SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY
"DYANTEERTH", VISHNUPURI, NANDED

SYLLABUS FOR
S.E. (MECHANICAL/PRODUCTION ENGINEERING)

w.e.f. 2015-16

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSIT, NANDED

Teaching & Examination Scheme for Second Year Mechanical Engineering

w.e.f. 2015-16

Sem - III

Course Code	Subject	Teaching Scheme			Examination Scheme					Credits		
		Th	Pr/ Tut	Total	ESE	MSE	CE	ESE	Total	Th	Pr	Total
							Pr / WS					
M-201	Engineering Math-III	04	-	04	80	20	-	-	100	04	-	04
M-202	Engineering Thermodynamics	04	02	06	80	20	30	70	200	04	1	05
M-203	Engineering Metallurgy	04	02	06	80	20	30	70	200	04	1	05
M-204	Mechanical Measurement & Metrology	04	02	06	80	20	30	70	200	04	1	05
M-205	Strength of Material	04	02	06	80	20	30	70	200	04	1	05
	Total	**20**	**08**	**28**	**400**	**100**	**120**	**280**	**900**	**20**	**4**	**24**

Sem-IV

Course Code	Subject	Teaching Scheme			Examination Scheme					Credits		
		Th	Pr/ Tut	Total	ESE	MSE	CE	ESE	Total	Th	Pr	Total
							Pr / WS					
M-206	Engineering Math-IV	04	-	04	80	20	-	-	100	04	-	04
M-207	Theory of Machine	04	02	06	80	20	30	70	200	04	1	05
M-208	Manufacturing Technology – I	04	02	06	80	20	30	70	200	04	1	05
M-209	Fluid Mechanics & Hydraulics Machines	04	02	06	80	20	30	70	200	04	1	05
M-210	Machine Design & CAD	04	02	06	80	20	30	70	200	04	1	05
M-211	Communication Skills	02	02	04	40	10	50	-	100	-	-	-
	Total	**22**	**10**	**32**	**440**	**110**	**170**	**280**	**1000**	**20**	**4**	**24**

CE – Continuous Evaluation **ESE – End Semester Exam**
MSE – Mid Semester Exam **Pr. – Practical**
Th – Theory **Tut – Tutorial** **W/S- Workshop**

S. E. (Mechanical) Part - I

M-201 – Engineering Mathematics - III

Teaching Scheme
Theory: 4 Hrs/Week

Examination Scheme
MSE: 20 Marks
ESE: 80 Marks

Course Objective

i) To develop logical understanding of the subject.

ii) To develop mathematical skill so that students are able to apply mathematical methods & principals in solving problem from Engineering fields.

iii) To make aware students about the importance and symbiosis between Mathematics and Engineering.

Course Outcomes

i) Student will demonstrate basic knowledge of L.D.E.,P.D.E.,Vector & F.T.

ii) Student will show the understanding of impact of Engg.Mathematics on Mech.

iii) Student will Demonstrate their understanding of mathematical ideas from multiple perspectives, such as by (a) using the internal connections between geometry, algebra, and numerical computation, (b) applying the connections between theory and applications, or (c) distinguishing between a formal proof and a less formal arguments and understanding the different roles these play in mathematics.

Unit-I Linear Differential Equation of Higher order **(08 Hrs)**

Introduction to Linear Differential Equation of n^{th} order with constant coefficients
Methods of solving Linear Differential Equation with constant coefficients

a) Shortcut Method
b) Variation of Parameter Method

Equation reducible to Linear Differential Equation with constant coefficients

a) Cauchy's Equation
b) Legendre's Equation

Application of Linear Differential Equations to whirling of shaft.

Unit-II Vector Differentiation **(07 Hrs)**

Vector and Scalar point function, Differentiation of vector point function, vector differential operator, gradient of scalar point function, directional derivative, divergence of vector point function, solenoidal vector field, irrotational and conservative field, second order differential operator and vector identities (only problems)

Unit-III Vector Integration **(08 Hrs)**

Line integral in Cartesian, polar and parametric form, work done, line integral independent of path, Green's theorem (without proof), its verification and application, surface integral, Stoke's theorem (without proof) and applications, volume integral, Gauss divergence theorems (without proof), and applications.

Unit-IV Fourier Transform **(07 Hrs)**

Fourier integral, Fourier sine and cosine integral, complex forms of Fourier integral, Fourier transform, Fourier sine and cosine transform –Fourier sine and cosine transform, Properties of Fourier transform, Parseval"s identity for Fourier transform.

Unit-V Partial Differential Equation **(08 Hrs)**

Introduction to partial differential equation, Solution of partial differential equation by Method of Separation of Varibles, Application of partial differential equation to 1) one dimensional Wave Equaitons, ii) one dimensional heat flow equaitons

Unit –VI Probability Distribution **(07 Hrs)**

Random variables, discrete probability distribution continuous probability distribution.
Probability distribution: Poisson distribution,Fitting of poission distribution & its application.Normal Distribution& its application.

B.S.Grewal, Higher Engineering Mathematics, 43rd edition, ISBN 9788174091955
Elementary Differential Equations and Boundary Value Problems By William E. Boyce,Richard C.DiPrima(9th Edition)
Jain and Iyenger, Advanced engineering Mathematics, Narosa Pub. House, New Delhi.
E. Kreszig, Advanced Engineering Mathematics, 6th edition, Wiley Eastern publication.

S. E. (Mechanical) Part -II

M-206 – Engineering Mathematics - IV

Teaching Scheme
Theory: 4 Hrs/Week

Examination Scheme
MSE: 20 Marks
ESE: 80 Marks

Course Objective

i) To develop logical understanding of the subject.

ii) To develop mathematical skill so that students are able to apply mathematical methods & principals in solving problem from Engineering fields.

iii) To make aware students about the importance and symbiosis between Mathematics and Engineering.

Course Outcomes

i) Student will demonstrate basic knowledge of Functions of Complex Variable & Numerical Technique.

ii) Student will show the understanding of impact of Engg.Mathematics on Mech.

iii) Student will Demonstrate their understanding of mathematical ideas from multiple perspectives, such as by (a) using the internal connections between geometry, algebra, and numerical computation, (b) applying the connections between theory and applications, or (c) distinguishing between a formal proof and a less formal arguments and understanding the different roles these play in mathematics.

Unit-I Function of a Complex Variable: **(07 Hrs)**

Introduction to Complex Numbers: Polar form of Complex Number. Relations between Circular function and Hyperbolic functions (only concepts no problems). Limits and continuity of complex functions, derivative of Complex functions, Analytic functions, C-R Equations in Cartesian and polar form, Harmonic function Construction of an analytic function only real or iginary parts are given by Milne Thomson Method.

Unit-II Complex Integration **(07 Hrs)**

Line Integral, Cauchy's integral theorem, Extension of Cauchy's integral theorem for multiply connected domain and Cauchy's integral formula, Taylor's and Laurent' series (only problems), Singularities and zeros of complex function, calculation of residue and residue theorem and its application to integration around unit circle.

Unit- III FINITE DIFFERENCES AND INTERPOLATION **(07 Hrs)**

Finite Differences :- 1) Forward
2) Backward
3) Central

Difference Operators: - Shift, Average, Relation between operators
Newtons Forward, Backward and Central (Only Stirling's formula) Interpolation Formulas.

UNIT IV NUMERICAL DIFFERENTIATION **(06 Hrs)**

Formulae for Derivatives

1) Derivatives using Forward Difference Formula
2) Derivatives using Backward Difference Formula
3) Derivatives using Central Difference Formula

Maxima & Minima of tabulated function.

UNIT V NUMERICAL INTEGRATION **(06 Hrs)**

Newtons cotes Quadrature Formula, Trapezoidal Rule, Simpson's One-Third Rule, Simpson's Three-Eighth Rule.

UNIT VI NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS (07 Hrs)

1) Picard's Method
2) Taylor's Series Method
3) Euler's Method & Euler's Modified Method
4) Runge-Kutta Method

B.S.Grewal, Higher Engineering Mathematics, 43rd edition, ISBN 9788174091955
Jain and Iyenger, Advanced engineering Mathematics, Narosa Pub. House, New Delhi.
E. Kreszig, Advanced Engineering Mathematics, 6th edition, Wiley Eastern publication.

S. E. (Mechanical) Part - I

M-205 – Strength of Materials

Teaching Scheme

Teaching Scheme
Theory: 4 Hrs/Week
Practical: 2 Hrs/Week

Examination Scheme

Examination Scheme
MSE: 20 Marks
ESE: 80 Marks
CE : 30 Marks
Practical Exam: 70 Marks

Course Objectives:

- To establish an understanding of the fundamental concepts of mechanics of deformable solids; including static equilibrium, geometry of deformation, and material constitutive behavior.
- Mechanical behavior of the body by determining the stresses, strains and deflections produced by the loads up to the elastic limit.
- Fundamental concepts related to deformation, strain energy, moment of inertia, load carrying capacity, slope an deflection of beams, shear forces, bending moments, torsional moments, column and struts, principal stresses and strains and theories of failure.
- To provide students with exposure to the systematic methods for solving engineering problems in solid mechanics.

Course Outcomes:

Student will be able to understand the concepts of various stresses and their significant effects in context with engineering applications.

- Student will be able to effectively use the concepts of shear force and bending moment diagrams in design of machine elements.
- Will be able to compute the principal stresses and Strains by analytical and graphical methods (Mohr's circle of stress 2-D.
- Able to use expressions for estimation of deformation in axially loaded members under gradual, sudden and impact loads.
- Able to estimate the Slope and Deflection in determinate beams.
- This subject enables the student to understand the important concepts of stress and strain, their significance in concept with engineering applications and is useful while studying the subjects like, Machine Design, Theory of machines, Dynamics of Machines.

Unit 1 : (6 hrs)

Simple stresses and strains: a) Concept of stress and strain (linear, lateral, shear and volumetric) Hooks law. Elastic constants and their relationship. Generalized Hook's law. Stresses, strains and deformation in determinate and indeterminate homogeneous and composite bars under concentrated loads, self-weight and temperature changes.

Unit 2 : (8 hrs)

a) Shear force and bending moment diagrams: Concept and definition of shear force and

Bending Moment in beams due to concentrated load, UDL, and couples in determinate beams. Relation between SF, BM and intensity of loading, construction of SF, and BM diagrams for cantilevers, simple compound beams .

b) Stresses due to bending: Theory of simple bending, concept and assumptions, Derivation of Flexure formula, Bending stress distribution diagram, Moment of resistance and section modules calculations.

Unit 3 : (6 hrs)

a) Shear stress distribution in beams: Shear stresses concept, derivation of shear stress distribution formulae, shear stress distribution diagram for common symmetrical sections, maximum and average shear stress, shear connection between Flange and web.

b) Torsion of circular shaft: Theory of torsion of shafts of circular, cross section. Assumptions, Derivation of torsion formulae. Shafts of hollow, solid, homogeneous and composite circular cross section subjected to twisting moments, stresses due to combine torsion, bending and axial force on shafts.

Unit 4 : (6 hrs)

a) Principal stresses and principal strain: Normal and shear stresses on any oblique planes and concept of principal planes and principal planes by analytical and graphical methods (Mohr's circle for a 2-D stress state).

b) Pressure Vessels: Stresses, strains and deformation in thin walled seamless cylindrical and spherical vessels due to internal fluid pressure. Change in volume, effects of additional compressible or Incompressible Fluid injected under pressure.

Unit 5 : (7 hrs)

a) Axially loaded columns: Concept of critical load and buckling, Euler's formulae for buckling load , concept of equivalent length for various end conditions. Rankin's formulae, safe load on column, Limitations of Euler's formulae.

b) Strain energy and impact. Concept of strain energy, derivation and use of expressions for deformation of axially loaded members under gradual sudden and impact loads.

Unit 6 : (7 hrs)

Slope and Deflection of Determinate Beams: a) Concept and definition, relation between B.M., slope and deflection,slope and deflection by double integration method (McCauley's method). b) Slope and Deflection in determinate beams.

Text Books:

- Ramamurtham, "Strength of Materials", Dhanpat Rai Publishing Company (P) Limited
- Beer and Johnston, "Strength of Materials" CSB Publisher

Reference Books:

- Gere &Timoshenko, "Mechanics of Material", CSB Publisher 1984
- E.P. Popov, "Introduction to Mechanics of solids", Prentice Hall Publication
- Singer and Pytel, "Strength of Materials", Harper and Row Publications
- Timoshenko and Young, "Strength of Materials", CSB Publisher
- Students will understand the effect of tensile, shearing force and can utilize the knowledge gained while tackling real life engineering problems.
- Students will be able to effectively incorporate the important concepts learnt while