurement and precision rectifier
7. IC-555 applications- astable, monostable, multivibrator.
8. Study of counters, ring counter and twisted ring counter.
9. Study of up - down counters (IC 74192/74193) and N- modulo counter. (IC 7490/7493).
10. Study of various flip-flops and verification of truth table.
11. Study of Multiplexer and De-multiplexer.

Swami Ramanand Teerth Marathwada University, Nanded

B. E. Second Year in Electrical Engineering & Electrical, Electronics and Power

(Revised Syllabus, CGPA Revised)

Effective from 2019-20

PCC EE 303. Electrical Machine-I

Category	Code	Course Title	L	T	P	CR	PR	OR	TW	MSE	ESE	Total Mark
Professional Core Courses	PCC-EE 303	Electrical Machine-I	3	-	2	4	50#	-	25	30	70	175

Course Objectives:

a) Introduce basic fundamentals of different electrical machines and transformers
b) Introduce the characteristics of different D.C. machines
c) Analysis and investigation of the major performance characteristics of different types of motors.
d) Investigation of motors' starting problems.
e) Allow the students to gain the proficiency to differentiate between the different types of motors, with the capability to select the proper motor for the proper application.
f) Provide the students with the proficiency to conduct and benefit from the testing procedures of electric motors with the ability to analyse data and to obtain the major characteristics

Course Content:

Module 1: Magnetic fields and magnetic circuits (07 Hours)

Review of magnetic circuits - MMF, flux, reluctance, inductance; review of Ampere Law and Biot Savart Law; Visualization of magnetic fields produced by a bar magnet and a current carrying coil - through air and through a combination of iron and air; influence of highly permeable materials on the magnetic flux lines.

Module 2: Electromagnetic force and torque (08 Hours)

B-H curve of magnetic materials; flux-linkage Vs current characteristic of magnetic circuits; linear and nonlinear magnetic circuits; energy stored in the magnetic circuit; force as a partial derivative of stored energy with respect to position of a moving element; torque as a partial derivative of stored energy with

respect to angular position of a rotating element. Examples - galvanometer coil, relay contact, lifting magnet, rotating element with eccentricity or saliency.

Module 3: DC machines (09 Hours)

Basic construction of a DC machine, magnetic structure - stator yoke, stator poles, pole-faces or shoes, air gap and armature core, visualization of magnetic field produced by the field winding excitation with armature winding open, air gap flux density distribution, flux per pole, induced EMF in an armature coil. Armature winding and commutation – Elementary armature coil and commutators, lap and wave windings, construction of commutators, linear commutation Derivation of back EMF equation, armature MMF wave, derivation of torque equation, armature reaction, air gap flux density distribution with armature reaction.

Module 4: DC machine - motoring and generation (08 Hours)

Armature circuit equation for motoring and generation, Types of field excitations – separately excited, shunt and series. Open circuit characteristic of separately excited DC generator, back EMF with armature reaction, voltage build-up in a shunt generator, critical field resistance and critical speed. V-I characteristics and torque-speed characteristics of separately excited, shunt and series motors. Speed control through armature voltage. Losses, load testing and back-to-back testing of DC machines.

Module 5: Transformers (08 Hours)

Principle, construction and operation of single-phase transformers, equivalent circuit, phasor diagram, voltage regulation, losses and efficiency Testing - open circuit and short circuit tests, polarity test, back-to-back test, separation of hysteresis and eddy current losses Three phase transformer - construction, types of connection and their comparative features, Parallel operation of single-phase and three-phase transformers, Autotransformers - construction, principle, applications and comparison with two winding transformer, Magnetizing current, effect of nonlinear B-H curve of magnetic core material, harmonics in magnetization current, Phase conversion - Scott connection, three-phase to six-phase conversion, Tap-changing transformers - No-load and on-load tap-changing of transformers, Three-winding transformers. Cooling of transformers.

Course Outcomes:

At the end of this course, students will demonstrate the ability to

1. Understand the concepts of magnetic circuits.
2. Understand the operation of dc machines.
3. Analyse the differences in operation of different dc machine configurations.

4. Analyse single phase and three phase transformers circuits.
5. Design and conduct experiments as well as analyse the parameter of DC machine & transformer.
6. Develop understanding of professional & ethical responsibility of DC machine & transformer.

Text / References:

1. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education, 2013.
2. A. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBS Publishers, 2004.
3. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.
4. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.
5. I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.

List of Practical's:-

1. To Know Your Electrical Machine Laboratory.
2. Identification of different terminals of a DC machine by Lamp method and multi-meter & measure insulation resistance.
3. To Measure the winding Resistance of DC Machines.
4. Dimensional and material study of various parts of a DC machine.
5. Plot OCC of a DC shunt generator at constant speed and determine critical Resistance from the graph.
6. Perform parallel operation of DC generator.
7. Study of Two point starter, connect and run a DC series motor
8. Study of Three point starter, connect and run a DC shunt motor & measure the no Load current.
9. Study of Four point starter, connect and run a DC compound motor with Differential, cumulative, short shunt and long shunt field connection.
10. Control the speed of a DC shunt motor by field control method.
11. Control the speed of a DC shunt motor by armature voltage control method.
12. Load test on DC shunt Generator.
13. Load test on DC Series Generator.
14. Determine the speed- torque characteristic of a DC compound motor with various Connections.
15. Determine the load current - torque characteristic of a DC compound motor with Various connections.
16. Determine the efficiency of a DC machine by brake test method.

Swami Ramanand Teerth Marathwada University, Nanded

B. E. Second Year in Electrical Engineering & Electrical, Electronics and Power

(Revised Syllabus, CGPA Revised)

Effective from 2019-20

PCC -EE 304. Numerical Methods Using MATLAB

Category	Code	Course Title	L	T	P	CR	PR	OR	TW	MSE	ESE	Total Mark
Professional Core Courses	PCC-EE 304	Numerical Methods using MATLAB	3	1	0	4	-	-	-	30	70	100

Course objectives:

a) To emphasize the need of computational techniques and analyse errors involved in the computation.
b) To provide sound knowledge of various numerical method.
c) To apply various numerical method to obtain solution of different types of equations
d) To impart skills to develop programs using MATLAB.

Course Content:

Unit 1: Basics of MATLAB (06 Hours)

Introduction of MATLAB ,basics of MATLAB,MATLAB windows, on line help, input-output file types. platform dependence, commands. Interactive computation, matrices & vectors, Matrix and Array operations. Application, Linear algebra, curve fitting interpolation.

Unit 2: Errors & concept of root equation. (08 Hours)

Basic principle of numerical methods, floating point algebra with normalized floating point technique. Errors, Definition, types of errors. Concept of root, Descartes rule of sign, stwrm's theorem, intermediate value theorem, roots of polynomial equation.

Unit 3: Solution of transcendental and polynomial equation and curve fittings. (08 hours)

Transcendental & polynomial equation, bisection, secant, regwa falsi, Newton raphson method. Curve fitting ,Least square approximation ,first order & second order.

Unit 4: Interpolation & Numerical differentiation. (08 hours)

Interpolation, Difference operator, Newtons forward , backward interpolation formulae, central difference formulae, stirlings formula, Newton divided difference formula, lagranges interpolation. Differentiation using Newton forward & backward interpolation formulae.

Unit 5: Solution of ODE and Numerical integration. (08 hours)

Solution of first order ordinary differential equation, Taylor's series method, Euler's method, Modified Euler's method, Runge kutta second and fourth order method, Numerical integration, trapezoidals and Simpson's 1/3 and 3/8 rule, weddles rule.

Unit 6: Solution of Linear simultaneous equation. (08 hours)

Solution of simultaneous equation, Gauss Jordan & Gauss elimination method,Gauss seidel method, LU factorization method, gauss Jacobi method.

Course Outcomes:

After completion of course student will be able to

1) Demonstrate types of errors in computation and their causes of occurrence.
2) Identify various types of equation and apply appropriate numerical method to solve integration
3) Apply different numerical method for interpolation, differentiation and numerical integrations
4) Apply and Compare various numerical methods to solve first and second order ODE.
5) Apply and Compare various numerical methods to solve Linear Simultaneous Equations.

Text/Reference Book:

1) Rudra Pratap-Getting started with MATLAB.
2) Dr.B.S.Grewal,"Numerical Methods in Engineering & Science ," Khanna Publications.
3) P.P.Gupta & G.S.Malik."Calculus and Finite Difference and Numerical Analysis," Krishna Prakashan Media Ltd,Merut
4) S.S.Sastry."Introductory Method of Numerical analysis." PHI Learning PVT.LTD
5) Steven Chapra,Raymond P.Canale," Numerical Methods for Engineers ." Tata McGraw Hill Publication.

Swami Ramanand Teerth Marathwada University, Nanded

B. E. Second Year in Electrical Engineering & Electrical, Electronics and Power

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Effective from 2019-20

ESC- 305. Engineering Mechanics

Category	Code	Course Title	L	T	P	CR	PR	OR	TW	MSE	ESE	Total Mark
Engineering science courses	ESC-305	Engineering Mechanics	3	1	0	4	-	-	-	30	70	100

Course Objectives:

a) To Study scalar and vector analytical techniques for analysing forces
b) Study the fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems also to understand measurement error, and propagation of error
c) To Study basic dynamics concepts

Course Contents:

Module 1: Introduction to Engineering Mechanics covering. (05 Hours)

Force Systems Basic concepts, Particle equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space – Resultant- Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems; Static Indeterminacy

Module 2: Friction covering (04 Hours)

Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, wedge friction, screw jack & differential screw jack;

Module 3: Basic Structural Analysis covering (06 Hours)

Equilibrium in three dimensions; Method of Sections; Method of Joints; How to determine if a member is in tension or compression; Simple Trusses; Zero force members; Beams & types of beams; Frames & Machines;

Module 4: Centroid and Centre of Gravity covering (06 Hours)

Centroid of simple figures from first principle, centroid of composite sections; Centre of Gravity and its implications; Area moment of inertia- Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Mass moment inertia of circular plate, Cylinder, Cone, Sphere, Hook.

Module 5 : Virtual Work and Energy Method (05 Hours)

Virtual displacements, principle of virtual work for particle and ideal system of rigid bodies, degrees of freedom. Active force diagram, systems with friction, mechanical efficiency. Conservative forces and potential energy (elastic and gravitational), energy equation for equilibrium. Applications of energy method for equilibrium. Stability of equilibrium.

Module 6: Review of particle dynamics- Rectilinear motion (05 Hours)

Plane curvilinear motion (rectangular, path, and polar coordinates). 3-D curvilinear motion; Relative and constrained motion; Newton's 2nd law (rectangular, path, and polar coordinates). Work-kinetic energy, power, potential energy. Impulse-momentum (linear, angular); Impact (Direct and oblique).

Module 7: Introduction to Kinetics of Rigid Bodies covering (04Hours)

Basic terms, general principles in dynamics; Types of motion, Instantaneous centre of rotation in plane motion and simple problems; D'Alembert's principle and its applications in plane motion and connected bodies; Work energy principle and its application in plane motion of connected bodies; Kinetics of rigid body rotation;

Module 8: Mechanical Vibrations covering (04 Hours)

Basic terminology, free and forced vibrations, resonance and its effects; Degree of freedom; Derivation for frequency and amplitude of free vibrations without damping and single degree of freedom system, simple problems, types of pendulum, use of simple, compound and torsion pendulums;

Course Outcomes:

1. Use scalar and vector analytical techniques for analysing forces in statically determinate structures
2. Apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems
3. Apply basic knowledge of maths and physics to solve real-world problems
4. Understand measurement error, and propagation of error in processed data
5. Understand basic kinematics concepts – displacement, velocity and acceleration (and their angular counterparts);
6. Understand basic dynamics concepts – force, momentum, work and energy;
7. Understand and be able to apply Newton's laws of motion;
8. Understand and be able to apply other basic dynamics concepts - the Work-Energy principle, Impulse-Momentum principle and the coefficient of restitution;
9. Extend all of concepts of linear kinetics to systems in general plane motion (applying Euler's Equation and considering energy of a system in general plane motion, and the work of couples and moments of forces)
10. Learn to solve dynamics problems. Appraise given information and determine which concepts apply, and choose an appropriate solution strategy; and Attain an introduction to basic machine parts such as pulleys and mass-spring systems.

Text/Reference Books:

1. Irving H. Shames (2006), Engineering Mechanics, 4th Edition, Prentice Hall
2. F. P. Beer and E. R. Johnston (2011), Vector Mechanics for Engineers, Vol I - Statics, Vol II, – Dynamics, 9th Ed, Tata McGraw Hill
3. R. C. Hibbler (2006), Engineering Mechanics: Principles of Statics and Dynamics, Pearson Press.
4. Andy Ruina and Rudra Pratap (2011), Introduction to Statics and Dynamics, Oxford University Press
5. Shanes and Rao (2006), Engineering Mechanics, Pearson Education,
6. Hibler and Gupta (2010),Engineering Mechanics (Statics, Dynamics) by Pearson Education
7. Reddy Vijaykumar K. and K. Suresh Kumar(2010), Singer's Engineering Mechanics 8.Bansal R.K.(2010), A Text Book of Engineering Mechanics, Laxmi Publications
9. Khurmi R.S. (2010), Engineering Mechanics, S. Chand & Co.
10. Tayal A.K. (2010), Engineering Mechanics, Umesh Publications Text Bookon" Engineering Mechanics by Sushil S. Dew.

Swami Ramanand Teerth Marathwada University, Nanded

B. E. Second Year in Electrical Engineering & Electrical, Electronics and Power

(Revised Syllabus, CGPA Revised)

Effective from 2019-20

HSMC- 306. Effective Technical Communication

Category	Code	Course Title	L	T	P	CR	PR	OR	TW	MSE	ESE	Total Mark
Humanities & social sciences including management	HSMC 306	Humanities-I (Effective Technical Communication)	2	0	0	2	-	25@	25	-	-	50

Course Objective:

a) To improve technical drafting skills, comprehension abilities and make students communicate effectively in global context.
b) To facilitate the knowledge of technical proposals, drafts, reports, business correspondence, agendas, minutes, etc amongst the learners.
c) To inculcate effective speaking skills and enrich presentation skills by enhancing comprehension abilities of students.
d) To encourage innovative thinking, artistic drafting and elegant expressions both verbally and non-verbally amongst students.

Course Content:

Module 1: Self Development and Assessment (04 Hours)

- Self Assessment and Awareness

- Perception, Attitude, and Belief System
- Self-esteem and Values
- Personal Goal Setting
- Career Planning and Assessment

Module 2: Technical Writing, and Business Correspondence (06 Hours)

A] Technical Writing

- Technical Writing: Meaning & Scope
- Technical Writing: purpose and objectives
- Drafting for print and online media.
- Basic Grammatical Errors

B] Office Correspondence

- E-mailing Etiquettes,
- Blog Writing
- Business Correspondence: Notices, Memos & Circulars, etc.
- Letter Writing: Formal and Personal
- Report Writing: Factual, Progress, Feasibility, Survey, etc.

Module 3: Drafting, Revising and Editing Skills (08 Hours)

A] Drafting and Revising Skills:

- Manuals, Brochures & Leaflets
- Articles & Business Proposals
- Newsletters and Magazines.
- Indexing Techniques

B] Editing, and Proof Reading

- Editing Techniques
- Translation Techniques.
- Note-Making Techniques.
- The Art of Condensation.
- Summarizing and Conclusion.

Module 4: Professional Work Culture & Ethics **(04 Hours)**

- Business Ethics & Morals
- Professional Work Culture
- Managing Time and Punctuality
- Conflict-management
- Problem-Solving Techniques

Module 5: Public Speaking and Presentation Skills **(06 Hours)**

A] Public Speaking Skills

- The Art of Public Speaking
- Group Discussion Skills
- Interview Techniques,
- Telephone Etiquettes
- Extempore, Elocution Techniques

B] Presentation Skills

- Presentation Skills
- Non-verbal Communication
- Power Point Presentation
- Using Audio-Visual Aids

Course Outcome (s): ***Learner(s) will be able to…***

1. Accumulate, review, mediate accurate information and transmit technical ideas, policies with greater clarity & precision.
2. Draft, revise and edit technical drafts, letters, proposals, applications, with effective linguistic skills and abilities by eliminating grammatical errors in the same.
3. Absorb, inculcate and practice an industrial ethics, professional work culture and collaborate effectively in organizational communication system.
4. Lead, present and communicate business strategies persuasively and convincingly through result oriented endeavors both verbally and non-verbally within and outside organizations.

List of Practical / Assignments:

1. Assessment of self perception, attitude, belief system and values by using worksheets, modals and charts.
2. Setting personal, professional goals and plan career by experimental activities in the classroom / labs.
3. Drafting activities based on con-current events, happenings for print as well as online media.
4. Identification and elimination of basic grammatical errors in sentences, paragraphs and content.
5. Drafting activity based on business correspondence, letter writing and report writing.
6. Drafting blog and emails for distinguished situations, in professional work culture.
7. Drafting, Editing and Proof Reading activities based on appropriate content in English.
8. Condensation, summarizing activities based on appropriated content in English.
9. Giving Presentations, seminars on suitable topic using PPTs to improve presentation skills.
10. Arrange elocution, extempore in the classroom on current topics in the social scenario.
11. Arrange group discussion, expert interview sessions, and mocks in the classroom.
12. Brain storming and problem-solving activities should be arranged in the classroom.

Note: This is the suggestive list of assignments / practical to be conducted in the classroom / language lab. However, the subject teacher is free to set, design new assignment / practicals in relevance with the subject content.

(Any eight assignments to be conducted and submitted to the subject teacher to form the record of the subject).

Text Books:

1. Meenakshi Raman and Sangeeta Sharma *Technical Communication Principles and Practice,* Third Edition. OXFORD University Press, New Delhi, 2015.
2. Dale Jung, k., *Applied Writing for Technicians*, McGraw Hill, New York, 2004. (ISBN: 07828357-4)
3. Sharma, R. and Mohan, K. *Business Correspondence and Report Writing*, TMH New Delhi 2002.

Reference Books:

1. David F. Beer and David McMurrey, *Guide to writing as an Engineer*, John Willey. New York, 2004
2. Diane Hacker, Pocket Style Manual, Bedford Publication, New York, 2003. (ISBN 0312406843)
3. Shiv Khera, *You Can Win*, Macmillan Books, New York, 2003.

Swami Ramanand Teerth Marathwada University, Nanded

B. E. Second Year in Electrical Engineering & Electrical, Electronics and Power

(Revised Syllabus, CGPA Revised)

Effective from 2019-20

HSMC- 307. Seminar- I

Category	Code	Course Title	L	T	P	CR	PR	OR	TW	MSE	ESE	Total Mark
Humanities & social sciences including management	HSMC 307	Seminar-I	0	0	2	1	0	25@	0	0	0	25

Objectives:

1. The seminar learning objectives is to increase competency of the students.
2. Understand more vital issues of basic science.
3. To improve communication skills and stage courage of the students.
4. To understand the ethics of presentation and to get a scope of self improvement..

Course Content:

This seminar is based on the recent advances in Basic Science. Student has to write a paper in a standard format on any recent topic pertaining to Basic science, mentioned below by referring different journals, books and other source of information. Student has to prepare PPT of the same and present in front of a group of students and faculties who will be the observer of the presentation.

Seminar Topics:

1. Polymers:

Introduction, Classification of polymers, addition polymerization, condensation polymerization, mechanism of addition polymerization, difference between thermoplastic and thermosetting resins, plastic, rubber, natural rubber, processing of latex, vulcanization of rubber. Biodegradable polymers .Basic methods of degradation.

2. Composites:

Introduction, characteristics of composites, Specific strength, Application of composites, design principles and concepts, constituents of composite, Types of composites, fiber reinforced composites, carbon fiber, reinforced polymer composites, layered composites, Aramid reinforced polymer composites.

3. Explosives and propellants:

Explosives, classification of explosive, primary explosives, 1000 explosives, High explosives, precautions during storage of explosives, blasting fuses. Manufacturer of Important Explosives, Rocket propellants, Classification of Propellants.

4. Inorganic Engineering materials:

Abrasives, Natural abrasives, Artificial Abrasives, Refractories, properties of Refractories, manufacture of refractories, Common Refractory Bricks, cements, Insulating Refractories, Gypsum plaster, manufacturer of Portland cements, Chemical constituents of Portland cements, Glasses and Ceramics, manufacture of Glass. Types of Glasses.

5. Semi Conductor:

Classification of metals, conductors and semiconductors. Different types of semiconductors, semiconductor diode, p-n junction, application of junction diode as a rectifier, photo diode, light emitting diode, solar cell.

6. Radiation:

Introduction, Electron emission, photoelectric effect, effect of intensity of light on photocurrent, Einstein's photo electric equation, Energy Quantum of Radiation.

7. Fiber Optics:

Principles of work, definition, fiber class, Launching of light into an optical fiber, Numerical aperture of optical fiber, application of optical fibre in industry and in medicine. Optical fiber as sensor.

8. Laser:

Principles of Laser, Einstein relation for spontaneous and stimulated emission. Microwave application by stimulated emission. Different types of Laser & their applications.

9. Nuclear Energy:

Mass energy equivalence, Nuclear binding energy, nature of Nuclear forces, energy released in nuclear reactor, nuclear fusion.

10. Plant physiology: Transpiration, Mineral nutrition.

11. Ecology:

Ecosystem components, types, flow of matter and energy in an ecosystem; Community ecology-characteristics, frequency, life forms and biological pyramids.

12. **Molecular Genetics: Structure of DNA and RNA, CONCEPT OF Gene, Gene regulation, e.g., Operon** concept. Biotechnology: Basic concepts. Totipotency and Cell manipulations, Plant

and Animal tissue culture, methods and uses in agriculture, medicine and health, Recombinant DNA Technology-Techniques and applications.

Course Outcomes:

1. Use multiple thinking strategies to examine real-world issues through self learning.
2. Explore creative avenues of expression, solve problems, and make consequential decisions.
3. Developing stage courage and confidence
4. Apply innovative thinking for best presentation.

Swami Ramanand Teerth Marathwada University, Nanded

B. E. Second Year in Electrical Engineering & Electrical, Electronics and Power

(Revised Syllabus, CGPA Revised)

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MC- 308. Environmental Science

Category	Code	Course Title	L	T	P	CR	PR	OR	TW	MSE	ESE	Total Mark
Mandatory Courses	MC 308	Environmental Sciences,	2	0	0	0	-	-	-	15	35	50

Course Objective:

i. To Make aware of the importance of Environment

ii. To understand about natural resources and their contribution on human life

iii. To understand about eco system, biodiversity, pollution, and social issues relatedto environment.

Course Contents:

Unit 1: The Multidisciplinary nature of environmental studies

Definition, scope and importance, Need for public awareness.

Unit 2: Natural Resources

Renewable and non renewable resources:

a) Natural resources and associated problems

- Forest resources: Use and over-exploitation, deforestation, case studies, Timber extraction, mining, dams and their effects on forests and tribal people.
- Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dam's benefits and problems.
- Mineral Resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.