

Mechanical Engineering

Sr. No.	Course Code	Courses	L	T	P	Credits
1	EN3BS03	Engineering Mathematics-III	3	1	0	4
2	ME3CO07	Manufacturing Processes and Machines	3	0	2	4
3	ME3CO08	Machine Design-I	3	0	2	4
4	ME3CO09	Energy Conversion – I	3	0	2	4
5	ME3CO10	Dynamics of Machines	3	1	2	5
6	EN3MC03	Technical Communication	2	0	0	0
7	EN3HS04	Fundamentals of Management, Economics and Accountancy	3	0	0	3
		Total	20	2	8	24
		Total Contact Hours		30		

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Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EN3BS03	Engineering Mathematics-III	3	1	0	4

Unit I

Functions of Complex Variables: Functions of complex variables: Analytic functions, Harmonic Conjugate functions, Cauchy-Riemann Equations, Complex Line Integral, Cauchy's Theorem, Cauchy's Integral Formula, Singular Points, Poles and Residues, Residue Theorem, Application of Residue theorem for evaluation of real integrals.

Unit II

Numerical Analysis –I : Errors and Approximations, Solution of Algebraic & Trancendental Equations (Regula Falsi method , Newton-Raphson formula and Iterative method), Solution of Simultaneous linear equations by Gauss Elimination, Gauss Jordan, Crout's Triangularization method , Jacobi's and Gauss-Siedel Iterative method.

Unit III

Numerical Analysis –II: Difference Operators, Interpolation (Newton Forward and Backward Formulae), Central Interpolation Formulae (Gauss, Bessel's and Sterling's formula), Lagrange's and Divided difference formulae, Numerical Differentiation.

Unit IV

Numerical Analysis –III : Numerical Integration, Numerical Solution of Ordinary Differential Equations (Taylor's Series, Picard's Method, Euler's Modified Method, Runge-Kutta Method, Milne's Predictor and Corrector method) .

Unit V

Statistics : Correlation, Karl Pearson's Coefficient of Correlation, Spearman's Rank Correlation Coefficient , Linear Regression, Regression coefficients ,Curve fitting (Method of Least Square), Testing of Hypothesis , Student's t-test, Fisher's z-test, Chi-Square test.

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. B.V. Ramana, Higher Engineering Mathematics, Tata McGraw Hill Publishing Company Ltd.

References

1. J. Ravichandran, Probability and Statistics, Wiley India.
2. R. George, Mathematical Statistics, Springer.
3. M. K. Jain, Iyengar and R. K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International Publication.

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
ME3CO07	Manufacturing Processes and Machines	3	0	2	4

Unit-I

Theory of Metal Cutting: Tool geometry , Mechanism of chip formation, Orthogonal and Oblique cutting, Machining force, Merchant's Circle Diagram, Thermal aspects of metal machining, Machinability, Cutting tool materials, Tool wear and Tool life calculations. Cutting fluids, Classification of machine tools and their basic components, NC and CNC Machines

Unit -II

Lathe: Specification, components & accessories, various operations on lathes, capstan & turret lathes, tool layout, methods of thread production, machining time, single point cutting tools, tool signature and nomenclature

Unit-III

Milling: Vertical, horizontal and universal type machines, specifications and classifications of milling machines, universal dividing head plain and different indexing, gear cutting, milling cutters. **Shapers:** Classification and specifications, principle parts, quick return mechanism, shaper operations, speed feed, depth of cut, machining time.

Unit-IV

Grinding: Types of grinding machines, surface, cylindrical and internal grinding, grinding wheels, specifications, wheel turning and dressing without eccentricity, centre-less grinding. **Drilling & Broaching:** Fixed spindle, radial and universal drilling machines, drilling time, broaching principle, broaches and broaching machines.

Unit- V

Gear Cutting: Die casting, methods of forming gears, generating process, Gear shaping, gear shaving, gear grinding gear testing.

Nontraditional Machining Processes: Principle of AJM, WJM, USM, EDM, ECM, LBM - Process characteristics – Applications.

Text Books:

1. S. Kapakjian and S.R. Schmid, Manufacturing Engineering and Technology, Pearson Education (Singapore) Pvt. Ltd.
2. P. N. Rao, Manufacturing Technology, Vol. 2, 2nd ed., Tata McGraw Hill Publications.
3. P.C. Sharma, Text book of Production Technology, S.Chand & Company Ltd, New Delhi.

Reference Books:

1. R.A.Lindberg, Processes and Materials of Manufacturing, PHI.
2. B.S.Raghuvanshi, Work Shop Technology Vol-I & II, Dhanpat Rai Delhi.
3. D.G.Alcatori & M.B. Histan, Introduction to Mechatronics and Measurement system, TMH



Web Sources:

1. <http://nptel.ac.in/downloads/112105127/>
2. <http://home.iitk.ac.in/~vkjain/Lecture1-Introduction.pdf>
3. <http://www2.isikun.edu.tr/personel/ahmet.aran/mfgprop.pdf>

Suggested Practicals:

1. To make a job on lathe machine.
2. To make a job on milling machine.
3. To make a job on a shaper.
4. To make a job on drilling machine.
5. To study broaching machine.
6. To study Tool Signature.
7. To study centreless grinding.
8. To study non traditional machining processes.
9. To study formation of chips during machining processes.
10. To study capstan and turret lathe.



Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
ME3CO08	Machine Design-I	3	0	2	4

Unit I

Design against Static & Fluctuating loads: Types of static loads, Theories of failure, design under static load, Stress concentration and its effect on ductile and brittle materials, stress concentration factor for various geometries, cyclic stresses, notch sensitivity, design for finite and infinite life, Soderberg, Goodman & Gerber criteria.

Unit II

Keys & Couplings: Keys; Types and selection, design of square and flat keys, splines. Selection of couplings, design of rigid coupling: Muff coupling, Clamp coupling and Flange coupling, Flexible couplings: Bushed pin flexible coupling.

Unit III

Shafts: Cause of failure in shaft, materials for shaft, stress in shaft and design of shafts subjected to twisting moment, bending moment and combined twisting and bending moments.

Unit IV

Mechanical Spring: Types, nomenclature of helical springs, spring materials, types of ends, design of helical springs subjected to static load. Leaf springs: types, classification, nomenclature and design.

Unit V

Belt Rope and Chain drives: Design of belt drives, Flat & V-belt drives, Condition for Transmission of max. Power, Selection of belt, design of rope drives and design of chain drives with sprockets.

Text Books:

1. V. B. Bhandari, Design of Machine Elements, TMH Publishing Co. Ltd.
2. Joseph E. Shigley, Machine Design, McGraw Hill
3. P. C. Sharma and D. K. Agrawal, Machine Design, Kataria Publishers.

Reference Books:

1. Robert L. Norton, Machine Design, Prentice Hall
2. M.F. Spotts, Design of Machine Elements, Pearson.

Web Sources:

1. <http://nptel.ac.in/downloads/112105125/>
2. <http://www.svecw.edu.in/Docs%5CMEDMMLnotes2013.pdf>



Suggested Practicals:

1. To study and draw the methods of reducing stress concentration.
2. Design and drawing of different types of keys.
3. Design and drawing of Muff coupling.
4. Design and drawing of Clamp coupling.
5. Design and drawing of Flange coupling.
6. Design of shafts subjected to combined twisting and bending moments & drawing of bending and twisting moment diagrams.
7. Design and drawing of different types of springs.
8. Design and drawing of different types of chains.
9. Design and drawing of different types of belts.
10. Design and drawing of different types of wire ropes.

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Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
ME3CO09	Energy Conversion - I	3	0	2	4

Unit I

Steam Generators: Classification, Features of high pressure (power) boilers, Boiler mountings and accessories, Performance evaluation of boilers ; Equivalent evaporation, Boiler efficiency by direct and indirect method Energy balance, Boiler draught (natural and artificial draught)

Unit II

Cycles: Vapor Power Cycles Carnot cycle, Rankine cycle, Comparison of Carnot cycle and Rankine cycle, Efficiency of Rankine cycle , Relative efficiency, Effect of superheat, boiler and condenser pressure on performance of Rankine cycle. Reheat & Regenerative cycle, Binary Vapor Cycle.

Unit III

Steam Condensers & Cooling Towers: Introduction, classification of heat exchangers , types of condensers, back pressure and its effect on plant performance air leakage and its effect on performance of condensers, various types of cooling towers, design of cooling towers,

Unit IV

Air compressors: Working of reciprocating compressor, work input for single stage compression, effect of clearance, volumetric efficiency, actual indicator diagram, isentropic isothermal and mechanical efficiency, multi stage compression, inter - cooling, condition for minimum work input.

Unit V

Gas dynamics: Speed of sound in a fluid, mach number, mach cone, stagnation properties, one-dimensional isentropic flow of ideal gases. Steam nozzles: isentropic flow of vapors, flow of steam through nozzles, condition for maximum discharge.

Text Books:

1. P.K. Nag, Engineering Thermodynamics, TMH.
2. B. K. Sarkar, Thermal Engineering, TMH.
3. R. K. Rajput, Thermal Engineering, Laxmi Publicaions.

Reference Books:

1. G.J.Van, Thermodynamics, Willey Publication.
2. Y. Cengel, Thermodynamics, TMH.
3. M.J. Moran & H.N. Shapiro, Engineering Thermodynamics, Willey Publication.



Web Sources:

1. <https://lecturenotes.in/subject/155/energy-conversion-techniques-ect>
2. <https://ocw.mit.edu/courses/mechanical-engineering/2-60-fundamentals-of-advanced-energy-conversion-spring-2004/lecture-notes/>

Suggested Practicals:

1. To study high pressure boilers and their accessories and mountings.
2. To prepare heat balance sheet for given boiler.
3. To determine effectiveness of parallel & counter flow heat exchanger.
4. To study of Induced, forced and balanced draught by chimney.
5. To determine efficiency of cooling tower.
6. To find calorific value of a given sample of fuel using Bomb calorimeter.
7. To study and find volumetric efficiency of a reciprocating air compressor.
8. To find dryness fraction of steam by separating and throttling calorimeter.
9. To study condenser and its types.
10. To find dryness fraction of steam by using electrical calorimeter.



Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
ME3CO10	Dynamics of Machines	3	1	2	5

Unit I

Force Analysis in Mechanisms : Static force and Inertia force, D' Alembert's Principle, Static force analysis in mechanisms, Free body diagrams and equilibrium of two, three and four force members, superposition of forces and torques, Concept of dynamically equivalent system, Inertia force analysis using graphical approach - in four bar and slider crank mechanisms.

Unit II

Dynamic Analysis of Reciprocating Engines: Analytical expressions of displacement, velocity and acceleration of piston, Analytical expressions of Piston effort, Connecting rod force and turning moment in engines, Turning moment diagrams of : Single Cylinder and Multi-cylinder Internal combustion engines, Double acting steam engines, Coefficient of fluctuation of- Energy and Speed, Flywheel and it's applications in reciprocating engines and Punching and riveting machine.

Unit III

Governor Mechanisms: Governors and its type, Types of governors, terminology of Centrifugal Governors, Different types of centrifugal Governors- Watt, Porter, Proell, Hartnell Hartung, Gravity and Spring Controlled Governor , their performance characteristics, Different characteristics like – Stability, Isochronism and Hunting in Governors.

Unit IV

Balancing of Inertia Forces and Moments : Balancing of rotating masses : Two Plane Balancing, Balancing of several masses rotating in different planes, Balancing of reciprocating masses in : single cylinder IC engines, Multi-cylinder inline engine, Radial Engine V-twin engines, Concept of firing order and harmonic balancing in multi-cylinder engine,

Unit V

Friction: Laws of Dry Friction, Boundary and Fluid film lubrication, Friction in Journal and thrust bearings, Concept of friction circle and axis in mechanisms, Rolling friction, Frictional torque in pivots and collars by Uniform Pressure and Uniform Wear Rate Criteria
Clutches: Single plate and multi plate clutches, cone and centrifugal clutches and torque transmission calculations.

Text Books:

1. A.G. Ambekar, Mechanism and Machine Theory, PHI.
2. S.S.Rattan, Theory of Machines, TMH.
3. R.K.Bansal, Theory of Machines, Laxmi Publications.

References Books :

1. Bevan Thomas, Theory of Machines, CBS Publishers.
2. A. Ghosh and A.K.Mallik, Theory of Mechanisms and Machines, Affiliated East-West Press,
3. R.L.Norton, Kinematics and Dynamics of machinery, TMH.

Web References:

1. <https://nptel.ac.in/downloads/112101096/>
2. http://www.vssut.ac.in/lecture_notes/lecture1429901026.pdf

Suggested Practicals:

1. Determination of moment of inertia of flywheel by falling weight method.
2. Determination of center of percussion of long body,
3. Determination of radius of gyration of a bar using Bifilar suspension method.
4. To determine the performance characteristics of Watt, Porter and Proell Governor
5. To determine the performance characteristics of Hartnell Governor.
6. To perform dynamic balancing of unbalanced rotating shaft.
7. To study the balancing of reciprocating masses in an reciprocating engine.
8. To study different types of clutches.
9. To determine stopping distance and braking torque using internal expanding shoe brake.
10. To determine center of gravity of compound pendulum (Symmetrical and Unsymmetrical body).

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Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EN3MC03	Technical Communication	2	0	0	0

Unit I Communication: Difference between general and Technical Communication, Barriers to Communication, Verbal/ Non Verbal Communication, Body language , flow, patterns, types of communication.

Unit II Confidence Building : Self evaluation and development, SWOT Analysis, overcoming hesitation and fear of facing public, exercises for confidence building, concepts and elements of emotional intelligence, significance.

Unit III Business Correspondence – Business letters, formats, parts and layouts of business letters. sales letters: job applications, resume writing, applications, calling quotations, sending quotation, placing orders, complaints, and aftermath. Email Etiquettes.

Unit IV Report Writing – Business letters, formats, parts and layouts of business letters. sales letters: job applications, resume writing, applications, calling quotations, sending quotation, placing orders, complaints, and aftermath. Email Etiquettes.

Unit V Formal Presentation- Organising data, assimilating, preparing slides, designing presentations, basic personality traits. Interviews, group discussion

Text Books:

1. R C Sharma, Krishna Mohan, Business Correspondance and Report Writing .
2. M Ashraf Rizvi, Effective Technical Communication

Reference Books:

1. P N Kharu Dr Varinder Gandhi Communication Skills IN English
2. Herta A Murphy, Effective Business Communication

Web Source:

<http://study.com/academy/lesson/communication-skills-definition-examples.html>
<https://books.google.co.in/books?>

Open Learning Source:

<https://onlinecourses.nptel.ac.in>



Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EN3HS04	Fundamentals of Management, Economics and Accountancy	3	0	0	3

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