।। 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.

CURRICULUM

For

UNDERGRADUATE DEGREE COURSES IN

SECOND YEAR

CIVIL ENGINEERING

Bachelor of Engineering [B.E.]

[Proposed from 2019-20]

For

Swami Ramanand Teerth Marathwada University Nanded

Semester III (Second Year)
Branch / Course B. E. Civil Engineering

Sr. No.	Category	Code	Course Title	Hours per week				Marking Scheme					Theory Total
				L	T	P	C	PR	OR	TW	MSE	ESE	
1	Professional Core courses	PCC-CE301	Solid Mechanics	3	0	2	4	-	25 @	25	30	70	150
2	Professional Core courses	PCC-CE302	Fluid Mechanics-I	3	0	2	4	25#	-	25	30	70	150
3	Engineering Science Courses	ESC303	Computer-aided Civil Engineering Drawing	0	0	4	2	50#	-	50	-	-	100
4	Engineering Science Courses	ESC304	Electronics & Sensors	2	0	2	3	25@	-	-	15	35	75
5	Engineering Science Courses	ESC305	Mechanical Engineering	1	0	2	2	25 @	-	-	15	35	75
6	Basic Science courses	BSC306	Mathematics-III	3	0	0	3	-	-	25	30	70	125
7	Basic Science courses	BSC307	Biology for Engineers	2	0	0	2	-	25	25	-	-	50
8	Humanities and Social Sciences including Management courses	HSMC308	Humanities-I (Effective Technical Communication & Life Science Based Seminar)	2	0	0	0	-	25@ +25 @	25	-	-	75
Total				**16**	**0**	**12**	**20**	**125**	**100**	**175**	**120**	**280**	**800**
Grand Total				**28**									

Symbols to remember: -@ - Internal Assessment, # - External Assessment T – Theory , P– Practical, T – Tutorial , CR – Credit , OR – Oral , TW – Term work, MSE – Minor Semester Examination, ESE – End Semester Examination.

Semester IV (Second Year)
Branch/Course B. E. Civil Engineering

Sr. No.	Category	Code	Course Title	Hours per week			Credits	Marking Scheme					Theory Total
				L	T	P		PR	OR	TW	MSE	ESE	
1	Professional Core course	PCC CE 401	Geotechnical Engineering	3	0	2	4	-	-	25	30	70	125
2	Professional Core course	PCC-CE402	Engineering Geology & Disaster Management	3	0	2	4	-	-	25	30	70	125
3	Professional Core courses	PCC-CE403	Fluid Mechanics - II	3	0	2	4	25#	-	-	30	70	125
4	Professional Core courses	PCC-CE404	Strength of Material	3	0	2	4	25@	-	-	30	70	125
5	Professional Core courses	PCC-CE405	Surveying & Geometrics	2	0	4	4	25#	-	-	30	70	150
6	Professional Core courses	PCC-CE406	Concrete Technology	3	0	2	4	25#	-	-	30	70	125
7	Humanities and Social Sciences including Management courses	HSMC 407	Civil Engineering - Societal & Global Impact	0	0	2	0	-	-	25	-	-	25
8	Humanities and Social Sciences including Management courses	HSMC 408	Group Discussion and Personality Development	0	0	2	0	-	25@	-	-	-	25
Total				**17**	**0**	**18**	**24**	**100**	**25**	**75**	**180**	**420**	**800**
				35									

<u>Symbols to remember:</u> -@ - Internal Assessment, # - External Assessment T – Theory , P– Practical, T – Tutorial , CR – Credit , OR – Oral , TW – Term work, MSE – Minor Semester Examination, ESE – End Semester Examination

ESC301	Solid Mechanics	3L:0T:2P	4 credits

Objective:

1) The objective of this Course is to provide an introductory treatment of *solid mechanics* to all the students of engineering, with a view to prepare a good foundation for taking up advanced courses in the area in the subsequent semesters.
2) A working knowledge of statics with emphasis on force equilibrium and free body diagrams.
3) Provides an understanding of the kinds of stress and deformation and
4) Provides an understanding of how to determine them in a wide range of simple, practical structural problems, and
5) An understanding of the mechanical behavior of materials under various load conditions.

Proposed Syllabus

Module 1: **System of Coplanar forces:-** Resultant of Concurrent forces, Parallel forces, Non Concurrent Non Parallel system of forces, Moment of force about a point, Couples, Varignon's Theorem. Distributed Forces in plane. charactristics of a force , effect of a force , principle of transmissibility, Graphical Method: representation of a force by vector and by bows notation method, Resultant of concurrent and parallel force system. **(6 Hours)**

Module 2*:* *Basic Structural Analysis covering,* Equilibrium of system of coplanar forces:- Condition of equilibrium for concurrent forces, parallel forces and Non concurrent Non Parallel general forces and Couples. Lami's Theorem and its application. Equilibrium in three dimensions; Method of Sections; Method of Joints; Simple Trusses; Zero force members; Beams & types of beams. **(6 Hours)**

Module 3*:* *Centroid and Centre of Gravity and moment of inertia,* 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. **(8Hours)**

Module 4*:* *Review of particle dynamics*- Rectilinear motion; 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). **(6Hours)**

Module 5:*Introduction to Kinetics of Rigid Bodies covering,* 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. **(8Hours)**

Module 6: Simple Machines: Simple machine, Compound machines, mechanical advantage, velocity ratio, input of machine, output of machine, efficiency of machine, ideal machine, load lost in friction, effort lost in friction. Law machine, maximum mechanical advantage and efficiency, reversibility of a machine, numerical on simple axle and wheel, differential axle and wheel, single purchase crab, double purchase crab, worm and worm wheel, screw jack.**(6 Hours)**

List of Experiments: **(Any 10 Experiments)**

1. To know your laboratory to understand the different mechanics and their components with purpose.
2. Verification of law of polygon of force.
3. Determination of coefficient of friction by inclined plane apparatus.
4. Determine the coefficient of friction between Belt and Pulley friction.
5. Determine efficiency of Single and Double purchase Scrab.
6. To verify the law of moments using parallel force apparatus.
7. To verify the law moments using Bell crank lever.
8. Determine moment of Inertia of a Fly Wheel.
9. Determine moment of Inertia of different bodies and parallel axis theorem.
10. Verification of force transmitted by members of given truss.
11. Determine unknown force using law of moment apparatus.
12. Determine efficiency of Warm and Warm wheel.
13. Determine efficiency of Differential axial and wheel of differential pulley block.
14. Determine efficiency of Screw Jack.

Text/Reference Books:

1. Irving H. Shames (2006), Engineering Mechanics, 4th Edition, Prentice Hall
2. R. C. Hibbler (2006), Engineering Mechanics: Principles of Statics and Dynamics, Pearson Press.
3. Shanes and Rao (2006), Engineering Mechanics, Pearson Education,
4. Hibler and Gupta (2010),Engineering Mechanics (Statics, Dynamics) by Pearson Education
5. Khurmi R.S. (2010), Engineering Mechanics, S. Chand & Co.
6. Tayal A.K. (2010), Engineering Mechanics, Umesh Publications Text Bookon" Engineering Mechanics by Sushil S. Dew.
7. "Solid Mechanics", by Md. Anwaruddin, GRACE.

Course Outcomes:

Upon successful completion of the course, student should be able to:

CO1) Apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems *(BT3)*

CO2) Apply basic knowledge of maths and physics to solve real-world problems *(BT3)*

CO3) Understand measurement error, and propagation of error in processed data *(BT2)*

CO4) Understand basic kinematics concepts – displacement, velocity and acceleration (and their angular counterparts); *(BT2)*

CO5) Understand basic dynamics concepts – force, momentum, work and energy; *(BT2)*

CO6) Understand and be able to apply other basic dynamics concepts - the Work-Energy principle, Impulse-Momentum principle and the coefficient of restitution; *(BT2)*

CO7) 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) *(BT3)*

CO8) Learn to solve dynamics problems. Appraise given information and determine which concepts apply, and choose an appropriate solution strategy; and *(BT3)*

CO9) Attain an introduction to basic machine parts such as pulleys and mass-spring systems. *(BT1 and BT2)*

PCC-CE302	Fluid Mechanics- I	3L:0T:2P	4 credits

Course Objective:-

1. The objective of this course is to introduce the concepts of fluid mechanics useful in Civil Engineering applications.
2. The course provides a first level exposure to the students to fluid statics, kinematics and dynamics.
3. Measurement of pressure, computations of hydrostatic forces on structural components and the concepts of Buoyancy all find useful applications in many engineering problems.
4. A training to analyse engineering problems involving fluids – such as those dealing with pipe flow, open channel flow, jets, turbines and pumps, dams and spillways, culverts, river and groundwater flow - with a mechanistic perspective is essential for the civil engineering students.
5. The topics included in this course are aimed to prepare a student to build a good fundamental background useful in the application-intensive courses covering hydraulics, hydraulic machinery and hydrology in later semesters.

Module 1: Basic Concepts and Definitions – Distinction between a fluid and a solid; Density, Specific weight, Specific gravity, Kinematic and dynamic viscosity; variation of viscosity with temperature, Newton law of viscosity; vapour pressure, boiling point, cavitation; surface tension, capillarity, Bulk modulus of elasticity, compressibility.**(6 Hours)**

Module 2: Fluid Statics - Fluid Pressure: Pressure at a point, Pascals law, pressure variation with temperature, density and altitude. Piezometer, U-Tube Manometer, Single Column Manometer, U-Tube Differential Manometer, Micromanometers.pressure gauges.**(5 Hours)**

Module 3: Hydrostatic pressure and force: horizontal, vertical and inclined surfaces. Buoyancy and stability of floating bodies, metacenter, metacentric height and its determination. **(3 Hours)**

Module 4: Fluid Kinematics- Classification of fluid flow : steady and unsteady flow; uniform and non-uniform flow; laminar and turbulent flow;rotational and irrotational flow; compressible and incompressible flow; ideal and real fluid flow; one, two and three dimensional flows;Stream line, path line,streak line and stream tube;stream function, velocity potential function.One-,two- and three-dimensional continuity equations in Cartesian coordinates. **(8 Hours)**

Module 5: Fluid Dynamics- Surface and body forces; Equations of motion - Euler's equation; Bernoulli's equation – derivation; Energy Principle; Practical applications of Bernoulli's equation : venturimeter, orifice meter and pitot tube; Momentum principle; Forces exerted by fluid flow on pipe bend; Vortex Flow – Free and Forced; Dimensional Analysis and Dynamic Similitude - Definitions of Reynolds Number, Froude Number, Mach Number, Weber *Number and Euler Number; Buckingham's* π-Theorem. **(8 Hours)**

Module 6: Pumps and Turbines: Definition and types, suction head, delivery head, static head and monometric head of pump, computation of power required for pump. Numerical problems, centrifugal pump, reciprocating pump, submersible pump and jet pump, component parts and

their functions, principal and working, selection and choice of pump, turbine and its type, impulse and reaction, components and their functions, working and selection **(6 Hours)**

Lab Experiments (Minimum 15)

1. Measurement of viscosity
2. Study of Pressure Measuring Devices
3. Stability of Floating Body
4. Hydrostatics Force on Flat Surfaces/Curved Surfaces
5. Verification of Bernoulli's Theorem
6. Venturimeter
7. Orifice meter
8. Impacts of jets
9. Flow Visualisation -Ideal Flow
10. Length of establishment of flow
11. Velocity distribution in pipes
12. Laminar Flow
13. Demonstration of centrifugal and reciprocating pump
14. Trail on Francis turbine
15. To determine metacentric height of floating body
16. Connect catalogues of pumps and use it for selection of pump for design discharge and head.
17. Measure pressure head and pressure intensity by using piezometer and simple U tube manometer
18. Demonstrate bourdons tube pressure gauge for measurement positive and negative gauge pressure

Text/Reference Books:

1. Fluid Mechanics and Machinery, C.S.P.Ojha, R. Berndtsson and P. N. Chadramouli, Oxford University Press, 2010
2. Hydraulics and Fluid Mechanics, P M Modi and S M Seth, Standard Book House
3. Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill
4. Fluid Mechanics with Engineering Applications, R.L. Daugherty, J.B. Franzini and E.J. Finnemore, International Student Edition, McGraw Hill.
5. Fluid Mechanics & Machinery- S. K. Agrawal (Mc. Grawhill).
6. Fluid Mechanics – Dr. A. K. Jain (Khanna Publication).
7. Fluid Mechanics – R. K. Bansal (S.Chand).
8. Fluid Mechanics- Dr.Vijay S Pawar, Sayali V Pawar.

Course Outcomes:

CO1) Understandbroad principles of fluid statics,kinematics&dynamics*(BT2)*

CO2) Understand definitions of the basic terms used in fluid mechanics *(BT2)*

CO3) Understand classifications of fluid flow *(BT2)*

CO4) Be able to apply the continuity, momentum and energy principles. *(BT3)*

CO5) Be able to apply dimensional analysis. *(BT3)*

CO6) They will have knowledge in hydraulic machineries(pumps &turbine). *(BT1)*

ESC303	Computer-aided Civil Engineering Drawing	0L:0T:4P	2 credits

Objectives:

1. Develop Parametric design and the conventions of formal engineering drawing
2. Produce and interpret 2D & 3D drawings
3. Communicate a design idea/concept graphically/ visually
4. Examine a design critically and with understanding of CAD - The student learn to interpret drawings, and to produce designs using a combination of 2D and 3D software.
5. Get a Detailed study of an engineering artifact

Proposed Syllabus

Module 1: A) INTRODUCTION; Introduction to concept of drawings, Interpretation of typical drawings, Planning drawings to show information concisely and comprehensively; optimal layout of drawings and Scales; Introduction to computer aided drawing, coordinate systems, reference planes. (2 Hours)

B) SYMBOLS AND SIGN CONVENTIONS: Materials, Architectural, Structural, Electrical and Plumbing symbols. Rebar drawings and structural steel fabrication and connections drawing symbols, welding symbols; dimensioning standards , English Bond and Flemish Bond – Corner wall and Cross walls - One brick wall and one and half brick wall. (4 Hours)

Module 2: A) BUILDING DRAWING: Terms, Elements of planning building drawing, Methods of making line drawing and detailed drawing. Site plan, floor plan, elevation and section drawing of small residential buildings.Foundation plan. Roof drainage plans. Depicting joinery, standard fittings & fixtures, finishes. Use of Notes to improve clarity. Principles of isometrics and perspective drawing. Perspective view of building. Fundamentals of Building Information Modelling (BIM). (6 Hours)

B) Fundamental of CAD

- CAD Software – Meaning, various CAD software's available in market, Advantages of CAD
- Starting up of CAD, CAD window, toolbar, dropdown menu, introduction of starting Auto CAD screen.
- CAD fundamental, co-ordinate system in CAD. Absolute, relative, polar, spherical, cylindrical co-ordinate system, filters, use of function key in Auto CAD.
- Drawing aids, Drawing basic entities, Modify commands, Layers, Text and Dimensioning, Blocks. Drawing presentation norms and standards.

(4 Hours)

Module 3: CAD COMMANDS

- WCS icon, UCS icon, co-ordinates, drawing limits, grid, snap, ortho features.
- Drawing commands – Line, Circle, Arc, Polyline, Multiline, Construction line, sp line, ellipse, polygon, rectangle, table, block, text.
- Editing commands – copy, move, offset, fillet, chamfer, trim, stretch, legthen, extend, rotate, mirror, array etc..
- Working with hatches, fills, dimensioning, text etc..
- Important commands in insert menu, format menu, tools and dimensions. (12 Hours)

Module 4: SUBMISSION AND WORKING DRAWING

- Preparation of line plan, detailed plan, developed plan, section, site plan, area statement
- Procedure for printing drawings.
- Intrduction to 3D drawings. (12 Hours)

List of Drawing Experiments:

1. Buildings with load bearing walls including details of doors and windows.
2. Taking standard drawings of a typical two storeyed building including all MEP, joinery, rebars, finishing and other details and writing out a description of the Facility in about 500 -700 words.
3. RCC framed structures.
4. Reinforcement drawings for typical slabs, beams, columns and spread footings.
5. Industrial buildings - North light roof structures - Trusses
6. Perspective view of one and two storey buildings.
7. Submission print on A4 size paper
   Submission drawing, to the scale 1:100, of single storeyed Load Bearing Residential building(2BHKD) with Flat Roof and staircase showing developed plan, elevation, section passing through stair or W.C. and bath, site plan (1:200), area statement, schedule of openings, construction notes show enlarge section with details.
8. Submission drawing to the scale 1:100 of (G+1) Residential building Framed structure (2BHKD with attached toilet to 1 bed room showing the position of European type WC pan)showing developed plan, elevation section passing through staircase, site plan (1:200), foundation plan (1:50), area statement, schedule of openings(also show the place for Washing Machine, WHB, Pooja, store etc.. Also show bed position, dining table with chairs, sofa, wardrobe etc..).
9. Submission of soft copy of the above drawing files on CD and hard copy on A4 size paper.

Text/Reference Books:

1. Subhash C Sharma & Gurucharan Singh (2005), "Civil Engineering Drawing", Standard Publishers
2. Venugopal (2007), "Engineering Drawing and Graphics + AUTOCAD", New Age International Pvt. Ltd.,
3. Sikka, V.B. (2013), A Course in Civil Engineering Drawing, S.K.Kataria& Sons,
4. CAD/CAM Computer Aided Design Manufacturing Mikell P. Groover
5. Auto CAD BIBLE Ellen Finkelstern (Willey India Pvt. Ltd.)
6. CAD/CAM Principles and Application P.n. Rao (Tata Mc GraHill)

Course Outcomes:

Upon successful completion of the course, student should be able to:

CO1) Develop graphical skills for communicating concepts, ideas and designs of engineering products graphically/ visually as well as understand another person's designs.*(BT2)*

CO2) Get exposure to national standards relating to technical drawings using Computer Aided Design and Drafting practice. *(BT2)*

CO3) Develop parametric design and the conventions of formal engineering drawing. *(BT2)*

CO4) Produce and interpret 2D & 3D drawings (*BT3)*

CO5) Examine a design critically and with understanding of CAD - The student learn to interpret drawings, and to produce designs using a combination of 2D and 3D software. *(BT5)*

CO6) Do a detailed study of an engineering artefact. *(BT2)* Develop drawings for conventional structures using practical norms. *(BT3)*

ESC304	Electronics And Sensors	2L:0T:2P	3 credits

Course Objectives:

1. The objective of this Course is to provide the students with an introductory and broad treatment of the field of *Electronics Engineering to facilitate better understanding of the electronics devices.*
2. Know broadly the concepts and functionalities of the electronic devices and switches.
3. Understand use, general specifications and deploy abilities of the analog electronic devices, and assemblies.
4. Confidence in handling and usage of digital electronic devices, tools and instruments in engineering applications.
5. *Instruments and sensors used in engineering applications.* This course emphasizes more on the laboratory/practical use of the knowledge gained from the course lectures.

Proposed Syllabus

Module1: *Diodes and Applications* covering, Semiconductor Diode - Ideal versus Practical, Resistance Levels, Diode Equivalent Circuits, Load Line Analysis; Diode as a Switch, Diode as a Rectifier, Half Wave and Full Wave Rectifiers with and without Filters; Breakdown Mechanisms, Zener Diode –Operation and Applications; Opto-Electronic Devices –LEDs, Photo Diode and Applications; Silicon Controlled Rectifier (SCR) –Operation, Construction, Characteristics, Ratings, Applications; **(6 Hours)**

Module 2*: Transistor Characteristics* covering, Bipolar Junction Transistor (BJT) — Construction, Operation, Amplifying Action, Common Base, Common Emitter and Common Collector Configurations, Operating Point, Voltage Divider Bias Configuration; Field Effect Transistor (FET) –Construction, Characteristics of Junction FET, Depletion and Enhancement type Metal Oxide Semiconductor (MOS) FETs, Introduction to CMOS circuits: **(6 Hours)**

Module 3*: Transistor Amplifiers and Oscillators* covering, Classification, Small Signal Amplifiers –Basic Features, Common Emitter Amplifier, Coupling and Bypass Capacitors, Distortion, AC

Equivalent Circuit; Feedback Amplifiers –Principle, Advantages of Negative Feedback, Topologies, Current Series and Voltage Series Feedback Amplifiers; Oscillators — Classification, RC Phase Shift, Wien Bridge, High Frequency LC and Non-Sinusoidal type Oscillators; **(8 Hours)**

Module 4*: Operational Amplifiers and Applications* covering, Introduction to Op-Amp, Differential Amplifier Configurations, CMRR, PSRR, Slew Rate; Block Diagram, Pin Configuration of 741 Op-Amp, Characteristics of Ideal Op Amp, Concept of Virtual Ground; **(5 Hours)**

Module 5: *Digital Circuits and Communications,*Number systems, logic gates AND, OR, NOT,NOR,NAND, XOR with symbols, Boolean algebra, De Morgan s theorem, Introduction to sequential and combinational logic circuits types of flip flops, shift registers, counters. **(6Hours)**

Module 6: *Sensors* Instrumentation System: Block diagram of instrumentation system, function of each block Sensors and transducer: basic definition, difference, classification of sensors :Thermal ,optical, magnetic and electric sensors. fibre optic sensors (FOS), piezoelectric sensors, magnetostrictive sensors, Magnetostrictive Sensors. Presure ,temptaure.velocity,strain. **(5 Hours)**

Practicals: (Minimum 15 Practicals)

1: Laboratory Sessions (Any Four)

Identification, Specifications, Testing of R, L, C Components (Color Codes), Potentiometers, Switches (SPDT, DPDT and DIP), Bread Boards and Printed Circuit Boards (PCBs); Identification, Specifications, Testing of Active Devices –Diodes, BJTs, JFETs, MOSFETs, Power Transistors, SCRs and LEDs;

2: Laboratory Sessions (Any Three)

Study and Operation of Digital Multi Meter, Function / Signal Generator, Regulated Power Supply (RPS), Cathode Ray Oscilloscopes; Amplitude, Phase and Frequency of Sinusoidal Signals using Lissajous Patterns on CRO; (CRO);

3: Laboratory Sessions (Any Three)

Experimental Verification of PN Junction Diode Characteristics in A) Forward Bias B) Reverse Bias, Zener Diode Characteristics and Zener Diode as Voltage Regulator, Input and Output Characteristics of BJT in Common Emitter (CE) Configuration, Drain and Transfer Characteristics of JFET in Common Source (CS)Configuration;

4: Laboratory Sessions (Any Two)

Study of Half Wave and Full Wave Rectification, Regulation with Filters, Gain and Bandwidth of BJT Common Emitter (CE) Amplifier, Gain and Bandwidth of JFET Common Source (CS) Amplifier, Gain and Bandwidth of BJT Current Series and Voltage Series Feedback Amplifiers, Oscillation Frequency of BJT based RC Phase Shift, Hartley and Colpitts Oscillators;

5: Laboratory Sessions (Any Four)

Op-Amp Applications –Adder, Subtractor, Voltage Follower and Comparator; Op-Amp Applications –Differentiator and Integrator, Square Wave and Triangular Wave Generation, Applications of 555 Timer –Astable and Monostable Multivibrators;

6: Laboratory Sessions (Any Three)
Truth Tables and Functionality of Logic Gates –NOT, OR, AND, NOR, NAND, XOR and XNOR Integrated Circuits (ICs); Truth Tables and Functionality of Flip-Flops –SR, JK and D Flip-Flop ICs; Serial-In-Serial-Out and Serial-In-Parallel-Out Shift operations using 4-bit/8-bit Shift Register ICs; Functionality of Up-Down / Decade Counter ICs; (15 Sessions)

Text/Reference Books:

1) David. A. Bell (2003), *Laboratory Manual for Electronic Devices and Circuits*, Prentice Hall, India
2) Electronics principles (7^{th} Edition) Albert Malvino, David j. Bates Tata McGRAW-HILL Edition
3) Malvino Electronic Principles (Sixth edition) Tata McGRAW-HILL Edition.
4) PRINCIPLES OF ELECTRONIC V.K. MEHETA /ROHIT MEHETA –S. Chand
5) A TEXT BOOK OF APPLIED ELECTRONICS- R.S. SEDHA.
6) Digital electronics Principle and Application Sixth Edition Tokheim, Tata McGRAW-HILL Edition.
7) DIGITAL PRINCIPLE AND APPLICATION LEACH MALVINO FIFTHEDITION.
8) Thomas L. Floyd and R. P. Jain (2009), *Digital Fundamentals* by Pearson Education, 4.Paul
9) Zbar, A.P. Malvino and M.A. Miller (2009), *Basic Electronics –A Text-Lab. Manual,* TMH 5.R. T. Paynter (2009), *Introductory Electronic Devices & Circuits, Conventional Flow Version,* Pearson
10) Electronics AND Sensors –Lokhande A.K.

Course outcomes:

CO1) Acquire a basic knowledge in solid state electronics including diodes, MOSFET, BJT, and operational amplifier.
CO2) Develop the ability to analyze and design analog electronic circuits using discrete components.
CO3) Observe the amplitude and frequency responses of common amplification circuits.
CO4) Design construct, and take measurement of various analog circuits to compare experimental results in the laboratory with theoretical analysis.
CO5) Study transfer characteristics of transistor, filters and amplifiers.
CO6) Students will demonstrate understanding of the different familiar of digital integrated circuits, of their direct current characteristics, and of handling precautions**.**
CO7) Use concepts in common methods for converting a physical parameter into an electrical quantity.

ESC 305	Mechanical Engineering	1L:0T:2P	2credits

Objectives:

1. To provide the knowledge in fields such as design, research, development, manufacturing, operations and service system
2. To provide a broad education emphasizing an excellent foundation in scientific and engineering fundamentals
3. The broad education necessary the impact of engineering solutions in global, economic, environmental, and social context
4. To create an intellectual reservoir to meet the growing demand of nation.

Module 1: Thermodynamics – Thermodynamics work, p-dV work in various process p-V representation of various thermodynamic processes and cycles. Ideal gas equation, properties of pure substance, statements of Ist and IInd law of thermodynamics and their application in mechanical engineering. Carnot cycle for heat engine, refrigerator and heat pump. **(2 Hours)**

Module 2: Heat transfer – statement and explanation of fourier's Law of heat conduction, Newton's law of cooling, Stefan Boltzmann's law. Conducting and insulation material and their properties. Selection of heat sink and heat source. **(2 Hours)**

Module 3: Power plants –thermal, Hydro-electric, nuclear and solar wind hybrid power plant. Machine elements : power transmission shafts, axles, keys, bush and ball bearing, flywheel and Gevernors. **(2 Hours)**

Module 4: Power transmission Devices – Types of belts and belt drives, Chain drives, type of gears, types of couplings, friction clutch (cone and single plate), brakes (types and application only) application of these devices. **(2 Hours)**

Mechanism : (Descriptive treatment only) slider crank mechanism, four bar chain mechanism, list of various inversions of four bar chain mechanism, Geneva Mechanism, Ratchet and paul mechanism. **(2 Hours)**

Module 5 : Material use in Engineering and their application metal, ferrous and Non-ferrous, Non metallic, materials, Material selection criteria, design consideration, steps fin design. **(2 Hours)**

Introduction to Manufacturing processes ant their Application –Casting, sheet metal forming, Sheet – metal cutting, forging fabrication, Metal joining precesses. **(2 Hours)**

Module 6: Machine Tools (Basic elements, working principle and types of operations) lathe Machine- Centre Lathe Drilling Machine- study of pillar drilling machine. Introduction to NC and CNC machine, grinding machine, Power saw, Milling Machine. **(2 Hours)**

List of Practicals: (Minimum 10)

1. Joule's experiment to validate first law of thermodynamics.
2. Determination of Cp and Cv for Ideal gas.
3. Calculate the thermal conductivity for a given sample of solid metallic rod.
4. Determination of Stefan- Boltzmann constant σ .
5. Prepare a report on visit to thermal/hydro electric/solar powar plant with specification of necessary component along with their function
6. Draw a schematic diagramof centrifugal governor and describe its working. Draw a graph between radius of rotation versus speed of governor to understand its function.

7. Determine slip, length of belt ,angle of contact in an open belt drive to understand its performance
8. Dismantle and assemble single plate clutch/cone clutch of four wheeler .draw neat sketch and state the functions of various components.
9. Dismantle and assemble mechanically operated brake mechanism of two wheeler.
10. Sketch and describe the working of Geneva Mechanism and Ratcht and paul mechanism.
11. To study centrifugal casting and Die Casting processes on demo model
12. To perform blanking and punching operation on sample sheet metal components.
13. To study a sample smithy operation & analysis different smithy tools (forging process)
14. To study various welding process, like gas welding, MIG welding, TIG welding, ete.
15. Study of basics of CNC machining and develop part program for CNC lathe.

Text/Reference Books:

1. Nag.P.K., "Engineering Thermodynamics", Tata McGraw-Hill, New Delhi.
2. Cengel, Thermodynamics – An Engineering Approach *Tata McGraw Hill, New* Delhi.
3. Sonntag, R. E., Borgnakke, C., & Wylen, G. J. V. Fundamentals of thermodynamics: Wiley.
4. Moran, M. J., Shapiro, H. N., Boettner, D. D., & Bailey, M. Fundamentals of Engineering

1.Thermodynamics: John Wiley & Sons.

5. Jones, J. B., & Dugan, R. E. Engineering thermodynamics: Prentice Hall.
6. Potter, M. C., & Somerton, C. W. Schaum's Outline of Thermodynamics for Engineers, McGraw-Hill.
7. Introduction to Mechanical Engineering, by *Prof. Kharat W. S.* GRACE.

Course Outcome:

Upon successful completion of the course, student will have:

CO1) Ability to apply mathematics, science, and engineering

CO2) Ability to design and conduct experiments, as well as to analyze and interpret data

CO3) Ability to identify, formulate, and solve engineering problems *(BT1 and BT2)*

CO4) Ability to apply modern engineering tools, techniques and resources to solve complex mechanical engineering activities with an understanding of the limitations. *(BT3)*

CO5) Ability to comprehend the thermodynamics and their corresponding processes that influence the behaviour and response of structural components *(BT1 and BT2)*

CO6) Ability to apply principles of engineering, basic science, and mathematics (including multivariate calculus and differential equations) and thermodynamics to model, analyze, design, and realize physical systems, components. *(BT3 and BT4)*